

A MULTITUDE OF MONUMENTS:
FINDING AND DEFENDING ACCESS TO RESOURCES
IN THIRD MILLENNIUM BC OMAN

By

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ABSTRACT

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How do different types of monuments and different monumental forms express social realities and inform larger social patterns? This dissertation research adds to this discussion from the perspective of the region best known for its ancient monuments: the Middle East.

Known to its neighbors as the land of “Magan,” the Oman Peninsula in the third millennium BC was the location of a dispersed yet well-integrated cultural tradition known as the Umm an-Nar. The people of Magan were trade partners with both the Mesopotamians to the west and the Indus to the north. Beginning in the late fourth millennium, the integration of coastal fishing communities and interior agricultural oases across the hyper-arid peninsula was matched by the development of a monumental tomb tradition spanning the length and breadth of Magan. In certain places – such as the Wadi al-Hijr – a second monumental tradition developed alongside the tomb tradition: that of the Umm an-Nar “tower.” The combination of these two types of monuments provides a unique opportunity to consider the way(s) in which middle-range societies use monuments.

This data set is a combination of published and unpublished excavation reports – particularly the towers of Bat by the American Expedition – and a survey designed and carried out for this project. The research progresses in several stages. Survey results indicate a high degree of clustering among the tombs, and occur within a variety of landscapes. I argue that the earliest (“Hafit”) tombs mark access to resources, but are also mnemonics of regional social

integration. Although the later (“Umm an-Nar”) tombs do not mark resources, they reference the earlier tomb tradition, concentrate energy in the mortuary realm and on the monument itself, and thereby indicate a shift toward local (tomb-based) group identity.

Excavations (led by the author) at the Hafit-Umm an-Nar transitional tower at Matariya demonstrate a change over time in the monumental aspects of the structure. This research argues that intensification limited access to underground and permanent water sources, and was used by local groups to leverage relative social, economic, and political position. Resource exclusivity flew directly in the face of ideologies of integration, visible in the Hafit tomb tradition, and Umm an-Nar people attempted to off-set this tension through an intensification of their mortuary practices. Contemporary monument types balance tensions between environments, individuals, kin and corporate groups. A diachronic study points to the ways in which structures of both types expand in monumentality. Together, synchronic and diachronic comparisons between different monument types indicate both growing friction between social groups, and a refusal to admit these divisions. Future research should investigate the tensions noted here.

To Jay and Charlotte

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CHAPTER ONE: INTRODUCTION

Landscape Archaeology and the Monument

The study of monuments is an important part of archaeological research into prehistoric societies. This research falls at the junction between the study of monuments, of mortuary practices, and the ways ancient cultures organized themselves and moved within the landscape.

Landscapes are full of meaning. They are invoked to reinforce and create a sense of cultural place and order (Basso 1996) and a physical link to past and present (Hingley 1996). Landscape archaeology evaluates the environment in terms of dynamic physical, cultural, and social interactions in space, and is therefore both “a material record of patterned behaviors within specific environmental contexts and a symbolic construction” (Anschuetz et al. 2001:179). As such it mutually produces and reproduces social action, and is itself the means of social system reproduction (Giddens 1984:19). It is based on the premise that the underlying spatial patterns visible archaeologically may correlate with certain social organizational features (Anschuetz et al. 2001) and cultural maps (e.g., Richards 1999). The study of monuments is therefore the study not of a built environment, on the one hand, and a natural environment on the other, but rather of the creation and re-creation of communities within multi-dimensional space and time (e.g., Buikstra and Charles 1999; Charles and Buikstra 2002; O’Shea and Milner 2002; Tilley et al. 2000). Locating, building, altering, and even viewing monuments can generate a new understanding of potential interactions with and within that world (Ashmore and Gellar 2005; Bradley 1998).

Monuments are most frequently thought to be associated with complex societies, in which they are evidence of vertical stratification and the consolidation of elite power (e.g., Earle 2000; Kirch 1990; see Kaplan 1963). Yet smaller-scale societies also have a long tradition of monument building. Kaplan suggests that monuments may function in chiefdoms as “a system-

maintaining mechanism” specifically because less complex societies are less rigidly organized (1963:404). Similarly, monuments can be employed to solve what O’Shea and Milner (2002) call the “two opposing problems” of the tribal system: large-scale integration and local differentiation (201). While studies of mortuary monuments tend to emphasize the exclusive rights of members to burial, ritual practice, territories and resources there is another kind of monument whose role it is to integrate. That is, depending upon the scale of analysis and the audience(s) in question, different levels of social access may be afforded – or at least made visible – through access to specific monuments, built for different audiences and in order to facilitate identification of members and non-members at different levels of society. Tombs have a history of use as territory markers (e.g., Mathews 2006; O’Shea and Milner 2002), in which the group’s space is marked through the maintenance of mortuary monuments. In this way, tombs are located in areas of contention along borders. A second relationship between tombs and the landscape correlates the maintenance of cemeteries – groups of tombs – with access to specific resources (Goldstein 1976, 1981; Saxe 1970). In this scenario it is not the territory itself that is of interest, but localized resources on the landscape. In either case the spatial relationship of mortuary monuments to each other and to the landscape are significant, and can be identified and characterized using a variety of clustering and cost surface techniques. Howey (2007) argues that monumental earthwork enclosures of Late Prehistoric (AD 1200–1600) Michigan acted as points of inter-tribal interaction.

This myriad of responses to the question, “Why monuments?” is summed up in the variety of deliberate and tacit social statements that the structures themselves are built to evoke. That different monument types can have different meanings in the same cultural tradition is possible, but how to understand those differences? This dissertation seeks to answer not only the question,

Why monuments? But also, Why multiple types of monuments?

Limitations of This Study

Relatively little is known about the ancient cultures of the Oman Peninsula. As discussed in Chapter 3 there is a general paucity of research on ancient Oman. We are, however, at the beginning of a period of intense research, which should facilitate rapid growth and change in our understanding of and ideas about the ancient land of Magan.

Chronology of the Oman Peninsula

As Childe (1944) pointed out long ago, archaeological ages and technological stages do not necessarily match up nicely (**Table 1**). The normative material-based development of Neolithic, Chalcolithic, Bronze Age, Iron Age is of limited use on the Oman Peninsula. Rather there was a primary Neolithic followed by an extended Chalcolithic with Neolithic elements into the first millennium BC. In an effort to build a more localized chronology D. Potts (1993b) has developed the terms Late Prehistoric (5000–2000 BC), Protohistoric (3400–2300 BC), and Early Historic (2300–300 BC) to refer specifically to the Oman Peninsula, but they have not caught on. The result has been the use of terms such as “Early Bronze Age” or “early third millennium BC” when the speaker links ancient Oman to its contemporaries (e.g., in Southwest Asia). This is discussed in further detail in Chapter 2.

Table 1. Some Comparative Chronologies of Southwest Asia. Based on D. Potts (1993b:169); Ur (2004:49); and Weiss and Courty (1993:151).

Absolute Dates	Northern Mesopotamia	Southern Mesopotamia	South Iran	Indus Valley	Magan		
1600	Middle Bronze II/Khabur	Old Babylonian	Old Elamite	Late Harappan	Wadi Suq		
1700							
1800	Middle Bronze I	Isin-Larsa					
1900							
2000	Post-Akkadian	Ur III					
2100	Akkadian	Akkadian					
2200							
2300							
2400	Early Dynastic III	Early Dynastic III					
2500							
2600							
2700	Ninevite 5	Early Dynastic I-II	Proto-Elamite	Early Harappan	Hafit Period		
2800							
2900	Post-Uruk						
3000	Late Uruk	Late Uruk/Jemdet Nasr					
3100							
3200							
3300	Middle Uruk	Middle Uruk	Eanna XIV-VI	Mehrgarh II-VI	Late Prehistoric C / Neolithic		
3400							
3500							
3600	Northern Middle Uruk						
3700							
3800	Northern Early Uruk	Early Uruk					
3900							
4000							
4100	Terminal Ubaid	Late Ubaid					Late Prehistoric B
4200							
4300							
4400							

During the 3rd millennium BC, while the Mesopotamian and Indus civilizations flourished, the Oman Peninsula was likewise the site of an ancient culture of great regional importance (**Figure 1**). The Umm an-Nar people of ‘Magan’, the Sumerian word for ancient Oman, were well known by their Mesopotamian and Harappan neighbors for their seafaring and boat-building, their utilization of precious white stone (diorite) in statues of the Mesopotamian kings, and the copper

that was so famous that ‘Magan’ became the Sumerian word for the precious metal itself.

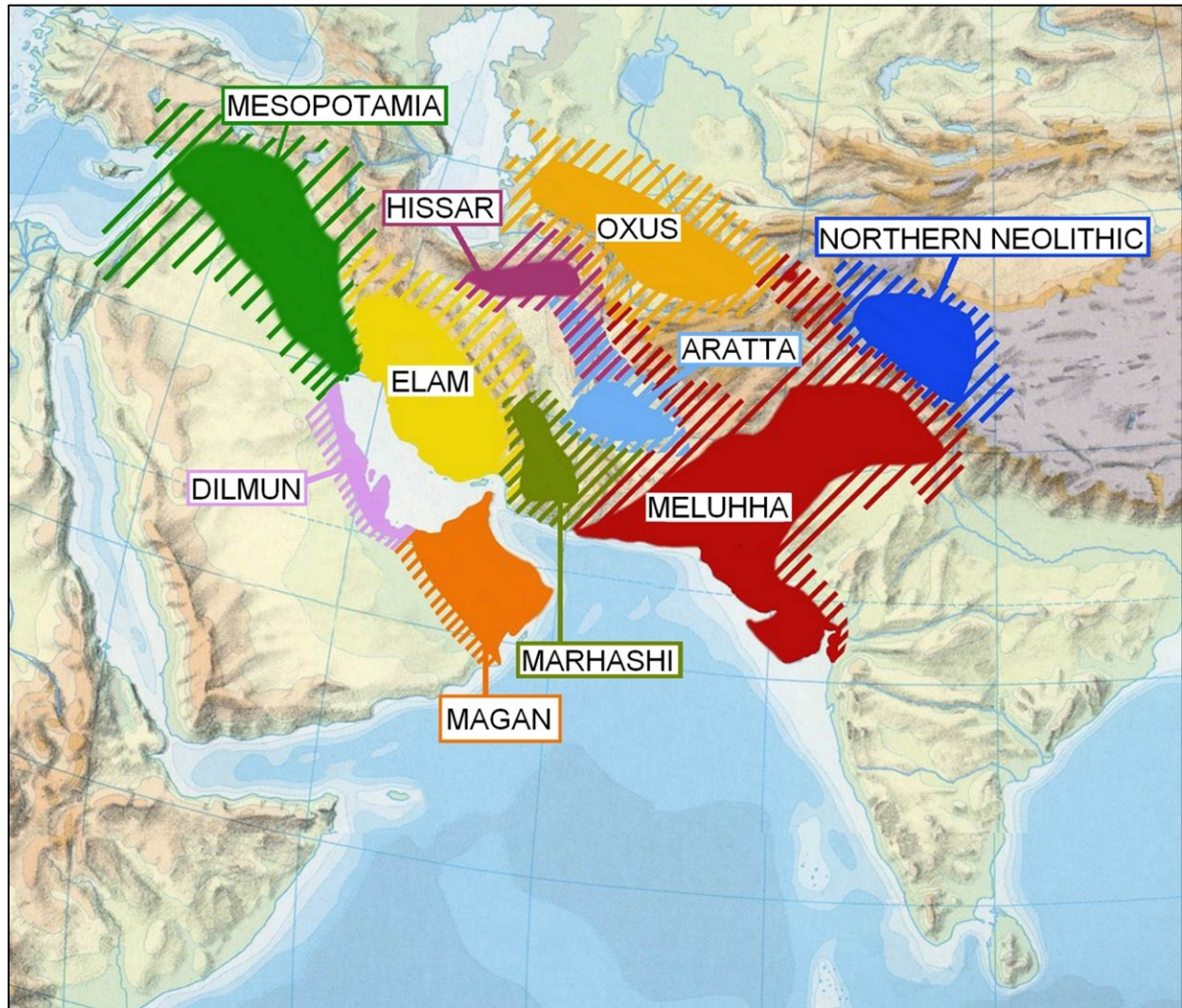


Figure 1. Oman (ancient "Magan") and other cultures of the third millennium BC. Figure compliments of Gregory L. Possehl. For interpretation of the references to color in this and all other figures, the reader is referred to the electronic version of this dissertation.

In spite of their close trade networks the Umm an-Nar culture was very different from both the Mesopotamian city-states and the Indus civilization. Archaeological evidence suggests that the Umm an-Nar was organized in small settlements rather than impressive cities. Rather than building empires, they engaged in a wide variety of small-scale farming, herding, mining, fishing and other maritime pursuits. These vastly diverse economic enterprises occurred in correspondingly disparate environments. Beginning in the late fourth millennium, the integration

of these communities was matched by the development of a monumental tomb tradition spanning the length and breadth of Magan. In the centuries that followed, in certain places a second monumental tradition developed alongside the tomb tradition: that of the Umm an-Nar ‘tower.’ Towers were first identified in the 1970s as 20–30 m circular stone above-ground structures, lacking burials, that resembled the Islamic watch-towers found across the Oman Peninsula (de Cardi et al. 1976; Frifelt 1976; Hastings et al. 1975). These two different yet contemporary monumental forms provide the opportunity to consider the way(s) in which monuments and their distinct positions can reflect social organization and ecological interaction.

Bat and the Wadi al-Hijr

Previous and on-going research on the Oman Peninsula has focused on a single monumental context, almost exclusively the third millennium tomb, with little understanding of the contemporary tower. The relative paucity and erratic distribution of towers compared to tombs has meant that few researchers have had the opportunity to study the tower, particularly in regards to the importance of their placement on the landscape. This dissertation combines both monuments into a single research program. The Wadi al-Hijr (Hijr Valley) provides a unique opportunity to study both types of third millennium monuments within a relatively small area (**Figure 2**). The survey region stretches from the UNESCO World Heritage site of Bat in the southeast to the mouth of the Wadi al-Hijr, where it joins with the Wadi al-Kabir (**Figure 3**).

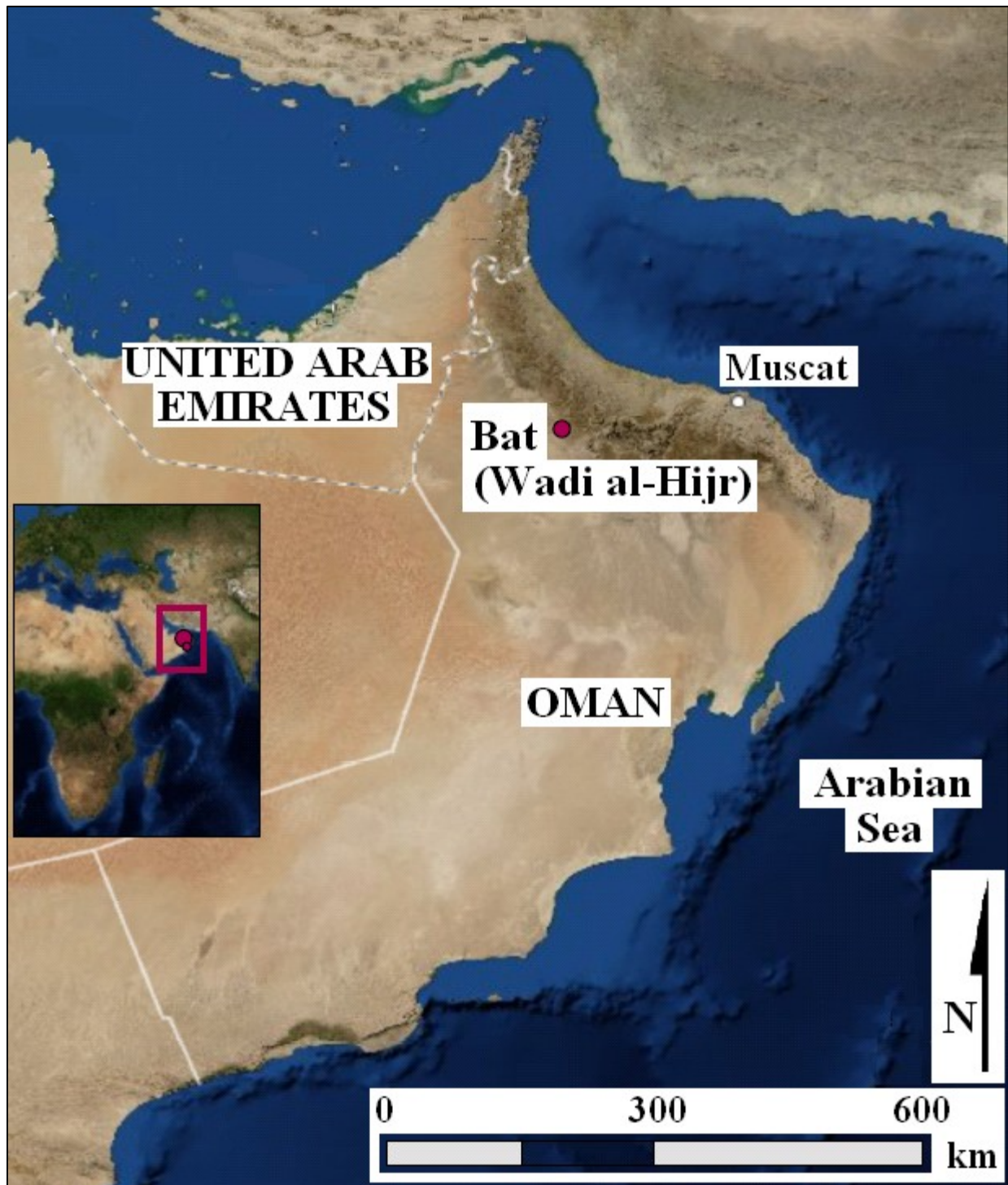


Figure 2. Location of Bat and Sultanate of Oman.

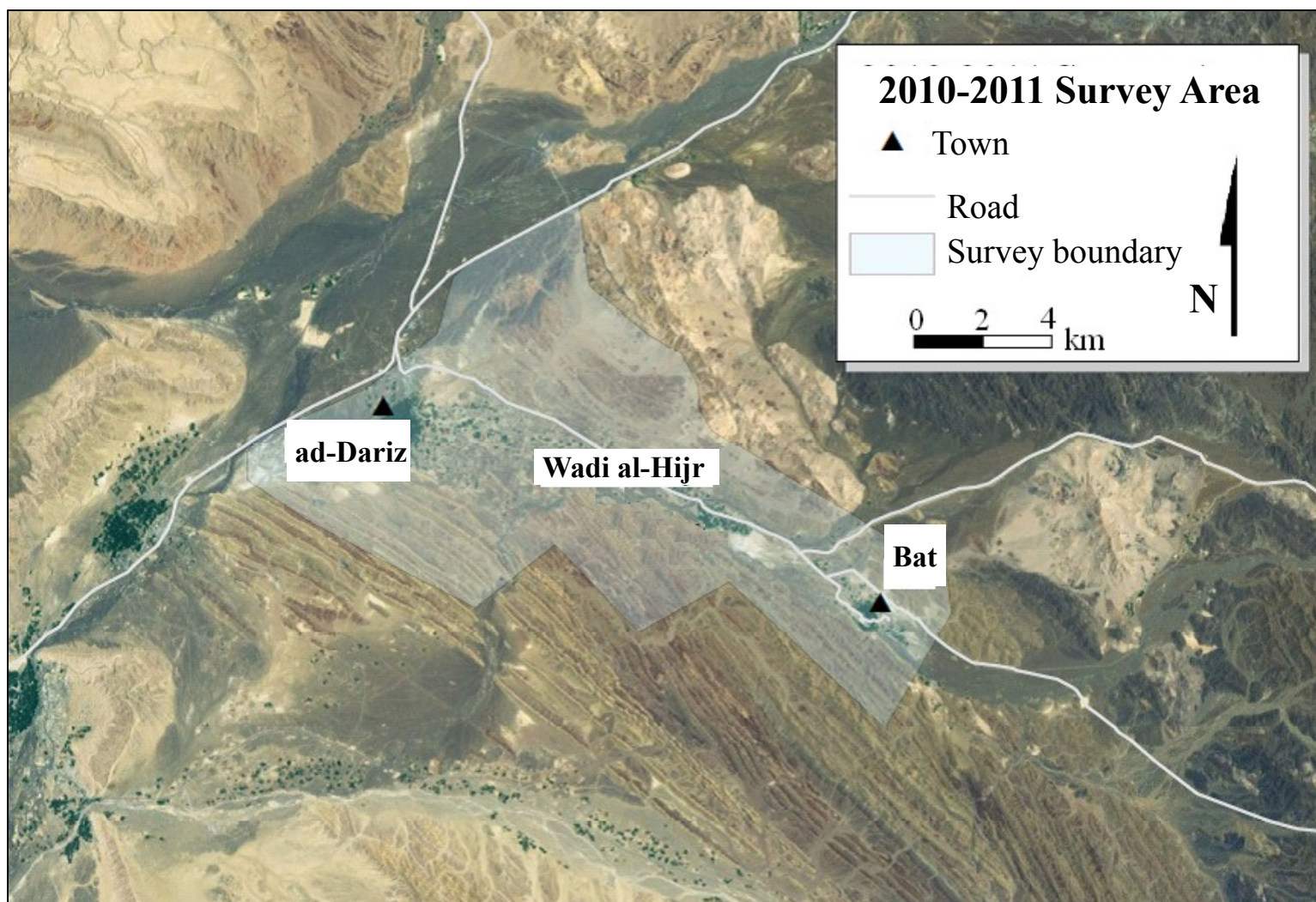


Figure 3. The Wadi al-Hijr.

This space, from the village of ad-Dariz to the west and Bat to the southeast, provides a unique window into third millennium BC life on the Oman Peninsula. Bat's third millennium monuments were the basis for its inscription on the UNESCO World Heritage list, where it is described as one of “the most complete collection of settlements and necropolises from the third millennium BC in the world” (UNESCO 2009). The site of Bat encompasses a modern village as well as extant agricultural fields. The third millennium component of Bat consists of multiple parts: (1) as many as seven Bronze Age towers, several of which are currently under study; (2) hundreds of Bronze Age tombs of various styles, clustered in a side valley at the so-called ancient “Necropolis” as well as arranged along the northern and southern ridges of the valley; (3) ancient agricultural fields, the presence (if not extent) of which have been briefly studied (Frifelt 1989); and (4) the Settlement Slope, where hints of domestic materials and architecture have been recovered (Brunswig 1989; Frifelt 1989). At the western end of the study region beyond the UNESCO boundaries, the ad-Dariz environs have been found to include numerous third millennium BC tombs in addition to several of its own towers.

Unlike the tombs, which are estimated to number over one hundred thousand across the entire Peninsula (Cleuziou and Tosi 2007:107), towers are relatively scarce; only 64 have been identified to date, and only in the last several years has there been any concentrated effort at their documentation (Cable and Thornton, 2012). Most third millennium sites have no towers at all. Those sites with towers tend to have one or two; on the entire Oman Peninsula, only in two cases are there as many as seven. The site of Bat belongs to this exceptional latter group, and as early as the 1980s archaeologists recognized that Bat was the most likely place to understand the purpose of the third millennium BC towers (Gentelle and Frifelt 1989:125). Only Bisya, ca. 100 km south of Bat, has a comparable number of towers, yet Bisya lacks such an extensive

collection of contemporary tombs.

The nature and distribution of the third millennium monuments in Oman – including those in the UNESCO World Heritage Site – has been up-to-now unknown. These investigations into the third millennium BC mortuary and non-mortuary stone-built monuments of Bat and the Wadi al-Hijr, northern Oman, evaluate the relationships between land use, landform, and the creation and distribution of different types of monumental architecture. Specifically, I ask:

- How can spatial relationships between third millennium BC monuments in the Hijr Valley inform our understanding of Umm an-Nar social interactions?
- What can the positioning of monuments in relation to landform and landscape tell us about how Umm an-Nar people organized their social and physical worlds?
- What are the implications of the spatial distribution of monuments and resources for understanding Umm an-Nar cultural interactions and social organization?
 - Why are there two different kinds of monuments in the third millennium BC?

Argument

This research agrees with contemporary literature, that tombs from the first half of the third millennium marked access to resources (Harrower 2008a; Cleuziou and Tosi 2007). Specifically, this dissertation argues that Hafit and Umm an-Nar people used Hafit tombs to mark access to a wide variety of resources, and further argues that these tombs acted as necessary integrative mechanisms across an extremely flexible social system. The mortuary record supports the idea that third millennium BC people of the Wadi al-Hijr were part of an active network of trade stretching along the western piedmont of the Hajar Mountains. However, this dissertation also asserts that the ideology of different-yet-equal, played out during the interment of a group member, expressed through the tomb monument itself, and made real through access to different

resources, is strained over time. This strain is visible in the mortuary record, but also in the development of the second monumental tradition: the tower.

This dissertation also posits that the development of the Umm an-Nar tower began with access to water. Seasonal flood water (*sayl*) flows slowly enough in the piedmont region so as to make possible limited horticulture and a variety of pastoral activities. However, in Bat this quickly became a more specific relationship: that of a tower with a central **well**. Unlike surficial water, wells provided access to semi-permanent, sub-surface wadi flows (*ghayl*), which is a predictable yet even more spatially limited resource. This dissertation argues that the formalization of access to *ghayl* in the tower monument limited an important resource to a specific subgroup. Although initially social access may have proceeded along the same lines as other resources, the association of towers with a resource as significant as *ghayl* became indelible, such that over time it was no longer necessary that every tower actually contain water; the **idea** of water was there. As the monumental aspects of towers increased over time, access to this one particular resource became more formal and limited, and the social rights to that access became more limited in tandem.

By the end of the third millennium, there was a strong disconnect between the mortuary monument, which expressed open social access to a variety of resources, and the tower monument, which expressed a more closed access to a specific resource. As such, I argue that the Umm an-Nar people employed their mortuary monuments as signs of culture-wide authoritative access and horizontal differentiation, while at the same time some people leveraged their specialized access to towers – and thereby to water – in order to promote their own interests. Both monument types signal access to resources, and in doing so they reinforce ideologies of social integration while promoting opposing social realities.

Methods

A Geographic Information System (GIS) provides the ability to store, manage, and query spatial data (Longley et al. 2005). In order to evaluate these relationships, survey methods specific to the environment and features to be observed were applied. The region was surveyed with an eye towards complete coverage both in terms of intensity and extensity. All potential third millennium features were documented, along with their surroundings. These were entered into a GIS using ArcGIS 10.0. The GIS was used to query field-collected data in a number of ways, combining non-spatial and spatial elements of the archaeological landscape. Combining unpublished, published, and field collected data it was possible to assign dates to some specific monuments and to types of monuments. These were then integrated into the GIS to facilitate a study of change over the third millennium.

Formal and spatial groups of towers were parsed out using data collected in the field and spatial visualizations. Cluster analysis was used to determine the nature of the distribution of the tombs and towers on the landscape. Where relevant, tomb clusters and tomb-tower clusters were compared to determine environmental and archaeological differences.

Order of the Dissertation

This dissertation progresses in several stages. Chapters 2 and 3 establish the archaeological, theoretical and ethnographic bases appropriate for a landscape study of monuments in ancient Oman, and set out the research questions. Chapters 4 and 5 focus on data collection and description: the survey of a 16-x-8-km area along the Wadi al-Hijr extending from the town of ad-Dariz in the northwest to Bat in the southeast. It describes the collection of archaeological survey data and its collation with excavation and physiographic data in order to characterize the third millennium BC landscape of the Wadi al-Hijr.

In Chapters 6 and 7 I assess the archaeological and physical features on the landscapes and in relation to each other using a combination of clustering analysis, spatial and formal, and comparing these clusters. Different patterns characterize the different types of monuments and resources. Finally, Chapter 8 discusses these relationships according to the ways in which people may have used monuments to identify and defend social and spatial boundaries, as proposed in the first stage of this dissertation. Chapter 8 also sets out future research and potential broader impacts of this research.

Summary

Monuments play an important role in signaling cultural and local identity. Mortuary spaces have been shown to be linked to resource access. The study of these monuments on the landscape has proven to be a fruitful way of understanding how ancient peoples marked access to resources.

This research therefore seeks to understand the nature of the distributions of third millennium BC monuments in the Wadi al-Hijr, and to determine whether those distributions are socially meaningful in regards to resources or identity.

CHAPTER TWO: ENVIRONMENTAL, ETHNOGRAPHIC, AND PREHISTORIC CONTEXTS

Physical and Social Geography of the Oman Peninsula

The Oman Peninsula is located on the southeast end of Arabia on the eastern edge of the Middle East along the Tropic of Cancer (**Figure 4**). It is made up of the United Arab Emirates and the Sultanate of Oman, and is bordered by land to the west and southwest (i.e., by Saudi Arabia and Yemen), and by water in every other direction: to the east by the Arabian Sea and Indian Oceans, to the northeast by the Gulf of Oman, and the northwest by the Persian Gulf. Today, as in the past, these numerous water routes provide relatively easy access from the Peninsula to Iran, Pakistan, and India as well as Bahrain, Iraq, and Qatar.

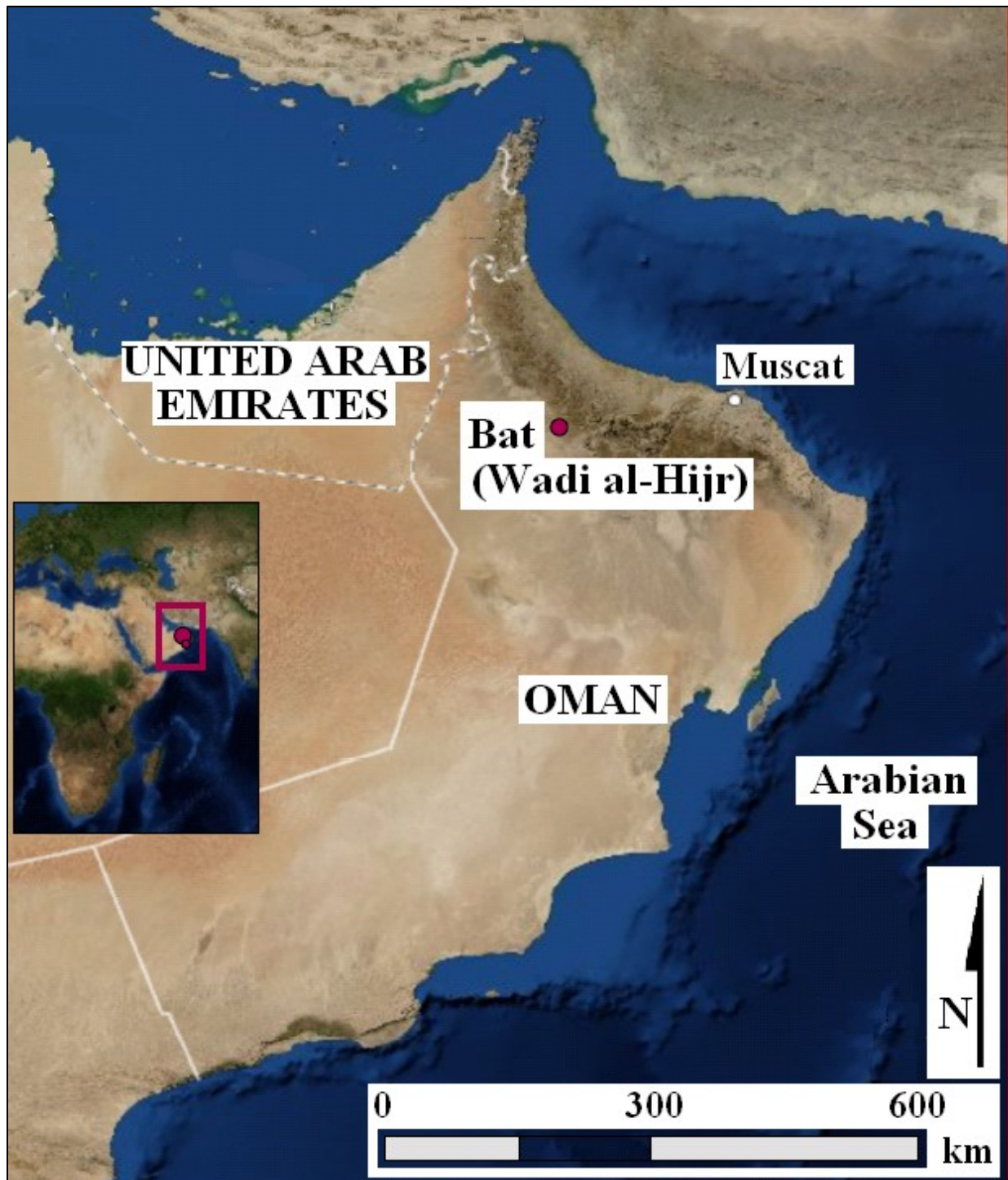


Figure 4. The Sultanate of Oman.

The unifying element of this geographic area is the rugged al Hajar Mountains, which stretch 700 km from the Straits of Hormuz in the northwest to the Arabian Sea and Ra's al-Hadd in the southeast. The Hajar Mountains are the boundary between the Indian and Arabian continental

plates and are one of the best examples of abduction in the world (Glennie et al. 1974; Robertson et al. 1990:xi). The result is the presence of older geological deposits above younger ones, and easy access to minerals and ores usually found only through deep subsurface prospection (Adachi and Miyashita 2003). Petroleum, copper, asbestos, diorite and limestone, chromium, gypsum, natural gas, and softstone have all been mined from these mountains at some point over the past 5000 years (CIA World Factbook; Hauptmann 1985; Hauptmann et al. 1988; Weeks 2004; Weisgerber 1980).

The Hajar Mountains separate the Oman Peninsula into two parts: on the eastern side of the range is the coastal plain, which is hot and humid; and on the western side are the hot, arid interior plains that merge into the Rub' al-Khali (or "Empty Quarter"). These areas can be further divided according to their relationship with the mountains and the coast: the western piedmont (foothills) region is the location of a number of settlements sustained by oasis agriculture; the coast maintains agricultural, fishing, and entrepôt communities; and the mountain altitudes provide the more moderate climate necessary for horticulture (Peterson 1990; Potts 1993b). The ruggedness of the mountains encourages cultural and ecological diversity, with ocean, mountain, and plain ecosystems all within a 100 mile stretch (Tosi 1986). The interior oases focus on date farming, which provides a canopy (and thereby protection from the brutal summer sun) for alfalfa, which is used as animal fodder, and household-oriented horticulture (Wilkinson 1977:16). While most employed Omanis work in the cities, they retain their connections to their tribal homes and villages through frequent, weekly visits by car. For many Omani men, this has meant leaving wives and children with their mothers and extended relatives, and even those Omanis who live and work in their family areas travel extensively on the weekends to maintain extended family networks. In effect, for the short- and long-term success of individuals, families,

and supra-family units each level must maintain a great deal of social and economic flexibility and integration.

Paleoenvironment. The Oman Peninsula has maintained ecological conditions similar to those of today for the past 5000 years or more (McClure 1976; 1988; D. Potts 1990a; cf. Stanger 1994). It consists of an arid landscape dotted with limited areas of higher population density, centered around oasis agriculture, mining, fishing, and coastal trading, and with extensive maritime trade and pastoral networks (Brooks 2006; Glennie et al. 1974(1994); Tosi 1975). Oman is above the isohyets (i.e., lines of precipitation – in this case, specifically referring to the 300mm isohyet that separates dry farming from irrigated agriculture) that denote dry farming areas; as such, all agriculture requires irrigation of some sort, whether by surface or ground water (R. M. Adams 1981).



Figure 5. Irrigated fields surrounded by non-irrigated fields; the Bat oasis is in the background.

Although an eighth of the country's land is arable, the majority of the land is too extreme (in

temperature, aridity, or topography) for sustainable human occupation (**Figure 5**). Runoff in the mountains tends to be too rapid for use in agriculture, while the coastal region suffers from brackish waters more suitable for mangrove swamps (Tengberg 2005). The piedmont region, however, has both space for alluvial soil accumulation and water for irrigation, especially where gabarbands and dams are used to divert surface flood-water (Costa 1983; Kalyanaraman 2003). Until the recent addition of motorized pumps, the water table has been relatively close to the surface for 5000 years. As few as 15 years ago in the oasis community of Bat, it was possible to reach ground water only seven meters below the surface while today the water table is 18-20 meters below the surface (Fouache and Desruelles 2010). Similarly, the early third millennium BC well at Hili was dug only four meters below the ancient ground surface (Cleuziou 1989:64). Access to the water table comes in the forms of wells and *aflaj* (singular *falaj*) systems of distributary irrigation channels that frequently run underground. *Falaj* wells may be vertical or “horizontal,” dug into the bases of mountains and extending at a slight negative gradient for kilometers. Contrary to its use in Iran (where they are called “qanats”), on the Oman Peninsula the term *falaj* refers generally to semi-subterranean irrigation systems rather than to specific hydro-technologies (English 1998; Wilkinson 1977, 1983a).

Physical and Social Geography of the Study Region

There are four natural valley systems that act as corridors from the interior piedmont region to the coast: the Wadi al-Kabir, the Wadi Khalfain, the Wadi Bahla, and the Wadi Suma'il (Shahin 2007:72). The Wadi al-Hijr is a tributary valley for the Wadi al-Kabir (literally, “The Big Valley”) on the western piedmont of the Hajar Mountains. (Bowen-Jones 1978:24)

The Wadi al-Hijr. This small side valley, several kilometers wide, is a seasonally-flooding tributary of the Wadi al-Kabir, joining one of the few natural routes leading through the virtually impassible Hajar Mountains (Glennie 2005; Glennie et al. 1974; Shahin 2007:72). The small and

intermittent flows of water that run seasonally along the northern and southern edges of the al-Hijr are essential for oasis agriculture. This area receives approximately 200 mm of annual precipitation. Here the schist of the Oman mélange geologic formation splits naturally into almost-modular preforms used in ancient and pre-modern stone architecture. Nearby to the north, the Jebel Shuwāṭī is still mined today for its white limestone, which once provided the building material for the finished facing stones (“sugar lumps”) found on Umm an-Nar tombs of the Bronze Age (Tosi 1975:204) and now is found in every “Gulf Gothic” façade (**Figure 6**). Geologically, the western end of the Wadi al-Hijr is made up of rows of vertically striking banded siltstone divided by deeply sedimented wadi bottoms, arid channels, and some low rocky plateaus.



Figure 6. "Gulf Gothic" architecture, Muscat.

The western end of the Wadi al-Hijr is bounded by Shuwā'ī and Wahrah Mountains to the north and south, respectively, while to the west the Wadi al-Hijr meets the Wadi al-Kabir. Where the Hijr Valley joins with the Wadi al-Kabir is the modern village of ad-Dariz. Sixteen kilometers up the valley to the east of ad-Dariz is the modern oasis village and archaeological site of Bat. Today settlements cluster in the modern villages of Bat, al-Wahrah, and ad-Dariz. The abandoned date groves to the north and west of the current settlement of Wahrah suggest that there has been a rapid and recent drop in water levels (probably coupled with a greater dependence on remittances) (**Figure 7**). A similar shift can be seen in the construction boom centering around the paved highway adjacent to ad-Dariz.



Figure 7. fields near Bat, looking north. Note the abandoned date grove (north) with an irrigated grove (east), and irrigated and fallow fields (foreground).

Topography in this section of the Wadi al-Hijr is dramatic. Bedrock outcrops of the al-Wahrah Series, oriented and striking northwest-southeast, rise out of alluvium (Bowen-Jones 1978). The result is a flat wadi plain of varying depth, with sudden outcrops of bedrock intermittently breaking through an otherwise gently sloping alluvial plain (**Figure 8**).



Figure 8. Limestone bedrock rising vertically up from the wadi floodzone. Note the pickup for scale.

Water in the Hijr Valley either comes from seasonal surface rains (*sayl*) or is in underground rivers (*ghayl*). The exploitable aquifer flows in Pleistocene conglomerate (and later) deposits in the al-Wahrah group (Bowen-Jones 1978:3; Fouache and Desruelles 2011), today providing relatively easy and regular access to water, but in limited locations. Pragmatically, one may expect multiple uses out of such marginal landscapes (Arikan 2012).

Ethnographic Insights into Omani Land Use and Access to Resources

The Middle-Range Society in Anthropology

Definition of a tribe. Tribes are characterized by dual and opposing forces: organizational flexibility and independence on the one hand; and a predictable, universally acknowledged societal framework on the other (O'Shea and Milner 2002). The tribe is a “pivot” between kin-based and territory-based societies, where it acts as a corporation that manages resources (Lancaster and Lancaster 1986; 1992a). For the purposes of this research, the tribe is an

arrangement of social, political, and economic relationships balancing societal integration and organizational flexibility. This balance requires some effort. Giddens (1984) argues that this is achieved in two necessary parts: (1) it occurs in the ideological realm, and (2) it depends “overwhelmingly upon interaction in the settings of locales of high presence availability” (182). That is, ideologies of integration and cultural one-ness are necessary, and these ideologies are reinforced at regular, ritualized events.

Modern Tribes in Oman and Ethnographic Parallels

It is only in the last 25 years that Oman has undergone a dramatic shift such that the use of the landscape has dramatically changed. Because the modern ecological constraints on groups in the recent past are similar to those that existed 5000 years ago there may be greater similarity between modern and ancient cultures in Oman than in many other places in the world. Modern tribes on the Arabian Peninsula are somewhat unique: they do not act as legally corporate groups; they are not necessarily localized nor do they invoke the same concepts of territoriality; marriage is endogamous; and tribal kinship is manipulated as justification for membership (Lancaster and Lancaster 1992a). It is therefore worthwhile considering potential ethnographic insights regarding the ways people may maintain access to resources in an environmental context such as the Oman Peninsula.

The Tribe in Modern Oman: Middle Range Responses to the Omani Environment

The natural environment plays an important role in the ways in which people of Oman have organized themselves in the recent past. The knowledge that “no one area or resource is able to sustain a livelihood over the year” (Lancaster and Lancaster 1996:141) has framed strategies of livelihood and concepts of identity. There are 12 tribal groups in modern Oman (Chatty 1996) and each has traditionally held a specific role in the overall functioning of the society at large. Certain tribes are traditionally known for camel or sheep/goat herding, acting as pastoralists

engaged in mixed horticulture. Others are agriculturalists with year-round cash-cropping (in the form of dates). Coastal tribes engage primarily in maritime-oriented activities. As each of these groups has its own socio-economic (and, to varying extents, geographically defined) niche, a fourth tribal group specializes in acting as intermediaries between the other, often warring, tribal groups (Wilkinson 1977).

That is, different tribes have different generalized economic roles to play, making up a heterogeneous network stressing their homogeneous culture. Specific tribal identities were subject to a much broader system of identity. In the fourteenth century Ibn Khaldûn described a distinction that is continually being lost today. According to Ibn Khaldûn (1967 [1377]), *Badw* did not refer to a particular subsistence strategy or style of living, but instead referred to “a politically 'primitive', decentralized tribal society, incorporating also 'settled' peoples who cultivate and trade, and many of whom live in 'towns'” (Wilkinson 1990:56). As Khuri (1980) describes them, *bedw* refers to a “tribally organized society whose elite operates from oasis settlement and whose power derives from manipulating 'kinship principles to regulate marriage, social interaction and the redistribution of power, force, wealth and benefits’” (Wilkinson 1983b:313). It is important to recognize that oases are not isolated settlements, although they do function partially as agricultural centers. Rather, they are “nodes” or fixed points in a larger network of seasonality and spatially varying subsistence patterns based on complementary resources that “**can only be exploited by mobility**” (Wilkinson 1978:7; emphasis added). As with other parts of the tribal network, they only exist as part of a greater exchange economy bound up in tribal networks spanning great distances (Wilkinson 1978).

From this description it is also possible to see some tension between two anthropological concepts, that of tribe and of chiefdom. It is the **degree** of flexibility and distinction between the

political, economic, and kin systems that is the primary distinction culturally; archaeologically, chiefdoms are noted primarily for their redistributive structures and emerging hierarchies, which are nevertheless bound up in social relationships of reciprocity.

Where resources are unpredictable and scarce, such as Oman, access is controlled not through defense of a territorial *space*, but through membership in a social group with rights to the space, what Casimir terms *social boundary defense* (1992:12). Lancaster and Lancaster (1992a; 1996) have found this strategy at work on the Oman Peninsula today, specifically in the Ja'alan. However, they also note that even in the Ja'alan there are “alternative views of territorial behavior; the tribes of Beni bu Ali would seem to view anchorages as possible nodes, those of Beni bu Hassan do not” (Lancaster and Lancaster 1992b:354). Among the nomadic (camel-herding) groups, territories are functional rather than formal, and non-exclusive; this is because one place can have multiple uses and at different times of year (Wilkinson 1983b:308). This emphasizes the extraordinary flexibility that characterizes the regularization of access to resources in this landscape.

Rights to Resources, and Accessing Them

Even without land ownership, it is possible to create notions of sovereignty framed around **control** of land (Wilkinson 1978:308). Modern Islamic land ownership law – specifically in conjunction with water – is framed around the **fruits** of the land and its active development (Wilkinson 1977) and it is the human input of labor and the development of land that marks the right to that resource (Lancaster and Lancaster 1986; 1996:147; 2002:239). While not at odds with the concept of a territory, it provides nuance. A territory marks out a space within which lie a variety of different types of land and resources (Dresch 1989: 81; Wilkinson 1983b) in order to regularize access to those resources (Casimir 1992). Rights to a resource, or a specific use of the landscape, however, is a slightly different way of conceiving of (and maintaining) access. In

addition, if a territory is “an area which is habitually exploited” (Higgs and Vita-Finzi 1972:30), it is important to consider the degree to which flexibility is important in the Omani environment; although some are more reliable than others, no one **space** or subsistence practice has what is needed to support a group on its own.

In Oman during earlier, historic periods access to resources was marked by the construction of simple ephemeral shelter for animals or people, and acknowledged in tribal terms. In the ethnographic present access to resources is established through the maintenance of more permanent structures (Lancaster and Lancaster 1992b:356), and also through the development of resources (e.g., through wells, cisterns, gardens). However, “a map of well ‘ownership’ would also be misleading as ownership is not synonymous with maintenance or use” (Lancaster and Lancaster 2002:240); rather, maintenance and use are matters of relationships between groups and people. **Access to resources is maintained through relationships.**

In total, there are two main, related problems confronting those who live in patchy environments such as the Oman Peninsula: first, there is the question of creating a system of access to resources over great distances and seasons, and with a limited population. The second is in maintaining that access. In Chapter Three, the monument comes to the rescue.

The History of Prehistory: Archaeological Survey in the Northern Oman Peninsula

Framework

Unlike most of the Arab world, very little was known archaeologically about the Oman Peninsula until a century ago. Situated beyond the Islamic empires to the northwest and the Mandate powers of Europe, the Oman Peninsula was considered lawless, lacking a stable, centralized (and principally European) governing body with which foreign scientists could negotiate (Potts 1998). It was not until petroleum companies began their forays into the Peninsula in the 1940s that research followed; by the 1960s several large-scale non-systematic

surveys and a few key excavations were underway (e.g., Pullar 1974:33). The purpose of these early ventures was descriptive and exploratory rather than systematic. The goals were to develop a very general model of ancient landscape use, and to identify the sites most likely to yield, through excavation, the greatest amount of information about this region. In particular, the purpose of these early forays was to relate the Oman Peninsula to its ancient neighbors in Mesopotamia, the Gulf, Iran, and Baluchistan, so as to link ancient Oman to better understood civilizations. The early Danish, British, German, and American surveys and excavations during this period began to fill the gap in archaeological knowledge of the Oman Peninsula.

While the number of archaeological survey projects in this region remains small, it is important to note that most archaeological expeditions have included survey of their research areas. Although these are rarely systematic, many of their results are included in annual reports presented to the Oman government. Over the past decade, survey methods in this region have improved dramatically, and archaeological surveys in northern Oman are beginning the transition from haphazard explorations to systematic GIS-aided landscape studies.

Previous Archaeological Survey – Early Phase

The 1970s were the first opportunity for archaeological surveys and excavations on the Oman Peninsula, birthed in the context of a political coup and a suddenly outward-looking alignment of government. The Danish survey under Karen Frifelt came from the west, seeking comparanda for the finds excavated by Bibby (1969) in Bahrain and throughout the Gulf. The British survey under Beatrice de Cardi came from Baluchistan in the east, where Mortimer Wheeler had sent de Cardi to search for the western extent of the Harappan Civilization (de Cardi 2008). The American team under Meadow and Humphries came to the Oman Peninsula from the north, looking for comparisons for Lamberg-Karlovsky's excavations at Tepe Yahya in southern Iran. The German survey team under Gerd Weisgerber came looking for the famed

copper mines of ancient “Magan,” described in Mesopotamian texts of the third millennium BC. Thus, all four early studies came to the Oman Peninsula seeking evidence of outside contacts and far-flung trade relations – an extroverted vision that would affect the archaeology of this region for many decades.

The Danish Expedition

The Danish Expedition in the 1960s identified three of the most famous third millennium sites on the Oman Peninsula: Umm an-Nar, Jebel Hafit, and Hili (Frifelt 1971, 1975a, 1975b) – all in Abu Dhabi, UAE. This work was quickly followed by surveys and excavations in northern and central Oman, such as Danish work at the second millennium BC type-site of Wadi Suq) and several surveys and excavations in the ‘Ibri area (e.g., Frifelt 1976; Gentelle and Frifelt 1989). Although much work was accomplished the surveys undertaken were unsystematic, and synthetic journal reports describe the surveys and excavations in lieu of primary publications. Many of the primary field reports and photographs have been preserved in the Ministry of Heritage and Culture archives and proved crucial to later survey and excavations in the Bat area, as well as to the inscription of Bat and al Ayn on the UNESCO World Heritage Site List.

As with the British Expedition led by de Cardi (see below), the Danish Expedition was primarily interested in providing a broad overview of the kinds of archaeological resources visible on the landscape and in identifying a few key sites for excavation. The result was a number of preliminary reports indicating clusters of archaeological remains for further exploration.

The American Expedition

The Harvard Archaeological Survey organized one of the earliest archaeological surveys of northern Oman, in 1973. Its results were published in the *Proceedings of the Seminar for Arabian Studies* and focused on three distinct parts of the archaeological record: the lithic

assemblages (Pullar 1974); the port town of Sohar in the Medieval Islamic Period (Williamson 1974); and “later prehistoric” sites (Humphries 1974). As Humphries himself notes, “the survey was by no means exhaustive, either throughout the Sultanate or even within the area of concentration” – that is, in the Wadi Bahla and the Jebel Akhdar in central Oman; the Batinah coast near Sohar; and the northern Dhofar region (1974:49). Several of the third millennium BC sites discovered by the Harvard Survey (e.g., BB-16) have since been excavated (Carl Phillips/Michael, Orchard). The most significant results of this survey were in establishing the first lithic typology for the Oman Peninsula (Pullar 1974, 1985) and the first typology of Islamic ceramics (Whitcomb 1975).

The British Expedition

In late 1971, de Cardi surveyed part of the Musandam Peninsula, and from 1974 to 1978 she continued exploration in the adh-Dhakhiliya and Sharqiyah regions of central and northern Oman (de Cardi et al. 1976, 1977). Her 1976 “Gazetteer” of sites in north-central Oman identifies some of the most famous prehistoric sites known in the region and remains a major reference guide for archaeological exploration. Although the survey methods were not systematic, the British Expedition was the first to pay close attention to the third millennium towers (including revisiting areas explored by the Harvard Survey) and paid near-equal attention to later prehistoric and early historic sites.

Previous archaeological survey – Middle Phase

The German Expedition

Inspired by Mesopotamian references to the copper of Magan, the German teams have retained a general focus on the archaeometallurgy of Oman. From the late 1970s Gerd Weisgerber et al. surveyed the copper-bearing ophiolites, particularly from Wadi Izki to Wadi Samad, and have led research on the second and first millennium BC cultures of Oman (Weisgerber 1980, 1981, 1983). Their research included more focused and systematic survey, in

both geographical and thematic terms. Not only did this result (in conjunction with the French expeditions (Berthoud and Cleuziou 1983) in a study of all of the copper ore sources in the region, it also led to several pivotal excavations at Maysar, Lizq, and Samad.

The Italian Expedition

In the late 1970s Paola Costa conducted a series of archaeological surveys along the coast. Although originally interested in the lithic technologies of Oman, Costa soon focused on the medieval port city of Sohar, and as such laid the groundwork for research on medieval Islamic settlements in the region. As part of Costa's Sohar Expedition Tony Wilkinson conducted the first systematic landscape survey in Oman, of the Sohari hinterland. Soon afterwards Maurizio Tosi began survey work near R'as al-Hadd, where he was joined by French and British teams by the 1990s. Costa's key work on "traditional Oman" is the first overview of the historic roots and layouts of many of the better-populated Islamic settlements of the Sultanate. Specifically he provides an overview of the character of traditional Omani settlements, which he differentiates into interior oasis settlements (following Wilkinson's 1977 report on *aflaj* and social organization) and coastal sites, such as those described by Barth (1983).

Previous Archaeological Survey – Current Phase

Omani Research

Nasser Al-Jahwari's dissertation on the Wadi Andam near Sinaw in the Sharqiyah region is the first published systematic survey in the Sultanate of Oman (2008). Al-Jahwari uses a probabilistic sampling method to locate sites within the Andam watershed, and develops a framework for studying third millennium BC settlements, thus attempting to deal with the ubiquitous problem of finding ancient remains under millennia of later occupation. In addition to his own survey, Al-Jahwari (2008) provides a complete literature review of all sites found in the Sultanate of Oman.

The French Expeditions

Working with Cleuziou, Jessica Giraud integrated 25 years of survey research – extensive and intensive, systematic and non-systematic – in the Ja’alan under the aegis of the Joint Hadd Project (Giraud 2007). Giraud’s research argues that third millennium tombs cluster into “necropolises”, indicating the location of contemporary settlement (2009). Since 2006, Giraud has been carrying out new surveys in the Wadi Adam, the southernmost oasis in northwestern Oman on the edge of the Rub’ al-Khali. While her research is ongoing, she has identified important new “necropolises” of the third millennium that will no doubt change the way we understand this marginal zone along the desert fringes (e.g., Giraud et al. 2010).

Other Projects

Also on-going is Eugenio Bortolini’s survey of tombs in the Zukayt (Izki) region of central Oman, directly to the north of Giraud’s current study area. His work focuses on understanding structural patterns of use and reuse during the third millennium BC, and as such will add immeasurably to our ability to date these enigmatic and diverse mortuary cairns. Most importantly, Bortolini will be the first to apply neo-Darwinian theories (*a la* Shennan 1982) to archaeological survey on the Oman Peninsula.

It is important to emphasize that the scarcity of information about the archaeological landscape of Oman should not detract from the important research conducted there over the past several decades. Rather, not only is opportunistic survey an important methodological first step in creating knowledge about ancient cultures, it is also the initial response to unique survey conditions such as are found on the Oman Peninsula. The traditional systematic, probabilistic survey methods are appropriate for relatively flat, ploughed land – such as much of Europe and the Mediterranean – but Oman exhibits extraordinary variation in topography and hydro-geology, and demands careful re-consideration of traditional survey methods (al-Jahwari 2008:7).

Furthermore, as the country develops and modernizes at a rapid speed, new roads and expanding populations provide access to never-before-seen archaeological sites on an annual basis.

Summary of the Late Prehistory of Oman

Introduction

When speaking to archaeologists who work outside of the Arabian Peninsula, the terms “Neolithic”, “Chalcolithic”, “Bronze Age”, and “Iron Age” are sometimes useful, but they bear little resemblance to the material culture of this region. On the Oman Peninsula there is evidence for a rather limited (probably due to research rather than representation of the archaeological world) Neolithic based largely around coastal resources, followed by an enigmatic “Chalcolithic” and “Bronze Age” that lasted well into the first millennium BC. As Oman was a prime producer of copper, there was little development of any reliance on iron, and even bronze was sporadic (Weeks 1999, 2003). The continued significance of lithic technologies on the other hand means that a finely developed and sophisticated stone tool tradition persists throughout prehistory (e.g., Giraud et al. 2010). Because these terms are misleading – at no time was iron a defining material component of life in Arabian Prehistory – they will only be used when there is no agreed-upon term (ironically, as is the case with the Early Samad and Lizq Periods in the Iron Age).

Neolithic (ca. 10,000–3100 BC)

Along the coast of Oman aridization occurred (i.e., both begins and culminates) slightly earlier, during the fifth millennium BC, and may correlate archaeologically with the peak of the shell midden tradition (Biagi 1994; Lézine 2009; Uerpmann 1992:103). Neolithic sites in this region consist of shell middens, rock shelters, lithic workshops, and/or butchering camps (Cleuziou and Tosi 2007). Domestic contexts tend to be made up of clusters of rough circular shelters that may have been the foundations for organic (wood or hide) superstructures.

Fifth and fourth millennia BC coastal sites such as Ras al-Hamra (Biagi and Nisbet 1989:44),

Bir Bir'a, and Bandar Jissa give overwhelming evidence for skilled fishing and marine activities linked both to mangrove swamps (near the shore) and the open ocean (Biagi and Nisbet 1992; Biagi 2004). Shellfish, crab, turtle, whale, and dolphin have all been found at Neolithic sites, in addition to sheep, goat, cattle (all in relatively small numbers), Arabian gazelle, and wild ass (Mosseri-Marlio 1998; H.-P. Uerpmann 1989; M. Uerpmann 1992).

The fifth millennium BC midden site of al-Buhais 18, located 60 km inland from the northern coast, yielded a few examples of domesticated cattle remains and a large number of mature goats (Uerpmann et al. 2000:231). None of the domesticated ruminants from the fifth millennium BC – the goat, sheep, or cattle – were indigenous to the Arabian Peninsula, and by the third millennium BC all are found at the coastal site of Ras al-Jinz (Bökönyi 1992; Cleuziou and Tosi 2000:43; Costantini and Audisio 2001).

There is a long tradition of the exploitation of coastal mangrove swamps, sometimes intensively, that develops in the Neolithic (Tengberg 2005). Coastal communities were actively making use of their terrestrial and marine resources (Biagi et al. 1984), and were engaged in curing fish for off-season consumption or long-distance trade (Charpentier et al. 1998). In the Ja'alan of eastern Oman, there is good evidence for a close complementarity between agricultural, coastal, and herding landscapes. Whether this relationship is based on trade or kinship networks is unclear, and probably both are significant to the integration that occurs in the following centuries (Cleuziou 2003:139). Regardless, this adaptive scheme – a system of production and exchange including pastoralism, fishing, and oasis farming – is in keeping with ecological expectations of such a small area with a high level of environmental diversity.

Since the material signatures of the Neolithic on the Oman Peninsula are less visible than in later periods, the majority of known and excavated Neolithic sites (i.e., shell middens) has been

located along the coast (where much of the population of Oman lives even today), among mangrove swamps and overlooking the ocean. There is a growing interest in locating sites on the interior and along the few routes linking the coast with the western piedmont areas.

The Third Millennium BC

By the beginning of the Hafit period, these patterns of transhumance and season-specific subsistence practices seem to have resulted in significant networks across ancient Oman. Although there is no direct evidence for date palms in the beginning of this period, it is hypothesized that they provided the micro-environment for intensive oasis farming (D. Potts 1994:616; Tosi 1986:475). *Sorghum bicolor* Linn. [Moench] ssp. *bicolor* race *durra* or race *durra bicolor* (Cleuziou 1989; Cleuziou and Costantini 1980:249) and Cucumis (melon) grew, potentially under the canopy. Nearby irrigated fields grew wheat (either *Triticum aestivum* or *T. durum*) and barley (Brunswick 1989; Wilcox 1989), and oat probably grew wild nearby (Cleuziou 1989a:79).

Camel, equid, and bird bones, found in midden contexts at Hili, indicate that the early third millennium BC people of Magan also hunted (Cleuziou 1989b:81), while copious evidence for ziziphus (both stones and charred fruits) have been found in archaeological contexts, giving evidence for some localized gathering (e.g., Biagi 1987:16; Biagi and Nisbet 1992; Cleuziou and Costantini 1980). Additionally, shell midden sites continue to give evidence to the presence of mangrove swamps, the importance of the turtle and the pearl even in the fifth millennium BC, and a variety of marine animals including dolphin (Mosseri-Marlio 1998).

The Hafit marks the beginning of a period of inter-regional trade networks that included Mesopotamia and the Indus. Beginning in the fourth millennium BC Mesopotamian (Jemdet Nasr) ceramics were finding their way into Hafit tombs (Frifelt 1971, 1975b), and by the Mature Harappan (i.e., mid-third millennium BC) there is ample evidence of Indus craftsmanship found

across Oman. In addition, key sites arise in Magan that are clearly situated according to ancient maritime access; while some sites have both agricultural land and marine access (e.g., ancient Sur), and therefore hypothetically could have been self-sufficient, others – such as Umm an-Nar Island and Ra's al-Hadd – have moorage (marine transport access) but no agricultural hinterland (Cleuziou 2003:138). Their primary justification was therefore likely related to foreign trade. Numerous Mesopotamian economic texts mention the importance of Magan as a trade partner, for a combination of copper, diorite, soft stone in addition to timber.

Hafit period (ca. 3100–2600 BC)

The Hafit Period in Oman is the first time that a unified cultural group, covering nearly the entire Oman Peninsula, maintained cultural links both at local and regional levels. The development and elaboration of a monumental tomb tradition provides the most overwhelming evidence of this cultural change. Interment is in stone-built cairn tombs (**Figure 9**). At some point in the Hafit Period, the tomb tradition was expanded to include the beginnings of what was to become the Umm an-Nar “tower tradition”: structures roughly 20 meters in diameter with interior wells, located in or around oasis settlements. However, there are numerous other differences in the material record. The most common imports, usually found in mortuary contexts, are the Jemdet Nasr / ED I-II style jars from Mesopotamia, although pottery from Southeastern Iran has also been identified (Méry 2000).



Figure 9. Hafit tomb.

Equally, materials from the Omani coast are first found inland in great numbers during the Hafit Period, and materials from interior Oman are found along the coast. By the beginning of the third millennium, individual sites are unequivocally parts of larger, inter-digitated social and political entities, exploiting a variety of resources and ecological niches (Cleuziou 2003:140).

The Hafit Period witnesses the beginnings of a cultural community that eventually spans the entire Oman Peninsula, a distinct culture shared among disparate sites and populations. Beyond the break in mortuary practices – i.e., the change from below-ground pit burials to above-ground stone cairn monuments – there is a dramatic change in domestic architectural styles. As opposed to the earlier oval stone domestic structures, Hafit settlements feature rectilinear stone foundations with mud brick superstructures (HD-6).

The Hafit Period is also the first time that there is evidence for permanent oasis development for agricultural purposes (Cleuziou 1996). It is likely that Neolithic agro-pastoralists exploited oases, but by the Hafit period this exploitation develops into permanent settlement and the cultivation of agricultural products to support pastoralism and long-distance trade networks.

While the Hafit period can certainly be seen as the early stage of the Umm an-Nar Culture that lends its name to the following period, it is notable that the Neolithic and Hafit periods are both defined by an aceramic tradition. That is, it is clear that people of the Hafit period had both the technology and the understanding to develop a ceramic tradition of their own. However, there is little evidence for locally made ceramics in the Hafit period, and those that do exist are imitations of Mesopotamian imports. This changed dramatically in the Umm an-Nar period.

Umm An-Nar period (ca. 2600–2000 BC)

By the middle of the third millennium BC, oasis communities were thriving agricultural settlements with close ties (social as well as economic) to coastal communities. In addition to the settlement of oases and the further exploitation of marine and mangrove resources along the coast, there is evidence of copper mining (Hauptmann et al. 1988) and accounts of such trade with Mesopotamia.

The traditions of rectilinear domestic structures with mud brick superstructures, and of above-ground circular stone tombs, continue and are elaborated. The towers develop into increasingly impressive circular monuments, with internal supporting cross-walls and external walling consisting of stones weighing up to a ton and a half each (1360 kg). Umm an-Nar architecture – from domestic to agricultural contexts – is unique throughout Omani Prehistory in the quality of the construction. Stone walls are dry- or mud-mortared, coursed, frequently with alternating header and footer stones, and are faced on visible sides (**Figure 10**).



Figure 10. Outer ringwall of Matariya (Tower 1147), facing southwest. Figure courtesy of the Bat Archaeological Project.

Wadi Suq Period (ca. 2000–1300 BC)

In the beginning of the second millennium BC, there is a sharp break in material culture that likely reflects an accumulation of social change that began in the late Umm an-Nar Period. The material signatures of the third millennium are eschewed, or at the least repurposed or rebuilt. With the notable exceptions of Kalba and Tell Abraq – both located along the northern Emirati coast as opposed to in the western piedmont – the third millennium BC “tower” is almost completely abandoned; tombs are built and rebuilt in a number of dramatically different styles and types; the ceramic assemblage becomes coarser overall; and there is a dramatic decrease in

foreign imports found in Wadi Suq contexts (Cleuziou and Tosi 2007). This is an ongoing debate about whether the Wadi Suq period represents a “dark age” of the Arabian Peninsula (Gregorička 2011).

The expansion in the number of tomb styles during the Wadi Suq Period is extraordinary. The apparently homogeneous tomb styles of the third millennium BC give way to a combination of above-ground, semi-subterranean and subterranean cist graves with single or double interments, in addition to “over-ground” single and monumental collective tombs. In addition, “casual” burials (single interments in older tombs) are relatively common.

Summary

The Oman Peninsula is a complex environment of extremes over short distances. Resources are patchily distributed both over time (seasonally) and space. It is rare that a single environmental zone provides access to resources year-round based on a single subsistence strategy, nor does it support large populations that could maintain access to all of these resources through sheer occupational numbers. The result, visible ethnographically up through the late-twentieth century AD, is a system of fluid territories and subsistence practices spanning considerable distances. The exceptions to this are oases, which act as nodes of permanence in a much larger shifting landscape.

The question of how ancient peoples survived and thrived in a remarkably similarly landscape to that of today demands a look at the kinds of information known about the prehistory of the Oman Peninsula. In such an archaeologically undiscovered landscape, it is equally important to place what little is known into its historical context. This chapter therefore introduced the prehistory of the Oman Peninsula, and the history of archaeological survey on the Oman Peninsula.

CHAPTER THREE: EXPECTATIONS FOR THE USE OF MONUMENTS IN MARKING, MAINTAINING, AND LIMITING ACCESS TO RESOURCES

The Monument in Landscape Archaeology and Anthropology

Monuments are built elements on the landscape. They act as markers of membership and reminders of group interactions (Bradley 1998). Monuments can also be the site of group inclusive or group exclusive activity (Howey 2007; Howey and O'Shea 2006; Johansen et al. 2004). This section discusses the ways in which monuments have been both used to mark and to limit access to resources and territories for middle range societies, and to have provided occasions for integration and exclusion. Chapter 3 goes on to outline the archaeological patterns of monuments that would represent those social practices and past social structures.

Monuments can be particularly useful in large-scale archaeological survey by providing points of relative consistency on the shifting landscape, thus populating the landscape and helping, at least initially, to frame ancient settlement patterns (e.g., Adams 1981; de Cardi et al. 1976; Wilkinson and Bond 2001; Wilkinson 2000). The exploration of monuments as part of the landscape can be a useful way of understanding cultural interactions (Brown 1995), particularly when monuments are maintained and altered across time.

The study of monuments has been an important part of research into prehistoric societies since Napoleon sent scientists to measure and study the pyramids of Egypt. However, it was not until the late 20th century that archaeologists became concerned with the spatial context of monuments in and on the landscape. Such developments in "landscape archaeology" (an outgrowth of settlement survey) rose in tandem with new methodological advancements in Geographical Information Systems and satellite remote sensing. The research presented in this dissertation falls at the junction between the study of monuments and the ways ancient cultures organized themselves within the landscape.

Landscape archaeology has flourished in many parts of the world, but has only recently become a major influence in archaeological studies of Southwest Asia. Robert McCormick Adams (1965; 1981), Hole et al. (1969), and others blazed the trail with their prescient integration of settlement patterns, landforms, and human ecology models in Mesopotamia and Southwest Iran. Tony Wilkinson (2000; 2003) and his students have done perhaps the most to make landscape archaeology a driving force in studies of the ancient Middle East over the past decade.

The Oman Peninsula has seen relatively few studies of landscape archaeology, despite the omnipresence of prehistoric stone monuments from Abu Dhabi to R'as al-Hadd. A notable exception is Costa and Wilkinson's (1987) important monograph *The Hinterland of Sohar: Archaeological surveys and excavations within the region of an Omani seafaring city* (described in the previous chapter).

Monuments and Mortuary Archaeology

The location of a monument or group of monuments can be a fruitful area of inquiry when trying to understand a culture. The study of monuments, the mortuary record, and landscape has been gaining ground since the 1970s, when several key works (i.e., Saxe 1970; Goldstein 1976) brought to light the relationship between access to critical resources and formal cemeteries. While cemeteries need not be monumental, they **are** formal and visible; clusters of mortuary monuments (such as tombs), therefore, are the most obvious examples of the relationship between resource access and the mortuary realm.

Two complementary interpretations of the spatial distribution of tombs are found in archaeological literature. The most well-known, "Hypothesis 8," correlates the presence of bounded spaces reserved for the dead with control over nearby crucial and limited resources (Goldstein 1981). That is, there is a link between making claims to resources and making claims to the dead such that social boundaries have material markers (i.e., cemetery spaces) and

environmental benefits (i.e., access to resources). A second tomb distribution, described by O'Shea and Milner (2002), links cemetery distributions and territory boundaries. They suggest that Juntunen band territories were marked with a combination of built and natural features, in which mortuary mounds were one of several types of built features on the Juntunen landscape. Mathews (2006) argues that the Straits Salish development of two new mortuary practices – building above-ground burial cairns and locating them in cemeteries on the edges of Salish territory – was the Salish answer to a growing need for definitive cultural boundaries. Both tomb distributions link “right-of-access” to the presence of tombs, and both have been employed for third millennium BC Oman, but their distributions are not necessarily the same: Hypothesis 8 suggests that there will be tomb clustering and will indicate access to a specific resource, while tombs as territorial markers suggests that highly visible tombs should be disbursed along (potentially disputed) boundaries between tribal communities.

The distinction between accessing a territory and accessing a resource is an important one, and according to Casimir (1992), has more to do with the characteristics of a suite of resources, which together constrain options for subsistence strategies based on routinized access to all of the resources that make a living possible. It may be more accurate to speak of resources as potential tools for subsistence – the ideology attached to a subsistence practice or of a worldview having a substantive impact on choices of resource or combinations of resources (Lancaster and Lancaster 1992a).

Although it is tempting to dismiss ideology as a factor in impacting subsistence practices, Giddens (1984) points out that, for tribal groups, integration is **focused** in the ideological realm, and upon most of the tribal members participating in activities that consolidate those ideologies with some frequency (182). That is, ideologies of integration and cultural one-ness are necessary.

Mortuary rites provide opportunities for the enactment of just these ideologies and for this purpose. While mortuary spaces can mark access to adjacent resources, participation in funerary ritual places individuals and groups within a larger social tradition and worldview (Goodale 1985). Funerary rites can be opportunities to manipulate the mortuary record to further the aspirations of the living, whether according to the goals of specific individuals or groups (e.g., Brück 2001; Cohen 2005; Gillespie 2002; Hendon 2000; O’Gorman 2001).

Mortuary ritual can also play an important role in reminding members of who they say they are (Chesson 1999) and in the active recreation of social relations (Walter et al. 2004). These rituals and the ideologies behind them can persist well beyond the social reality (e.g., Kuijt 2001; Porter 2002a). Mortuary rituals – and the monuments themselves – can also be a form of legitimizing control or reinforcing the supremacy of an elite (Brown 2003; Cohen 2005). Pollock (2003) argues that funerary and commemorative feasts and comestible distribution in Early Dynastic (mid-third millennium BC) Mesopotamia were employed as opportunities both to reinforce social stratification and, conversely, to create ideological brethren of very disparate groups, thereby encouraging participation in and support of the state systems which may have conflicted with the interests of the other members.

Tombs – mortuary monuments – are particularly suited to the dual needs of tribal societies (i.e., on the one hand, flexibility and independence; on the other hand, the need for integration). As built elements on the landscape they act as markers of membership and as reminders of group interactions (Bradley 1998; Porter 2002b). Monuments – whether mortuary or non-mortuary – can therefore play important roles by evoking memory (Gillespie 2001), referencing specific ideologies of power and control (Kirch 1990), and providing opportunities for activities of social integration and differentiation (Blake 2001, 2002; Gili et al. 2007; O’Shea and Milner 2002).

Gili et al. (2007) argue that megalithic burial rites in Bronze Age Menorca was an active attempt to create an ideology of social solidarity while maintaining local (and immigrant) identities.

The Bronze Age Monuments of Oman

Third millennium burials are markedly different from those that came before. Fourth millennium burials, such as those at RH-5 near the present-day capital of Muscat, are primary and secondary pit interments of one or several individuals and located within settlements or in adjacent cemeteries (e.g., Salvatori 1996). The adoption of monumental tombs – indeed, the adoption of *monumentality* – on the Oman Peninsula began with the Hafit and Umm an-Nar periods.

Tombs of the third millennium reveal several similarities: they are domes or cylinders, built on a plinth and usually consisting of one or several layers (or “skins”) of stone walling and with small, triangular or trapezoidal entrances. Their variation is considerable (Blau 2001:Table 1). Although research has proposed widely differing typologies and chronologies ranging from four to ten distinct types (e.g., Böhme 2011, 2012; Doe 1977), as of now there is a general acceptance of only two basic, chronologically and stylistically distinct, tomb types: one tomb type dating to the Hafit period, and the other to the Umm an-Nar (e.g., Schippman et al. 1991).

Third millennium towers are also quite variable in style and size, and their function is unknown. It is not even certain that they served the same function(s). Although the first tower was excavated 50 years ago, these monuments are still enigmatic.

The Hafit Tomb

The development and elaboration of a monumental tomb tradition provides the most overwhelming evidence of long-range cultural integration. Hafit tombs date to the transition between the fourth and third millennia. They tend to be four to seven meters in diameter, with one or more layers (or “skins”) of perimeter walls forming a single interior chamber. The tombs

make use of the local brown and gray schist that splits naturally into blocks (Bortolini 2007), and generally contain the remains of only a few individuals. These are found across the entire Oman Peninsula. These collective, single-chambered stone-built cairn tombs (**Figure 11**) group on low ridges overlooking “cultivated areas” (Cleuziou 1996:160).



Figure 11. Some tombs in Bat cemetery. Hafit tombs on the ridgeline, Umm an-Nar tomb in the foreground (a); closeup of Hafit tomb (b).

Working to the south of the Oman Peninsula, in Yemen, Harrower (2008b) suggests that there were similar relationships between monuments “marking territorial claims to land, water, and irrigated areas reinforced through reference to ancestry” (197) – though again, this was not studied. Rather it is generally accepted that the third millennium BC tombs of the Oman Peninsula similarly map territories (e.g., Bortolini 2007; Cleuziou and Tosi 2007). Studies along the east coast of Oman by Giraud (2007, 2009; Giraud and Cleuziou 2009) have found that Hafit tombs are likely to be situated along ridgelines, surrounding contemporary settlements.

Human remains tend to be poorly preserved, but tombs contain one to four individuals of all ages and both sexes. Although these tend to be primary interments there is evidence of secondary burial as well.

The Umm an-Nar Tomb

The basic tomb idea – the circular stone-built monument – continued in elaborated form with

several structural, stylistic, and situational changes. These tombs are multi-chambered, with a plinth, sometimes partially or completely paved, circular or sub-circular in plan with a diameter greater than 7 m and up to 2 m tall. These tombs have double-faced ringwalls without a fill, and generally very finely constructed dry masonry of both local and non-local stone. The outer white limestone facing, which is non-local (or at least not expedient), is pecked, wedge-shaped ashlar (**Figure 12**); the local stone is chipped into blocks which are sometimes wedge-shaped and tend to be used to make the plinth, internal ringwall, and any interior wall support. Stone size varies dramatically, from 15-x-15 cm square face to 70-x-150 cm. The roof is built of flat slabs and lack a keystone.



Figure 12. Examples of original pecked white limestone tomb facing (camera lens in lower right corner for scale).

Another dramatic development marking the transition from the Hafit to the Umm an-Nar tomb architecture is the addition of an imported white limestone facing which covers the local brown or grey stone structure (**Figure 13**). This facing varies from roughly hewn cobble-sized chunks of white limestone (fresh breaks oriented outwards), to carefully pecked ashlar blocks up to 1.5 m tall, some of which display some of the only examples of third millennium BC sculptural art on the Oman Peninsula.



Figure 13. Partially reconstructed Umm an-Nar tomb at Bat (left) and Hili, UAE (right). Note the rock art relief above the tomb entrance on the right (ca. 40 cm wide).

This is partially due to the need to span an increasingly wide roof, and results in numerous internal walling styles and chamber shapes. As the structure increased in size, so too did the number of interments. While burials in Hafit cairns tended to be single interments or a few individuals, Umm an-Nar tombs are dramatically larger, and may easily contain the remains of hundreds of individuals. Individuals of all ages and both sexes have been interred in the same tomb, and while people can be related, that is not necessarily so (Frifelt 1991). Recent isotopic studies on third millennium remains by Gregorička (2011) support the theory that group membership may have been broadly (as opposed to exclusively) recognized through mortuary practices.

Artifacts associated with the Umm an-Nar tomb include local finewares and imported ceramics from Iran, Baluchistan, and Mesopotamia; beads made from exotic materials (e.g., carnelian), finished in exotic technologies, or both. Bronze artifacts including daggers, pins, razors, and rings are found as well, and stone (e.g., chlorite) vessels are quite common. In a few cases seals – cylinder and stamp – have been found.

Finally, Giraud (2007, 2009; Giraud and Cleuziou 2009) suggests that in the Ja'alan, Umm

an-Nar tombs were located within settlements and on low, flat areas (including wadi bottoms and low plateaus) (see **Figure 11**).

The Bronze Age Towers of Oman

At some point in the Hafit Period, the monumental tomb tradition was expanded to include the beginnings of what was to become the Umm an-Nar “tower tradition”: structures roughly 20 meters in diameter with interior wells, located in or around oasis settlements. The Bronze Age towers of the Oman Peninsula were first identified in the 1970s as “circular walled enclosures,” generally 20–30 meters in diameter and usually constructed of either large stone boulders or square stone blocks (de Cardi et al. 1976; Hastings et al. 1975). The first attempt at a typology of these structures used a number of features to distinguish between different types of circular walled enclosures. Humphries’ and de Cardi’s typologies relied upon extant remains and surface pickup for both classification and dating. The first of these “walled enclosures” to be excavated was at the site of Hili near Buraimi, where a 24 meter-in-diameter circular building made of mud bricks was uncovered (Frifelt 1971:376; 1975a:368–370). In the middle of this structure was found a stone-lined circular shaft, or “well,” nearly in the center of a compartmentalized complex of internal mud brick walls. These compartments were not rooms *per se*, but were filled with compact rubble and sand. The excavator referred to this building as a “circular watchtower” (Frifelt 1971:376), even though only “half a meter’s height of wall remain[s] above the surface” (Frifelt 1975a:369).

The second of these monuments to be excavated, known as Tower 1145, is located at Bat in the center of this survey area, and its form reminded the excavator of “a fortification, a watch tower perhaps. ... The same principle is known from much later towers” (Frifelt 1976:59). The association of these “walled enclosures” with medieval towers has become a convenient gloss for these archaeological structures, but it is not intended to suggest either a specific form or function.

It is, however, the most common way to communicate about these monuments.

One reason for the vagueness of the term is the need to consider a great deal of variation amongst these Bronze Age monuments. While no known towers are currently buried, some were placed prominently on rocky hill-tops, while others are located within the flood plain on what is now agricultural land. Their location is clearly significant; but variation in precise location also suggests that the term “tower” may combine different types of monuments into a single category based primarily on formal similarities.

Most of the known towers are built of stone, although they vary in the architectural techniques and features employed in their creation. The stones used to construct the tower walls could be either rough-hewn boulders or partially-dressed blocks. In addition, while there is some consistency in the size, shape, and color of stones used in any one tower, there is quite a bit of variation between towers, sometimes even at the same site. For example, at the site of Khadil in northwest Oman there are three known towers: one made of massive white limestone boulders; a second made of a mix between large white limestone boulders and brown limestone slabs; and a third made of small, rose-colored limestone blocks. The white limestone tower sits atop a natural outcrop of rose-colored limestone, with the nearest source of white limestone located many kilometers away. From this we can infer that while a significant amount of energy and resources was expended in the construction of these monuments, it was not uniformly distributed. Even the shape of the towers is non-uniform. Most are circular or near-circular; some are oval or semi-rectangular with rounded edges; and a rare few are distinctly rectangular.

Towers are generally ca. 20–25 m in diameter but may be as small as 18 m and as large as 50 m. External walls tend to be ca. 2–3 meters thick, often consist of two layers of stone (an inner and outer), and each is held together by a simple mud mortar. Many towers seem to have been

combined with structures that abut or sit adjacent, while others have a series of circular ring walls or retaining walls surrounding them.

Most of the excavated towers have internal walling, usually made of smaller stone blocks. The site of Hili has the only known example of towers built entirely of mud-brick; only the off-centered “wells” were made of stone. After stripping away the variation, few elements endure. Of course, this is no different from any other “type tool” paradox, in which by virtue of sharing the most singular characteristics with others of its type, it is as a whole the least like any other single tool of its type.

The function of these towers has remained a matter of some debate. Weisgerber (1981:198–204) described the tower at Maysar as a “Fluchtberg” (i.e., a refuge or keep) used to protect the ancient inhabitants from invading forces. Orchard and Orchard (2008) argue that the towers at Bisya are ritual platforms on which were built temple superstructures that have since disappeared. Cleuziou and Tosi (2007:147) suggest that the towers were “fortified residences for prominent members of the community.” Frifelt presented a number of potential functional possibilities for the towers at Bat (e.g., Frifelt 1976:64; 1985:92), but most strongly saw their role linked to irrigation and agriculture (Frifelt 1989:113; 2002:107). It is clear that the towers were neither mortuary nor purely domestic in nature.

Bronze Age Towers – Distribution

Across the Emirates and the Sultanate of Oman are sixty-four known towers. When plotted on a map (**Figure 14**) it is clear that the majority of towers are located along the southern foothills of the Hajar Mountains.

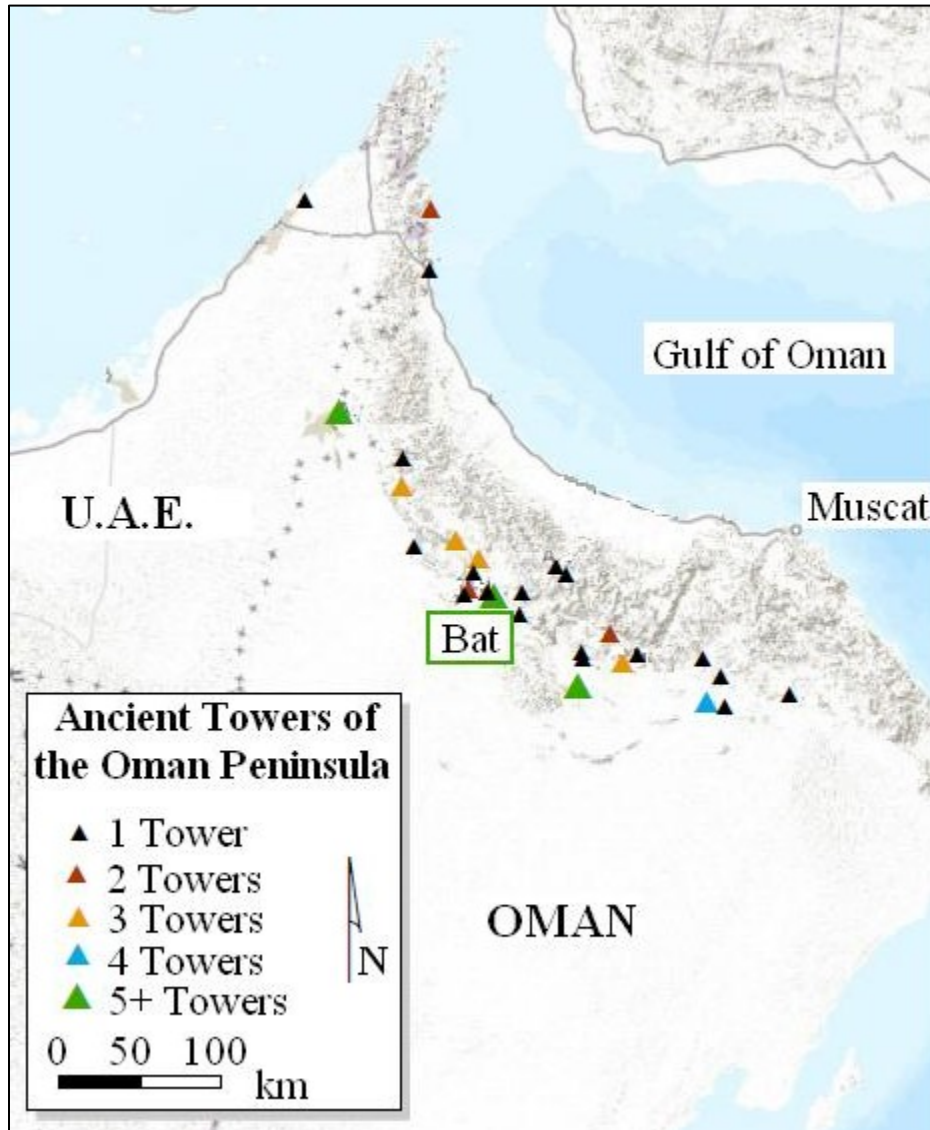


Figure 14. Locations of known ancient towers on the Oman Peninsula.

These sites create a line that may indicate the ancient east-west trade routes that moved copper and other goods between Abu Dhabi and R'as al-Hadd (Frifelt 1985). Most of the known tower sites of the plateau are spaced between Hili and Khashbah, two well-known and important locales in the 3rd millennium BC, with few known towers either to the east of Khashbah or to the

west of Hili. In the UAE all towers except those at Hili are located along the coast; in Oman not a single tower has been reported from lowland coastal contexts. These differences may reflect archaeological realities; the coastal towers in the UAE date to the end of the Umm an-Nar period (ca. 2100 BC) and reach their zenith in the Wadi Suq period (ca. 2000–1500 BC) (Carter 1997:95), while most of those in the Omani highlands appear to date to the first half of the third millennium (ca. 2700–2400 BC) and are abandoned before the Wadi Suq period. However, the lack of systematic surveys in the regions left blank on this map (e.g., the Batinah coast of Oman) may have skewed these data significantly, and it has been argued that we should find them in similar locations (Cleuziou 2003:137).

Second, there is a notable distinction between sites with two or more towers compared to those with only one. This differentiation raises a series of important questions about settlement types and histories of the Bronze Age on the Oman Peninsula, regarding (1) population density; (2) towers as ritual or economic centers; (3) towers as nodes of small communities living in close proximity; and (4) phases of use and abandonment. On-going excavations suggest that there is indeed a chronological component, at least at Bat (Possehl et al. 2010; Possehl et al. 2011), but it is more likely that this represents an addition to, rather than a replacement of, earlier towers.

Research Questions Revisited

With the exception of the Ja'alan survey (Giraud 2009), research on third millennium monuments in Oman have been divided into broad, impressionistic studies and small, targeted excavations. While both of these have yielded certain results in the Wadi al-Hijr region, what is needed now is two-fold: first, a systematic study of the distribution of these monuments as architectural forms in their own right, and in relation to the larger landscape and surrounding resources; and second, a comparison of the roles that the two types of monuments may have held

to third millennium BC Oman culture. In addition, no one has yet asked why Umm an-Nar people of third millennium BC Oman chose to build **two** different kinds of monuments in a specific geographic range.

The research questions, then, focus on understanding those monuments in relation to each other and to the broader landscape:

1. What are the spatial distributions of third millennium BC monuments in the Wadi al-Hijr?
Do they differ?
2. What are the relationships between tombs, resources, and social inclusion or exclusion?
How do these relationships change over time?
3. How can we account for formal and spatial variation in third millennium BC towers?
4. What is the relationship between towers, resources, and social inclusion or exclusion, as it develops through the third millennium BC? How does this change over time?

Expectations of Research Questions

Hypothesis 1a: Hafit Period Tombs Will Cluster.

Saxe (1971) and Goldstein (1981) have found that formal, bounded areas for the exclusive disposal of the dead are used to mark resources and justify access to those resources. If this is the case in the Wadi al-Hijr, tombs will be arranged spatially in the following manner:

1. Hafit period tombs will cluster;
2. Hafit period tomb clusters will exclude non-mortuary features as evidence for exclusive mortuary uses of the space.

Hypothesis 1b: Hafit and Umm an-Nar Period Tomb Distributions Will Differ but Complement Each Other.

If Umm an-Nar period people are culturally contiguous with the earlier (Hafit period) people and continue their Hafit ideologies, we can expect that they will use the same manner of

indicating access as the Hafit period people (i.e., cemetery location). However, since the Hafit period cemeteries will already be positioned on the landscape:

1. Umm an-Nar tombs will be located within or on the edges of Hafit tomb clusters (i.e., associated with earlier tomb clusters);
2. Umm an-Nar tombs will be located elsewhere, but serve the same purpose (i.e., clustering near other resources);
3. Umm an-Nar tombs will not cluster exclusively.

Hypothesis 1c: Third Millennium BC Tomb and Tower Distributions Will Differ.

If the different kinds of monuments serve different technical and social functions, then we can expect that contemporary tombs and towers will exhibit different distributions. As others have noted (Cable and Thornton 2012), on a regional scale towers are associated almost exclusively with the western piedmont of the Hajar Mountains. A closer look at the distributions of tombs and towers on the western piedmont, using a finer scale and a more targeted region such as the Wadi al-Hijr, will allow for a more careful look at their respective distributions. I expect that the towers will be located near oases, while tombs will have a broader distribution.

Hypothesis 2a: Hafit Period and Umm an-Nar Period Tomb Distributions Will Mark Access to Resources.

In the Wadi al-Hijr, resources will consist *minimally* of the following:

1. Regular, dependable water
2. Land *beyond* (above) regular flood zones
3. Soil buildup

In general, the greater the combination of these three resources the more likely it is that these spaces will be marked by clusters of Hafit tombs. Umm an-Nar tomb distributions will coincide with all of the Hafit tomb distributions, i.e., Umm an-Nar tombs will also be associated with crucial, limited resources. However, parts of the natural environment considered “resources”

expand during the Umm an-Nar period. During the Umm an-Nar period Magan entered an inter-regional trade network which featured, among other natural resources, white stone (diorite or limestone) which was used in building and statuary in Mesopotamia (Glassner 1989; Leemans 1960). This white stone also became significant to the Umm an-Nar people, who used it to face their tombs. Since this natural resource, in boulder form, is found at the base of Jebel Shuwā'ī on the northern edge of the study region, Umm an-Nar tombs will also be found there. Umm an-Nar tombs will be associated with the following:

1. The same sets of resources as those marked by Hafit tombs;
2. Additional parts of the landscape, made into resources by new technology and/or new, Umm an-Nar, conceptions of resources.

Hypothesis 2b: The Mortuary Realm Will Provide Opportunities for Integration at the Level of the Group and the Broader Society.

Monuments and the mortuary realm provide opportunities for expressions – both ritual and physical – of social integration (Blake 2002; O'Shea and Milner 2002). These opportunities and emphases will differ between the Hafit and Umm an-Nar periods. Specifically, the Umm an-Nar mortuary realm demonstrates a shift in focus from the participation of the individual in the broad society, to a focus on the participation of the individual in the local group. To this end:

1. Hafit mortuary rituals will allow for the greatest number of participants;
2. Hafit mortuary traditions will provide frequent occasions to reinforce ritual ideologies of integration;
3. Hafit mortuary monuments will provide visual reminders of broad social integration.
4. Umm an-Nar tombs will provide visual reminders of Hafit tombs;
5. Differences between Hafit and Umm an-Nar mortuary practices indicate a shift in worldview.

The first of these expectations of the Hafit period will be evident through (a) the inclusion of all members through participation in building the monuments; and (b) the inclusion of all members through participation in death. These will manifest through variation in tomb construction style, and through tomb interment of individuals of all ages and both sexes.

The second of these Hafit period expectations – the provision of opportunities for rites of integration – is expressed in the frequency of Hafit tomb building. If the building of the tomb itself is a ritualized opportunity for individuals to create integration, then these opportunities will be maximized through high tomb-interment ratios.

Finally, while Hafit tombs themselves may vary in construction technique, an emphasis on the universal form of the monument should be evident in several ways. First, the form itself should be consistent. Second, the overall form, as opposed to the form of a particular tomb type, should be emphasized on the landscape. Third, these monuments should be in some sense ubiquitous, plentiful, and virtually indistinguishable.

Umm an-Nar tombs reinforce links with resource access and the Hafit world order. They continue an emphasis on the monument form through individualized tomb construction; a continuation of the general shape of the monument; and the construction of these later monuments in easy sight of earlier Hafit tombs. Those parts of the third millennium mortuary tradition that change from the Hafit to the Umm an-Nar periods indicate parallel changes in third millennium BC worldview.

Hypothesis 3: Variation in Third Millennium BC Tower Form is Due at Least Partially to Change Over Time. Third millennium BC towers demonstrate increasing monumentality (e.g., in their façade) over time.

While a typology of third millennium BC tower has been frustrating researchers for decades (Cable and Thornton 2012), there remains a strong sense that these monuments are somehow linked. The technical function of the Umm an-Nar tower has been in question since the first

tower excavations, with emphasis placed either on the association of some towers with central wells or on the fort-like tower construction (Gentelle and Frifelt 1988; Weisgerber 1981).

The picture is muddled because until quite recently nearly all towers were undated; the result was at least a partial confusion of temporal variation with functional variation. New dates from tower excavations by the American Expedition at Bat, combined with excavations by Frifelt in the 1970s and 1980s, allow seriation of five of the towers in the Bat. If towers are distinct **both** due to their associations with water **and** to their constructions, a seriation of third millennium BC towers in the Wadi al-Hijr will allow the disentanglement of tower water associations from tower fort-like construction. Specifically, it will be possible to document a trajectory of increasing monumentality:

1. Changes to the towers over time will consist of changes to the tower form (as opposed to function).
2. Changes to the tower form will consist of increasingly complex and energy-intensive façades.

Hypothesis 4a: Third Millennium BC Tower Monuments Will Be Associated with a Specific, and Critical, Resource. That is, towers will primarily mark access to well water (ghayl).

The presence of internal wells (or rather, to subsurface groundwater, *ghayl*) in third millennium BC towers is central to the argument that these towers are related to irrigation (Gentelle and Frifelt 1989). However it is likely that a number of towers did not have access to *ghayl*. If it is true that the towers came to be associated with access to a consistent water source, then we will see two related phenomena:

1. In cases where the structure of a specific tower changes over time, access to water will continue throughout the tower's use **as** a tower;
2. The earliest towers will always be associated with water.

Hypothesis 4b: Changing Access to ghayl Over Time Will be Evident through Changes in Third Millennium BC Towers. These changes will be increasingly restrictive in their accessibility.

Umm an-Nar efforts to limit and consolidate access to well water (*ghayl*) will be visible in changes to tower structures over time.

Tower structures will provide more and more restricted access to their interiors over time. First, the resource itself will be less accessible when raised above ground level. Second, the resource will be located within highly and actively visible spaces (Howey 2007). Third, the resource may be physically bounded.

Summary

Cemeteries – land maintained exclusively for the disposal of the dead – are one method of marking access to resources. Where resources are unpredictable and scarce, access is controlled not through defense of a territorial space, but through membership in a social group with rights to the space, what Casimir (1992) terms **social boundary defense**. Lancaster and Lancaster (1992; 1996) have found this strategy at work on the Oman Peninsula today.

Where resources are spatially limited yet predictable - as characterizes the distribution of oases in modern Oman – access is more likely to resemble **spatial boundary defense** (Casimir 1992). Well water, the source of oasis agriculture, was accessible in the third millennium through the towers and would have been worth defending.

In ancient Oman, where both social and spatial boundary defense are logical extensions of complex resource distributions and diverse subsistence patterns, tombs will cluster on the landscape and, as a whole, in highly visible locations. These clusters, while marking the landscape as “taken”, nevertheless admit access to those communities (and their resources more generally), an access made visible in the inclusiveness of the individuals interred there. The location of these clusters should be adjacent to, or surrounding, at least one limited resource. The

resource need not be the same in every place where tomb clusters are found. The towers, however, provide alternative views of access and integration: specifically, this research proposes that they will offer far fewer opportunities for integration, and far greater restrictions.

CHAPTER FOUR: DATA COLLECTION

Introduction

Plog et al. (1978) and others have pointed to the importance of field survey methods that are uniquely tailored to the kinds of data meant to be detected through survey. Banning et al. (2006) introduce the impact that obtrusiveness has on deciding which are appropriate methods for the detection of archaeological material (or in fact, any other type of field survey). In effect, proper survey methodology is dependent upon whatever minimizes false targets and maximizes detection of real targets, both of which are functions of the survey area, the “obtrusiveness” (Banning et al. 2006) of the target material sought. Survey methods, therefore, are extremely individualized. This chapter describes the strategies of other quantitative archaeological surveys in similar landscapes, and outlines the methods used in this survey.

Landscape Properties and Archaeological Survey Design on the Arabian Peninsula

Sampling strategies in archaeological survey allow for the high-intensity inspection of a limited area, and make statistically valid statements based on these samples. Traditional systematic, probabilistic survey methods work well in landscapes that are relatively flat, or have been ploughed (e.g., Europe, the Mediterranean); for areas like Oman, in which there is extraordinary variation in topography and hydro-geology (see **Figure 8**), these survey methods become problematic. While landscape and topography impact the choices people make about movement and spatial organization across the globe, the Oman Peninsula presents very few locations suitable for settlement and vastly different “costs” for movement across and through it (al-Jahwari 2008:7). At this stage, the nature of the distribution of tombs in north-central Oman is unknown. In fact, such distributional information will be invaluable to understanding land use patterns and social organization as it is written onto this extreme landscape. Therefore, it was

necessary to conduct a full-coverage survey and measure the location of each monument to describe accurately their distribution.

The appropriate methods for achieving “full coverage” survey vary according to landscape and the kinds of information to be collected. The obtrusiveness of a feature is the sum of the characteristics that lend themselves to detection or concealment (Schiffer et al. 1978; Banning et al. 2006). Specifically, obtrusiveness refers to the difference between the object one is trying to locate and its background (false targets included). Monuments tend to be highly obtrusive, and the obtrusiveness of third millennium monuments on the Omani landscape in particular can be quite high (**Figure 15**).



Figure 15. Approaching tombs (mounds of stone silhouetted against the sky), south of Bat.

There is a trade-off between survey intensity and output (i.e., the likelihood of correctly

identifying the sought-after data and false targets). Transect intervals are primarily limited by a combination of the need to minimize false targets (targets incorrectly identified as third millennium monuments), and to maximize the detection of real features (Banning et al. 2006:726). This is also of vital importance if we are to have confidence in any patterns that may be parsed out from the location of these features (Banning et al. 2006:724).

Archaeological Survey Design in the Wadi al-Hijr

Survey universe

The survey boundary is a combination of natural and semi-arbitrary boundaries (**Figure 16**). The study region follows and includes a 16km-long section of a valley, the Wadi al-Hijr. At the western boundary the Wadi al-Hijr meets the larger Wadi al-Kabir, which forms a major route through the Oman Mountains. A series of parallel ridges (**Figure 17**), running northwest-southeast, provide the southern edge of the study region, and are included in it.

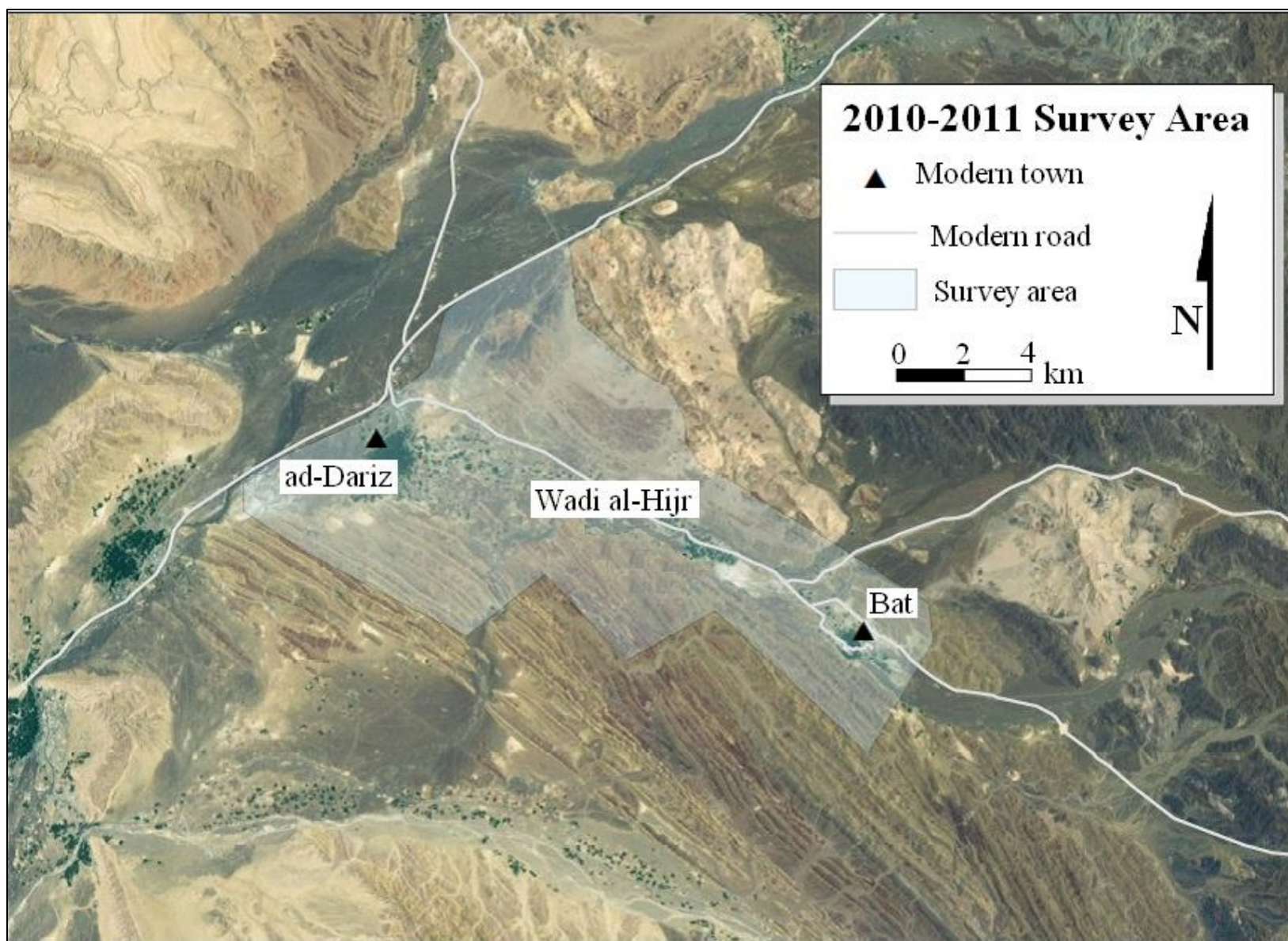


Figure 16. The survey area.



Figure 17. Landscape south of Bat, looking south across a bedrock ridgeline.

The decision to limit the southern boundary to the fourth series of ridges was arbitrary, and it is important for future research to consider the continuation of tombs on ridges further to the south. In the Bat area the wadi is relatively narrow, and widens as it joins the Wadi al-Kabir. The survey area follows the shape of the wadi. The southern edge is staggered to accommodate the ridgelines' strikes, which veer from northwest-southeast to NNW-SSE from the western to eastern halves of the study area. The total survey area is 123.9 square km.

Survey methods and coverage

In a 2008 pre-dissertation study of different field survey methods in the research area I evaluated the effectiveness of different transect intervals and directions in the survey area, varying from intensive circular pickup sub-areas to half-kilometer transect intervals. Although visibility tends to be quite high, 300 m transect intervals were a little less than twice the visible distance to a third millennium tomb – about 175 m. At that distance and beyond it was more

difficult to move off of the transect line in order to verify a positive target than simply to walk another transect. As described below, other survey methods and other intervals of pedestrian survey were tested in areas in which feature obtrusiveness varied.

The survey area was roughly divided into topographic zones based on the obtrusiveness they provided for the monuments. In general this translated into 300 meter intervals in which the surveyor could anticipate 150 m views to the right and the left. Seven 0.5–1.0 square kilometer areas were randomly chosen to survey at 50 m intervals. Direction of data collection varied: mostly the transect orientation followed topographic elements – usually ridgelines, which tended to run NNW-SSE. On open wadi floors (that is, those not under cultivation) transects tended to be oriented N-S or W-E. Data collection within the Bat cemetery itself was pragmatically oriented to take into account the site's fence and its topography.



Figure 18. David and Leslie Bosch documenting an archaeological feature near Bat, 2011.

Data was usually collected in teams of two (**Figure 18**). In areas of low feature density the pair split between 150 m and 300 m apart, depending upon topography, rate of false positives, etc. In areas of extremely high density and relatively high preservation, as within the UNESCO boundaries, two teams of two worked side-by-side. Both teams had one GPS running a constant tracklog at 10 m intervals.

In seven cases areas were randomly selected for survey at 50 m intervals. All of these were accomplished with two to four surveyors at 50 m intervals, with 25 m to both sides the expected visibility. In each 50 m interval, 0.5-1.0 square km were covered. Surveyors walked parallel lines, usually along cardinal directions to aid in maintaining direction and interval distance. The

beginning and end of each transect line for every surveyor was marked with the GPS, and the transect lines recreated in the lab using Garmin's MapSource and ESRI's ArcMap software.

Alternative data collection methods

Nearly all data was collected on foot. There were three exceptions to this rule: first, parts of the research area have previously been surveyed, and excavations have been conducted by a Danish expedition, two German expeditions, and an American expedition. In any cases where these data were available they were incorporated into this analysis.

Second, modern manipulation of the landscape sometimes made vehicular survey a better option. This was particularly true in the wide agricultural plain of the wadi bottom, where bulldozing had led to the development of tall berms of sediment aimed to contain water and to act as field boundaries (**Figure 19**). These berms frequently obscured views when on foot.



Figure 19. Satellite imagery of field systems east of ad-Dariz.

Third, in a few cases local research collaborators were able to explain recent environmental and developmental histories. These included knowledge of unpublished excavations as well as the ways in which modern building practices have altered the landscape, whether this was dam-building, fluctuations in ground-water levels, or the destruction of specific monuments.

The survey area was roughly divided into topographic zones based on the type of landscape and recent or current land use. These two characteristics directly impact the obtrusiveness of a monument, and therefore the distances between individual transects.

Of the total survey area (124 sq km), ca. 90% was open landscape; “open” in this case does not mean a flat horizon, but rather lacking ground cover, where feature-landscape obtrusiveness

would be high. This was determined to consist of the ability to positively identify archaeological features easily at a distance of up to 150 m and to limit false positives. Full coverage of areas designated as highly obtrusive therefore consisted of pedestrian survey at 300 m intervals. Obtrusiveness was maximized by aligning survey transects with topographic contours to allow for the greatest amount of uninterrupted visibility and landscape- feature contrast.

Landscape-feature areas with lower obtrusiveness were divided according to the likely success of different survey methods and surveyed with one or the other in mind: at 50 meter intervals on foot for areas where distance visibility was low (e.g., in cultivated date groves); or at 300 m intervals in a 4-x-4 vehicle, where visibility was limited by modern manipulation of the landscape. The latter was particularly likely in the wide agricultural plain of the wadi bottom, where bulldozing had led to the development of tall (in some cases nearly two meters high) berms of sediment aimed to contain water and to act as field system boundaries. These berms frequently obscured views when on foot. These areas account for 4% (5 sq km) of the survey area.

The remaining 16% (20 square km) went unsurveyed. Two-thirds of that area was determined to be unlikely to yield ancient archaeological remains. These areas consist of: modern construction; areas with recent and extensive surficial disturbance for no known reason (e.g., clear evidence of bulldozing without evidence of nearby construction); areas where the surface has been masked by modern rubbish; and heavily cultivated plots. A final ca. 8 sq km were enclosed areas where it was determined that survey would be culturally inappropriate (e.g., where the field's owner could not be contacted for permission, enclosed modern cemeteries).

Several areas were surveyed at 50 meter intervals. These were identified following the initial 300 m-interval survey according to initial qualitative assessments of feature density: (1) in

apparently “empty” areas, to verify that archaeological features were not going undetected; (2) in areas of apparent low feature density, that the spatial distribution of the archaeological features (regardless of their form and function) was accurate; and (3) in areas of high feature density, to facilitate data collection (i.e., increase the ability of the surveyors to remain within and aligned to their survey tracts).

Transect orientation

Direction of data collection varied based on maximizing obtrusiveness, and took into account anthropogenic and environmental pragmatics (such as fenced plots and sheer cliffs). Most transect orientations followed topographic elements: usually ridgelines, which tended to run NNW-SSE. On open wadi floors (that is, those not under cultivation), transects tended to be oriented N-S or W-E. Data collection within the Bat cemetery itself was pragmatically oriented to take into account both the site’s boundary fence and its topography.

Data Collection

For each feature a series of characteristics were assessed in the field and in the laboratory. Field assessments remained separate from post-field analysis records. Laboratory analysis was aimed at artifact documentation, and functional and period assessments.

Field Data Recovery

Field data recovery took several forms for each feature: spatial data (X, Y, Z) were gathered using Garmin GPSMaps; photographic documentation was gathered using digital cameras; architectural, qualitative (relational) landscape, and preservation data were recorded on a one-page field form (see **Appendix E**); and associated artifacts were collected and/or noted (presence/absence; photographed) and left with the feature.

Features identified were given a designation consisting of a year prefix and a unique feature number (e.g., 100089 is feature 89, year 2010). Eight sets of data were gathered for each documented feature:

- Spatial and locational
- Visibility of other archaeological features
- Overall and wall dimensions
- Material (e.g., stone) specifications
- Tomb-specific construction style and elements
- Feature in-field qualitative assessments regarding dating, function, reuse, and destruction.
- Photograph data for cross-verification with the photo log, and associated notes
- Comments and comparisons to other features

Spatial data recovery

Accuracy, precision (reproducibility), and cost (measured in both time and money) vary considerably between recreation- and survey-grade handheld GPS units. Recreation-grade GPS units – specifically, the Garmin GPSMap 60 and 76 and the Garmin eTrex Vista – are capable of logging the accuracy of the X, Y data captured, and have a 95% probability that any single data capture event will be precise to within 10 m (Garmin 2007:49). Although the GPSMap76 is designed for marine use, water resistance is useful in arid environments to keep out dust and fine sand. For all three models precision increases significantly (e.g. from 10 m down to as little as sub-meter) as data from single capture events of the same location are averaged, particularly for the first 100–120 events. For this reason all feature X,Y locational data were averaged for a minimum of two minutes (a single event was captured every second). All features attained a horizontal planar accuracy greater than 4.8 m, with an average accuracy of +/-2.4 m.

The tomb and tower features surveyed here range from two meters to 30 m in diameter. The

distance between features can be quite small – in some cases tombs may be touching – yet for the most part at least 10 m separates them. Since the averages and medians are far better than the minimum accuracy appropriate for the scale of this study, the use of recreation-grade GPS units was the best answer to the cost-benefit quandary.

Data from the Garmin GPS units were downloaded using MapSource, computer software that facilitates creating, viewing, and editing waypoints and tracks from Garmin devices. These data were then exported as tab delimited text files, which registers the spatial coordinates as a single value. These need to be separated to be read in ESRI's ArcMap software. Therefore the text files were opened in the Microsoft spreadsheet application, Excel. Spatial coordinates (Zone, Easting, and Northing) were separated using the Data Text To Columns function, and the text file resaved as a .xls file (Excel spreadsheet). The spreadsheet was then added in ArcMap, the coordinates displayed using "Display X/Y Data", and the projected coordinate system set (UTM WGS 1984 Zone 40N). Finally the exported data were saved as a shapefile. Tracklog data were organized according to day, such that a query by date would bring up the route taken that day. Waypoints were renamed in MapSource according to the associated feature's name and were organized into a single growing file. Spatial data files were saved separately at all stages of manipulation so that it would be possible to refer back to the data at any step of the translation process.

Of the several competing standard projection-datum systems found in Oman, the Universal Transverse Mercator (UTM) projection / WGS 84 datum and spheroid are the most common in research and government contexts. This system also makes possible spatial analysis in ways non-projected data do not (e.g., Euclidean distance measurements).

Digital photographs can be invaluable resources during post-excavation study and analysis. For each feature, a minimum of one overview photo was taken. At least one additional photo

documenting specific architectural elements (e.g., building material, wall curvature or coursing) was taken as well.

Qualitative locational assessment

Feature location is an important part of its chronological and functional identification. Hafit tombs are typically located on ridges, low enough to be visible from the valley bottom. Umm an-Nar tombs tend to be found on low plateaus within or just above valley bottoms (and therefore just outside flood zones), where it is likely that flooding was infrequent. Locational data were collected for each feature, including primary and secondary location, and further notes in the “notes on surroundings” field. Primary locations consisted of one of these, and refers to the main landform upon which the feature was built: foothill, low rise, other, plain/wadi, plateau, or ridgeline. Secondary locations referred to where, on the main landform, the feature was situated and were more varied: base, end-slope, foothill, low rise, mid-slope, plain, plateau, prominence, ridgeline, and saddle. During analysis Primary and Secondary locations were then assigned ordinal numbers based on elevation from the wadi floor and visibility (Primary locations were assigned based on the elevation; Secondary locations were assigned based on visibility). Ordinals were assigned from lowest to highest. For Primary locations: plain = 1, low rise or plateau = 2, foothill = 3, ridgeline = 4. For Secondary locations base or plain = 1, low rise or plateau = 2, end-slope, mid-slope, saddle, or foothill = 3, and prominence or ridgeline = 4. The product of the two ordinal values approximated the relative visibility of each feature. These, and the primary and secondary locations, were later mapped using the GIS in order to see their distributions.

Visibility of other archaeological features

For every feature, data was collected relating specifically to visibility from the feature in question. Each cardinal direction was assessed independently, and any combination of the following could be applied as visible in a particular direction: tombs; towers; settlement; other

archaeological features; agricultural fields; no archaeological features; wells; or other. Tombs, towers, and settlement each referred specifically to third millennium features. “Other archaeological features” referred to any non-third millennium features. “Agricultural fields” included any evidence of field systems, either currently in use or in the past. Although this was not quantifiable, it **was** useful in assessing the agricultural potential of nearby landforms, and it was also helpful in documenting whether features were likely to have been removed from the immediate landscape by later land development. When “no archaeological features” were found the landform visible was specified, e.g. “ridgeline only” or “wadi only”. Although these never appeared to be third millennium, wells and falaj access points were noted as general indicators of potential stable water sources. Finally, if an “other” feature was notable on the landscape – a modern vehicle track (indicating possible modern stone removal), a check dam, white limestone sources, or modern date palm groves (thereby obstructing the view in that direction), this was explained in the “notes on surroundings” field with the relevant direction(s).

Architectural data recovery

Construction techniques and building styles are important elements in assigning both functional and chronological information to archaeological features. The following architectural information was gathered for each feature: wall orientation, construction style, dimensions, number, fill, and coursing; overall dimensions and orientation; stone size, shape, color, and whether the feature is situated on the same material as that from which it was built.

Despite thousands of years of re-use and abuse, there are several aspects of third millennium BC mortuary and tower monument architecture that make them unique. Here they are described and explained for tombs.

Tomb ringwalls. Hafit tomb ringwalls vary in number, presence/absence of between-wall fill, in the type of wall fill, and in wall coursing (**Figure 20**). Sufficient-but-not-necessary for Hafit

tombs is the presence of multiple ringwalls. Sufficient and necessary for Umm an-Nar tombs is a double-faced (i.e., to the interior and exterior) ringwall (**Figure 21**). The Umm an-Nar ringwall stone is pecked on the exterior and the stones are closely fitted in place, while Hafit walls tend to be only roughly faced. Tombs from both periods are dry-wall construction.

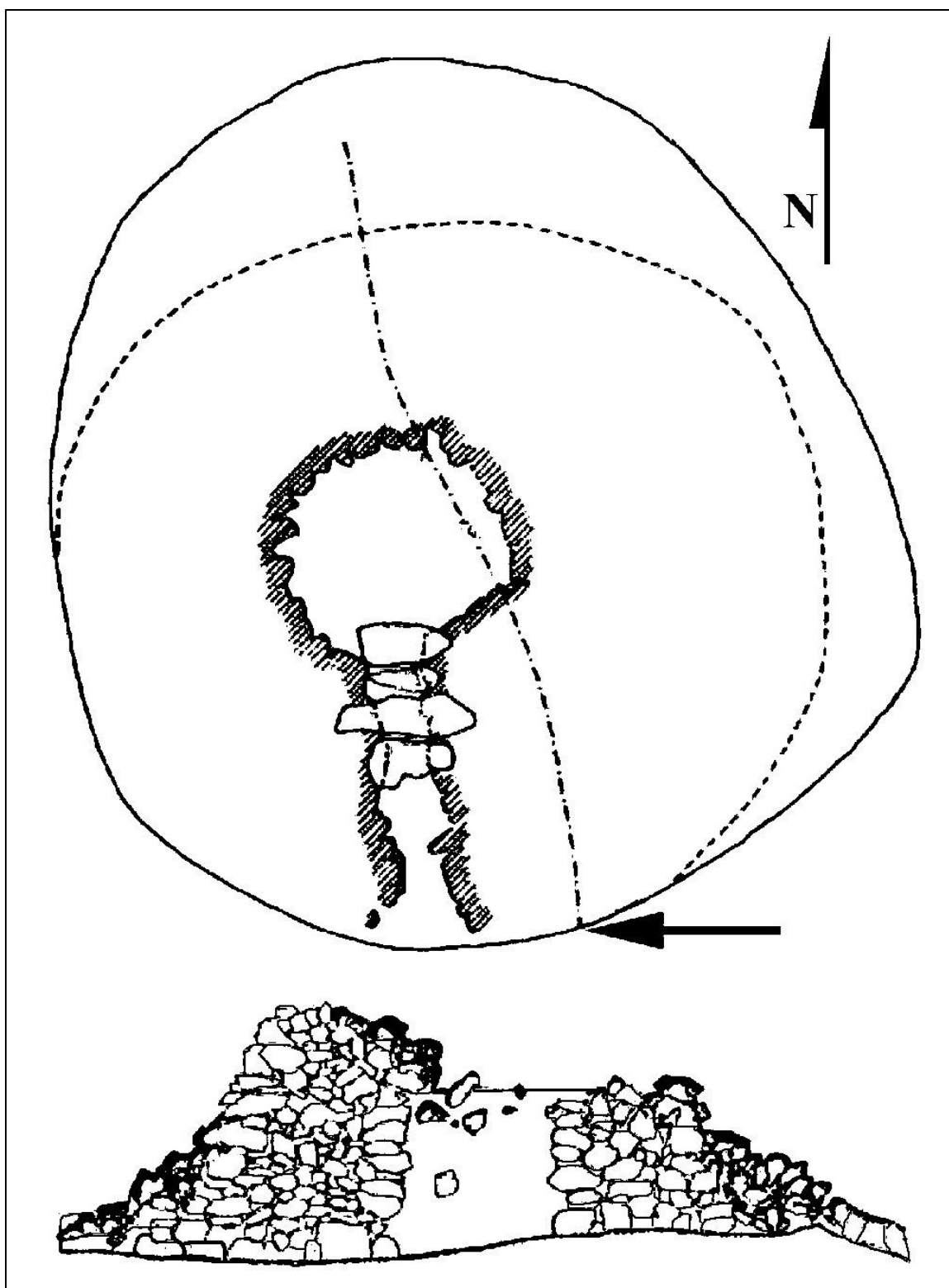


Figure 20. Hafit cairn in plan and section. Note single rubble-filled ringwall. After Frifelt 1971:Figure 8, Cairn 17.

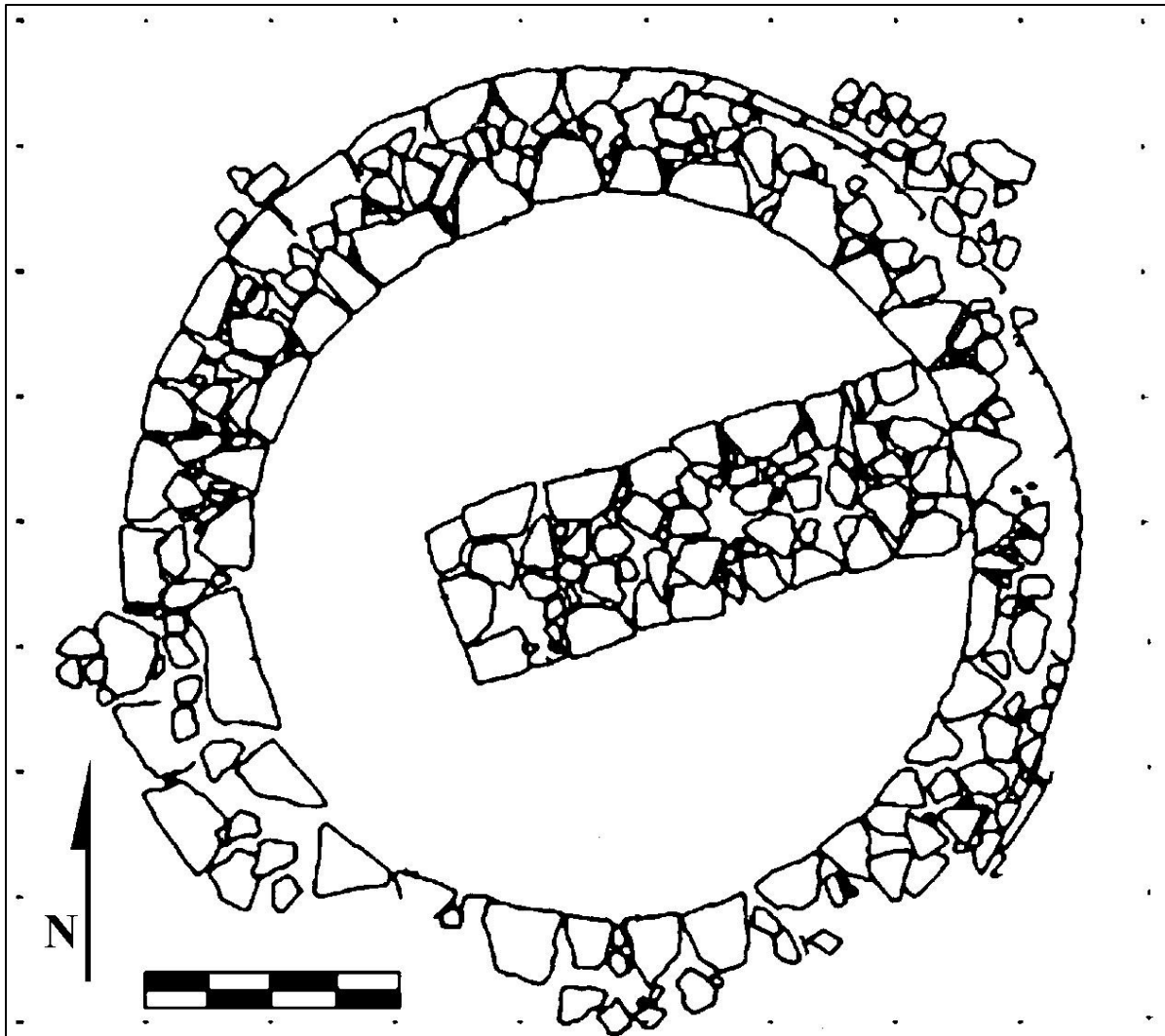


Figure 21. Umm an-Nar tomb “401”. Note double-faced ringwall, ashlar facing stones on SE corner, and interior support wall (scale is 2m). After Bohme (2011).

Entrance. There is much debate about why certain Hafit tombs do not have entrances, while others do (e.g., Vogt 1985; Williams 2012). The presence of an entrance – frequently quite small (ca. 40 cm wide and 50 cm tall) and varying in shape from trapezoidal to triangular – is useful (though neither necessary nor sufficient) as a functional feature characteristic. For the potentially Hafit tombs, the presence of entrance is a stylistic indicator, but its absence is not. Umm an-Nar tombs all have entrances and may have door stones. These entrances are similarly quite small. Entrances of tombs from both periods tend to be raised.

Diameter. In general, tomb diameter increases from four to as much as 14 m in diameter across the third millennium BC. Regardless of the diameter or of period, **third millennium tombs and towers are circular**, to the near-exclusion of features from other periods and with other functions. However, it is rare that the ringwall is intact and clear enough to discern precise dimensions.

Corbelling. Construction technology in third millennium BC Oman did not include the arch; therefore roofing construction was limited in its unsupported distances. During the Hafit period tombs were therefore quite small in diameter, and corbelled in such a way as to provide a successively smaller distance to roof as the structure gained height (**Figure 22**). During the Umm an-Nar period the base diameter of the tombs increased considerably to accommodate the growing number of individual interments (from several to several hundred individuals), and as such tombs dating to the latter half of the Umm an-Nar period tend to have central walls.

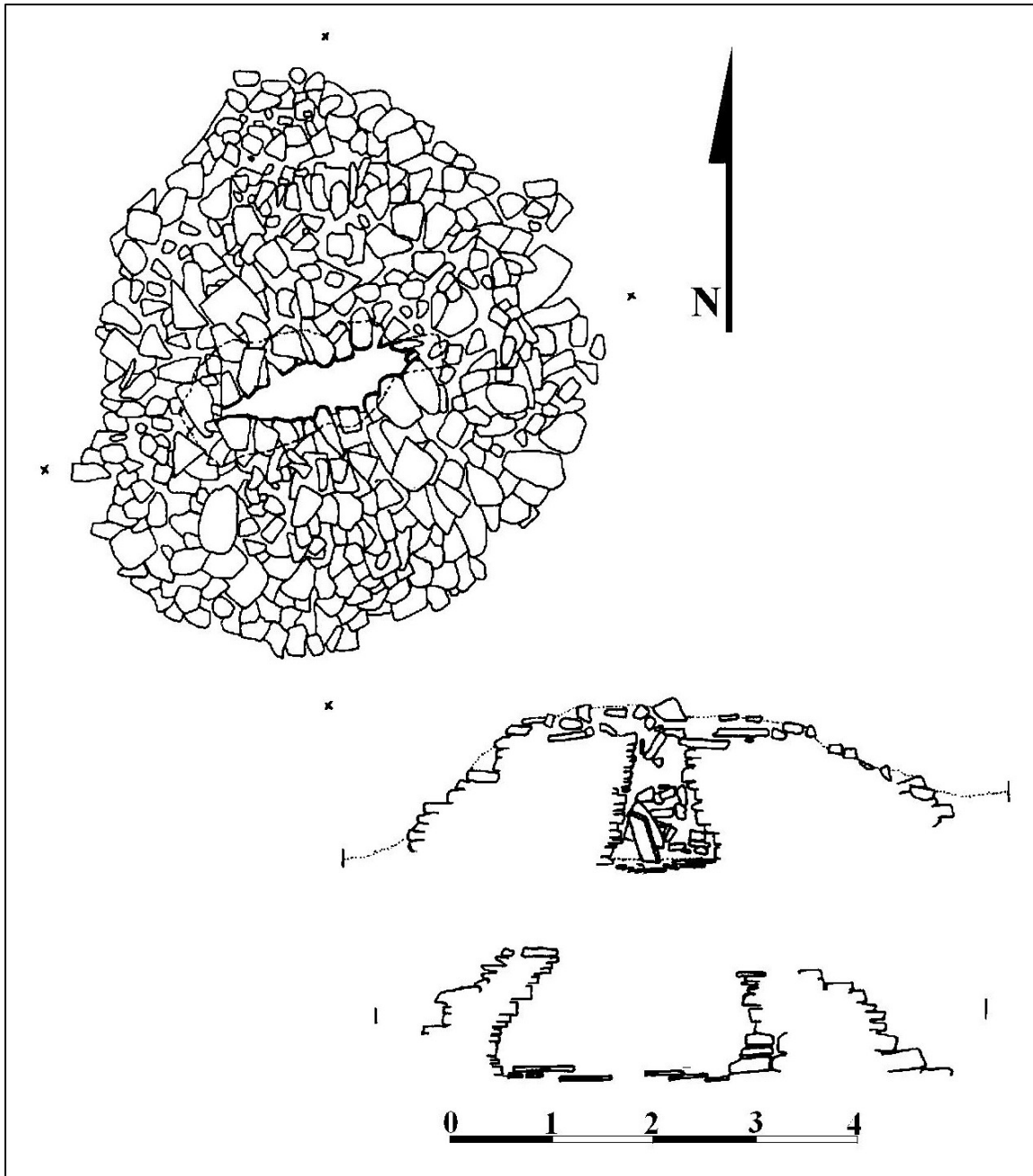


Figure 22. Hafit tomb corbelling in plan and section views. After de Cardi et al. (1979:Figure 5), Cairn 4.

Internal walling. Central walling in a variety of shapes and directions served a technological function for Umm an-Nar tombs; it is unknown whether there was also a social distinction. Regardless, the presence of central linear walling – cruciform, single or double dividing, or even central posts – within a circular stone structure is a clear indication of an Umm an-Nar tomb. No

such internal walls are present in Hafit tombs, although the shape of the internal chamber can vary from circular to “P”-shaped.

Ashlar. Ashlar is any dressed (prepared) stone. Siltstone schist of this region cleaves easily into blocks and is a ready building material and is the primary building material (besides mud brick), so it is the evidence of further stoneworking – specifically, stone pecking to create wedge-shaped cuboid blocks with square edges and smooth faces – that is particularly useful in identifying Umm an-Nar period tomb masonry. This kind of stone dressing applies specifically to the outermost skin, facing outwards, of third millennium tombs dating to the middle and latter half of the third millennium BC. These are most diagnostic when the stones are themselves non-local; this is discussed further below. Hafit tombs are not faced with ashlar.

Local and nonlocal stone. In the Omani landscape construction stone is plentiful. Upright beds of siltstone and limestone provide excellent building material and these (or other local stone) are always used in the construction of Hafit tombs. The inclusion of nonlocal stone in a feature is limited to the Umm an-Nar period (or re-use of features originally dating to that period).

Limestone – specifically hewn or pecked white limestone – is frequently added as the outer, “facing” wall for Umm an-Nar tombs. This creates a starkly white face to the tombs, and is highly visible against a backdrop of brown, gray, and green. The white limestone, which is still mined today, is quarried from Jebel Shuwā’ī, which forms the northern boundary of the study area. Stonemasonry was assessed according to the amount of finishing (and thereby effort) put into dressing it: from 0 (non-worked stone, such as natural cobbles) to 3 (finely pecked ashlar).

Pavement. Sufficient but not necessary, Umm an-Nar tombs frequently have flat stones arranged in something like a full or partial pavement inside the tomb chamber(s).

It is important to remember that the above distinctions between Hafit and Umm an-Nar

period tomb architecture are somewhat false; it is not only possible but rather very likely that these architectural distinctions morphed from one form into the other over time such that the transitional phase has architectural features either combining both styles, or intermediary between them on the same architectural feature which is not faced with white limestone but has an external ringwall made of carefully pecked and fitted brown (i.e., local) limestone (**Figure 23**).



Figure 23. Umm an-Nar tomb, Bat cemetery. Note that this tomb lacks white ashlar facing stones but is finely built.

Conversely, Bohme's (2011) reconstructed Hafit tomb (603) has an exterior facing of rough white limestone chunks (**Figure 24**). That "Hafit" tomb interior chambers vary in shape may be coincidental, or it may also signal attempts to alter the shape of the tomb to increase the interior space, as is later achieved by internal walls in the Umm an-Nar period. For this reason Hafit and Umm an-Nar period dates were assigned independently to each feature (discussed in Chapter 5).



Figure 24. Hafit tomb "603" (after Bohme 2011:Figure 4) with roughly shaped white limestone facing.

Artifact collection

The level of detail in the analysis of artifacts is frequently too in-depth to be achieved in the field (Plog et al 1978; Schiffer and Gumerman 1977). This includes assigning both chronological and functional attributes to features based in part on associated artifacts. Generally speaking, the disturbance of sealed features provides greater opportunities for associated artifact recovery, but at the expense of the intact feature – so there is something of an inverse relationship between tomb dating and identification and its level of disturbance. This is helpful, because it is the combination of artifacts and structure that make possible the identification of a particular feature as (for example) a third millennium BC tomb. Therefore a surface artifact or ecofact was collected if it was likely to give insight into the function(s) of the associated feature, or to aid in

dating the feature. Where possible, these artifacts were collected according to the following in-field assessments:

Ceramics. In survey research ceramics are one of the best ways of determining the function and/or age of a feature or site. All diagnostic sherds, and a representative sample of body sherds with a range of fabrics. Body sherds were considered non-diagnostic if they were indistinguishable from other sherds of different periods or functions. For example, the presence of a thin-walled body sherd increases the probability that a stone-built feature may have been a tomb, even if it is impossible to determine the associated period.

Metal. Throughout antiquity, metal – specifically, copper – artifacts are found primarily in two archaeological contexts: at copper-working sites (such as Maysar), and in burials.

Shell. Because of their clearly foreign origin, and therefore cultural significance, marine shell was always collected. Worked shell (which was always marine) was also collected, as it is frequently found in prehistoric burials.

Skeletal remains: in assigning a burial function to a particular feature skeletal analysis is clearly helpful. However, the collection and analysis of the skeletal remains was practically more complicated. First, in a country where animal remains are deposited across the landscape (whether by the side of the road or in a rubbish dump) and left to the elements as standard disposal practice, the likelihood that any particular remains will be both modern and faunal is quite high. Second, exposure of a burial's internal contents to pedestrian survey is quite likely to result in grave goods as well as human remains, and therefore the assignment to a particular feature to the mortuary realm is as likely to occur based on grave goods as on human remains. This may be problematic in terms of the Hafit tombs, which contain both fewer individuals and significantly fewer grave goods, and therefore may result in lower feature recognition rates.

Taphonomically speaking skeletal remains that have been exposed to the elements (and therefore to the eye of the surveyor) are likely to be in extremely poor condition. In these cases, it was better to identify patches of bone debris, then look closely in that area for micro-beads (described below) or other small artifacts, rather than attempting to collect and identify the bone fragments. Where identifiable, human skeletal fragments were collected, photographed, and analyzed in the field, then deposited back with the feature.

Lithics. Although little research has been undertaken with the lithic assemblages of Oman, there are clear trends in lithic technology and forms through time. As they are found with some regularity in mortuary contexts, they can be helpful in assigning both an age and a function to an associated feature.

Groundstone. Softstone vessels are found in mortuary contexts dating to all Prehistoric periods. They vary stylistically across these periods and are therefore useful chronological and functional indicators. However, hammerstones were in use in Eastern Arabia until the late Pre-Islamic (e.g., Potts 1990b:Figures 152.2–3, 154; 1991:145–147) and therefore are not useful as chronological or functional indicators. These were documented and left in place.

Other. As is usually the case – particularly when dealing with mortuary contexts – there are significant numbers of artifacts that simultaneously defy easy categorization and facilitate feature identification (of period or function). These may be singular examples (e.g., a glass stylus) or a series of artifacts better categorized according to form than material (e.g., beads). Micro-beads are found throughout the first three millennia BC, but are particularly diagnostic of mortuary contexts. In addition they can be technologically and stylistically diagnostic, and therefore can be useful chronological and functional markers. Artifacts belonging to this category were always collected.

Other data collection methods

In recreational grade GPS units, vertical accuracy is sacrificed to obtain greater horizontal planar accuracy. I acquired altitude data from GPS-recovered X,Y coordinates, which then were overlaid on a JAXA satellite-derived DEM with a 2.5 m resolution. The DEM was built by Robert Goodwin at MSU's Remote Sensing & GIS, Research and Outreach Services using ERDAS and rectified using ArcGIS 10.0. Basemap imagery included freely available low-resolution world satellite imagery and i-cubed 15 m eSAT imagery at medium-to-large scales (down to 1:70,000) (accessed June 2012 at http://goto.arcgisonline.com/maps/World_Imagery).

As discussed in previous chapters three other archaeological expeditions have collected data on the third millennium landscape in the survey region. In ca. 35 cases it was possible for features from one expedition to be associated with features identified during my survey, the data culled from other project reports were appended to my own data. Although this rarely saved time, it frequently provided additional data helpful in identifying a feature's function and/or date(s) of use.

In a few cases, local research collaborators were able to explain recent environmental and developmental histories. These included knowledge of unpublished excavations as well as the ways in which modern building practices have altered the landscape, including dam construction, fluctuations in ground-water levels, and the destruction of specific monuments in recent times.

Excavation Data and Methods

To anchor an understanding of the towers in the Wadi al-Hijr this research will combine published and unpublished excavation reports of towers in the UNESCO World Heritage Site of Bat. Many of these third millennium monuments were first identified in the 1970s by de Cardi et al. (1976). Excavations at four of these towers – 1145, 1146, 1147, and 1148 – by Frifelt (1976, 1979, 1985, 1989, 2002) in the 1970s and 1980s have been introduced in Chapter 3. In 2007 the

American Expedition at Bat, directed by Dr. Gregory Possehl of the University of Pennsylvania, began work on these monuments (Possehl and Thornton 2007). In 2008 excavations began at Matariya (Tower 1147) and Kasr al-Khafaji (Tower 1146), and in 2011, excavations were re-opened at 1156. I led excavations at *Matariya* (Tower 1147) from 2008 to 2011, under the aegis of the American Expedition at Bat (Possehl et al. 2008, 2009, 2010, 2011). Until 2009, Building III at Hili was the only tower known to have a well and to date to the Hafit period (Cleuziou 2009; Possehl et al. 2009). Research into the construction phases at Matariya are used here to understand changes in the towers over time. Records of excavations at Kasr al-Khafaji (Tower 1146), under the direction of Dr. Christopher Thornton, and at Tower 1156, under the direction of Anne Mortimer, have both been made available by the American Expedition at Bat (Possehl et al. 2008, 2009, 2010, 2011; Thornton and Mortimer 2012). Together they form the basis for an understanding of change in towers over time. Descriptions of the methods used at each tower are thoroughly outlined in the annual reports (Possehl et al. 2008, 2009, 2010, 2011; Thornton and Mortimer 2012).

Survey Post-Field Methods

Daily laboratory activities proceeded on three fronts: (1) spatial data and digital photography pre-processing; (2) field note transcription and conservation; and (3) artifact processing, documentation, and analysis.

Spatial data and digital photography pre-processing

Pre-processing of digital data were daily activities. Tracklogs were downloaded from the Garmin GPS units separately from waypoints. Where relevant tracklogs were created in Garmin's MapSource software to account for a second, separate surveyor's track based on the beginning- and end-of-line waypoints recorded in the field. These were then exported as tab-delimited text

files according to date of data collection.

Waypoints were also downloaded using MapSource. Waypoint numbers were replaced with feature names (IDs). Simultaneously coordinates were checked against those collected on the field forms. This acted as an initial verification process so as to minimize clerical errors. Then these too were exported as tab-delimited text files, according to date of data collection.

Both sets of files were then brought into separate spreadsheet workbooks. A main sheet kept a running log of all archaeological features; daily logs were kept as separate sheets and locked, so that they could be used as cross-references during data manipulation. Tracklogs were maintained as separate sheets for every day and, in the case of morning and afternoon survey sessions, designated AM or PM. These could then be imported and displayed in ArcGIS with relative ease.

Digital photographs taken during fieldwork were downloaded daily and checked against the handwritten field photography log, and inconsistencies noted on the field log.

Field Note Transcription and Conservation

As a form of data checking, data collected on the field forms were entered into a spreadsheet that same day. Inconsistencies were addressed using a combination of assessments from photographs, consultation with research collaborators, and secondary field visits. For data conservation purposes field forms were also scanned as PDFs and stored separately.

Artifact Processing and Analysis

Artifacts were labeled during collection according to associated feature and material type and cross referenced on the field form. Artifacts were cleaned, relabeled, documented, analyzed according to material type, and in some cases set aside for specialists. All artifacts were documented using digital photography of at least three angles, with a color bare and scale, and where necessary and possible, stanced appropriately. All ceramics were individually analyzed for

ware and style. Where possible diagnostic sherds were assigned comparanda from published and gray literature. Ceramics assigned to the third millennium BC were hand illustrated, then used as comparanda as other samples were analyzed. These were later digitized by Ms. Jen Swerida.

As mentioned above all artifacts were photographed. In two cases Dr. M. Kenoyer examined the drilling patterns for two beads, first through visual inspection in the field and later using SEM photographs of drill hole casts made by Dr. R. Law. Several lithics, unique in the Bat assemblage, were illustrated and later digitized. All were analyzed macroscopically and formally described (Appendix B).

All artifacts were given over to the care of the Ministry of Heritage and Culture (MHC) at the end of the field season. Registration numbers were assigned to each set of artifacts according to material and as specified by the MHC.

Summary

The field methods used in this research were developed over the course of several years in order to most efficiently collect data to respond to the research questions at hand. Full-coverage pedestrian survey, at 300 m transect intervals, was conducted across 80% of the 124 sq km area. A randomly chosen set of sub-areas were walked at 5 m intervals and the results of each interval coverage compared. All archaeological features were documented using digital photography, field forms, and recreation-grade GPS. Artifacts useful in establishing the function and/or age of an associated feature were either documented on-site or collected for further analysis. Features were identified according to dimensions, construction style, and associated artifacts. Each feature was assigned independently a probability (0-3) for its functional type (e.g., tomb or tower) and its age(s) of use (e.g., 3rd millennium BC, 2nd millennium BC).

Results of excavations at several of the towers at Bat will be used to understand changes in

the towers over time. Excavations I led from 2008 to 2011 at Matariya (Tower 1147) under the auspices of the Bat Archaeological Project form the center-piece of the study of diachronic tower variation, and are supported by contemporary research (also by the Bat Archaeological Project) at other towers in Bat.

CHAPTER FIVE: RESULTS AND DISCUSSION OF DATA COLLECTION

This chapter lays out the general results of the survey and excavations at the Bat towers.

Survey Methods Evaluation

Survey methods were evaluated on three lines. First, it was known that feature distributions from different periods were likewise different from the third millennium distributions. If distributions of features from all periods were the same, this could indicate survey bias rather than a representation of the extant features on the landscape. Second, finer 50 m intervals were randomly chosen from across the survey region in order to determine whether any features were being missed at wider intervals. If the survey results from the 50 m interval areas resembled those of the 300 m interval areas then this would indicate that the 300 m interval transects were allowing for the documentation of the archaeological landscape as well as transects six times more intensive (**Figure 25**).

Transect Data Collection

Transects were documented using the tracklog option using GPSMap76. Points were taken at 10 m intervals, and tracklogs were imported from Garmin MapSource as tab-delimited files. MapSource exports Easting and Northing as a single tabbed variable; the exported tab-delimited column was therefore separated using Microsoft Excel and then imported into ArcMap for display.

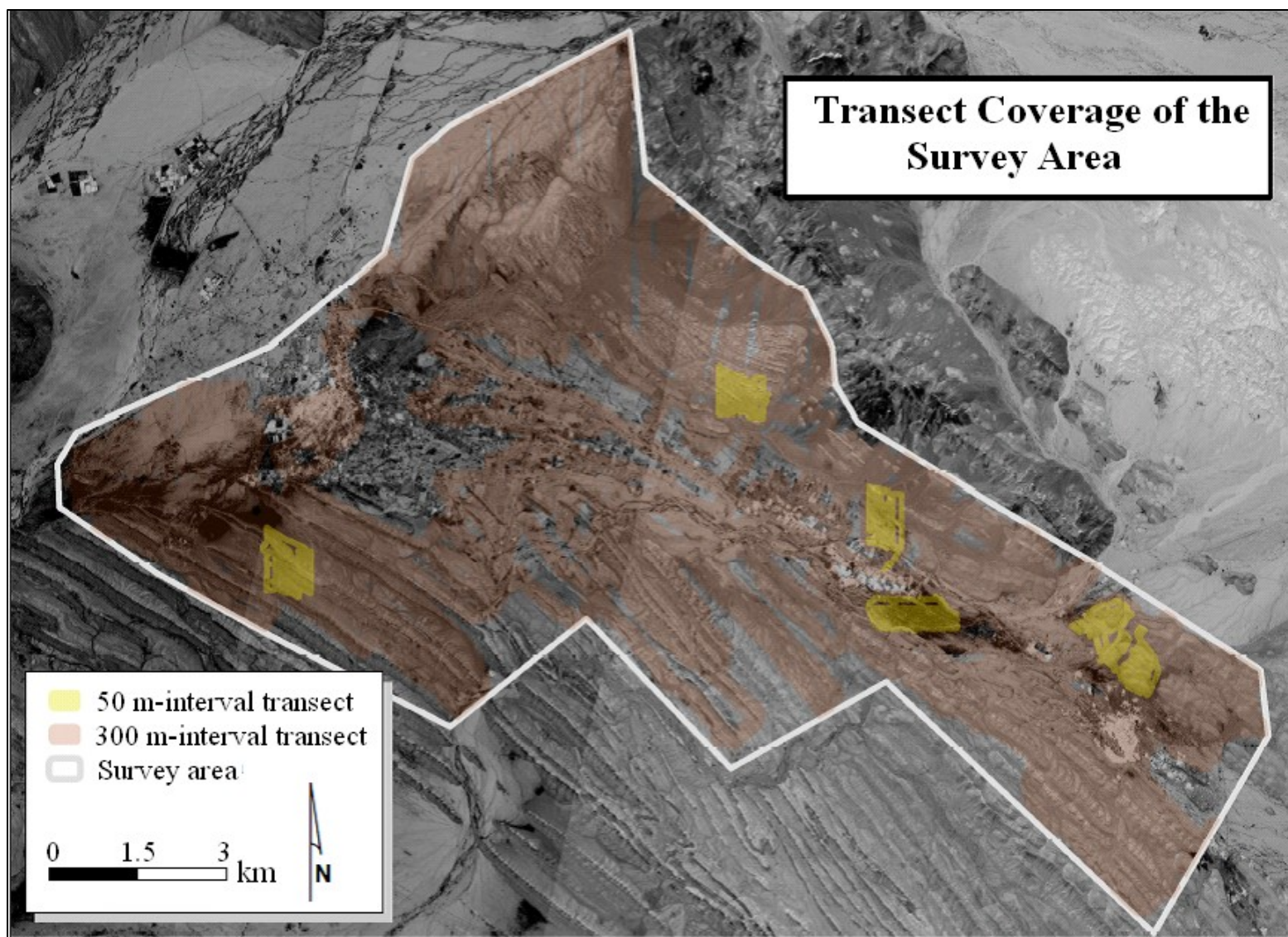


Figure 25. The survey area showing coverage (and coverage intensity).

50 meter intervals

In ArcGIS I turned each tracklog into a polyline, buffered each line (25 m buffer), dissolved any overlaps, and calculated each area. A total of 4.226 sq km were covered at 50 m intervals, or 3.4% of the total survey area (4.2% of the actual area surveyed).

Assigning Dates to a Feature

Third Millennium BC is a convenient term to describe the Hafit and Umm an-Nar periods combined; however it is generally agreed that the Hafit begins ca. 3100 BC, and the Umm an-Nar ends ca. 2000 BC, thus spanning ca. 1100 years. Each feature was assigned a likelihood of dating to the third millennium BC from zero to three (0–3) based on a combination of factors. Because reuse, human and nonhuman disturbance, material removal, etc. can each complicate assessment of a feature to different degrees and in different ways, each feature could date to any or all time periods. Although only those third millennium features with a likelihood of 2–3 are discussed here, attempts were made to date all features to all of their represented time periods.

Because they are not included in the bulk of the discussion, this section will discuss those features assigned as “possibly” tombs and dating to the third millennium; i.e., assigned a score of 1 for third millennium BC and/or tomb assessments. A full third of archaeological features assessed in the survey area were scored 1, “possibly” third millennium tombs. Surface survey allows for a limited age and functional assessment; therefore to be assigned a score of 1 it was only necessary that a feature date to the third millennium BC in one of the six sets of field data. Artifact assemblages were also used to date associated features; the individual artifact’s date likelihood was assigned to the feature as well, but whichever likelihood was higher was assigned overall. For example, feature 100439 had been almost completely destroyed by bulldozing such that any dimensions, architectural elements, etc. were ambiguous if present at all (**Figure 26**). The late third millennium style soapstone bowl found in the feature’s remains, however, gave a

third millennium (and Umm an-Nar) score of “3” to both the artifact and the feature overall.



Figure 26. Feature 100439. The slight mound on the right represents the bulldozed remains. The structural disturbance resulted in relatively simple identification of feature function and date.

The assignment of a feature to the Hafit or Umm an-Nar periods was completely independent from each other. A feature could independently be assigned a third millennium score of “1” but an Umm an-Nar score of “2”; or a third millennium score of “2” but a Hafit score of “1” and an Umm an-Nar score of “1”.

Dating features was more difficult than assigning a functional identity. Three hundred fifty features were completely undateable or clearly not third millennium BC. Of the rest, 286 features were highly probably third millennium; 397 features were probably third millennium; and 456 features were potentially third millennium for a total of 1138 features that may have belonged to the third millennium landscape.

Assigning a Function to a Feature

Mortuary

Mortuary artifacts tend to include:

- A. Copper-bronze weaponry and jewelry
- B. Jewelry of various materials
- C. Ceramics
- D. Groundstone vessels
- E. Human skeletal remains
- F. Lithics.

Metal objects tend to be weaponry (primarily blades) and jewelry. Copper rings are found in mortuary contexts, as are copper pins, and copper, silver, and gold beads (**Figure 27**).



Figure 27. Copper-bronze ring (probably finger ring)

Jewelry is most commonly beads, which come in huge varieties of styles and materials (See Appendix B). Typical of the Hafit period are disc-shaped micro beads, usually of frit, stone, and bone, and pierced shell. By the Umm an-Nar period beads are of carnelian, banded agate, steatite, faience/frit, shell, and quartz crystal, among others. Their shapes change dramatically and exhibit beautiful craftsmanship that takes advantage of natural elements in the material. For example, the agate may be shaped, and the hole drilled, such that the natural light bands in the agate are highlighted in bead form. The technology changes to reflect foreign manufacture (pers comm. 2012, Mark Kenoyer) (**Figure 28**).

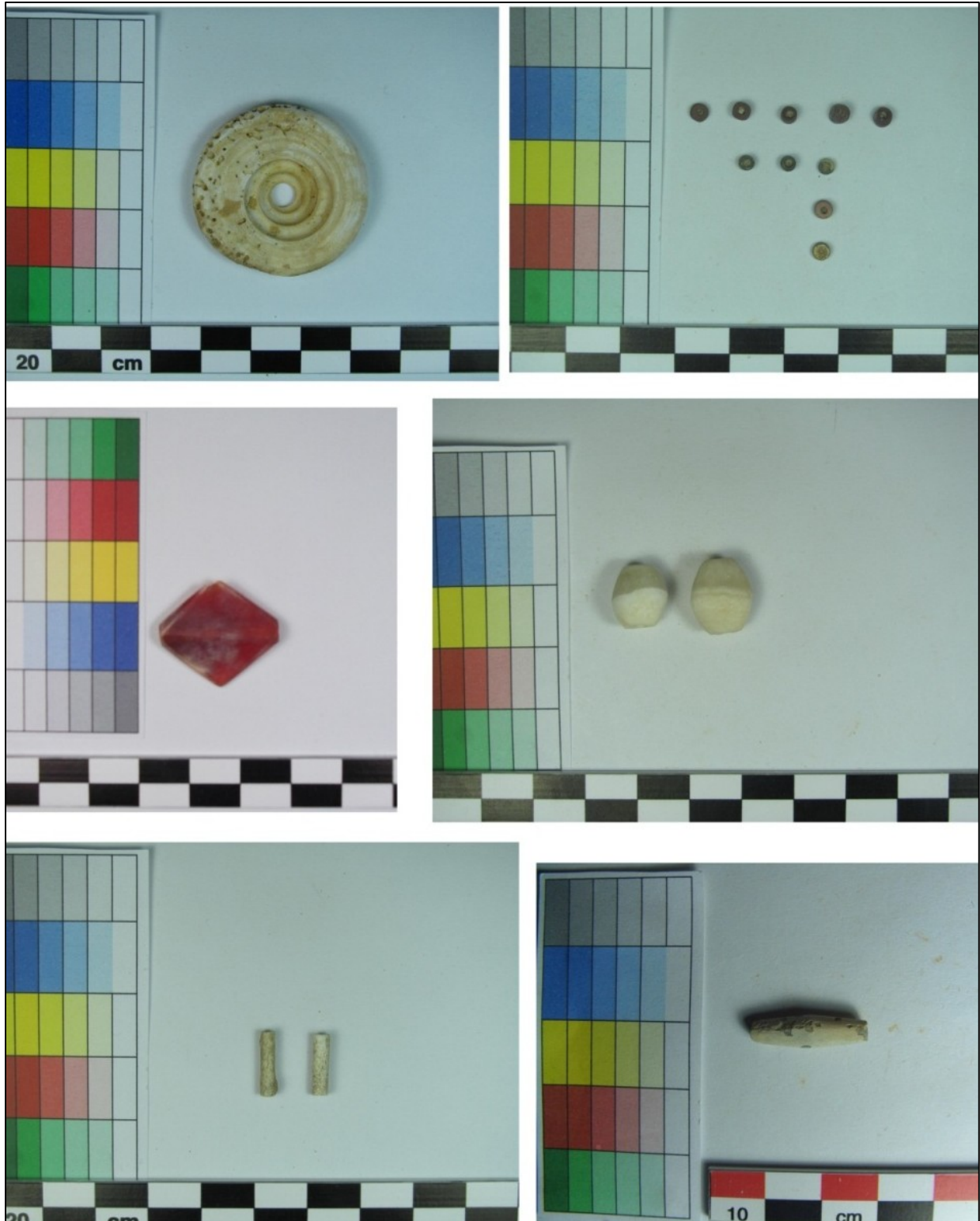


Figure 28. An assortment of beads from third millennium tombs.

Ceramic mortuary wares tend to be synonymous with fine wares. The Hafit period ceramic

assemblage is characterized by imported forms, or local copies of these forms. Petrographic analysis on these wares and fabrics are ongoing, but initial identification as local, non-local, or specifically Mesopotamian are relatively simple and easy to make with the naked eye.

The Mesopotamian Jemdet Nasr/Early Dynastic I–II (JN/ED I–II) fabric and form are well documented: one shape includes a closed mouth jar with everted rim, the profile of which is quite distinctively wedge- or beak-shaped and vaguely platformed. These ceramics are well fired, turning the fabric a greenish-buff color. The fabric is sandy in texture and friable, due both to age and over-firing. A second (“red”) ware is either polychrome (for the Jemdet Nasr period) or unpainted (Jemdet Nasr or Early Dynastic I–II). There are interesting examples of this ware and style in ancient Oman (Blackman et al. 1989). Specifically, these precise forms and wares have been found in numerous funerary contexts across northern Oman. Red-brown wares found on the Oman Peninsula are a combination of local imitations and imports. Early “black-on-red” ware ceramics are imported from Iran and found in Hafit burials.

The Umm an-Nar period is marked in part by the adoption of local ceramic production into major spheres of life. While the forms from settlement contexts tend to be slightly sturdier and are more likely to be undecorated, fine ware tends to be finer, miniature versions of domestic wares, and are more likely to be decorated. Decoration tends to be black paint over a red/orange (“black-on-red or buff (“black-on-buff”) slip. Generally speaking mortuary ceramics of the Umm an-Nar period tend to be of the “black-on-red” variety (**Figures 29 and 30**).

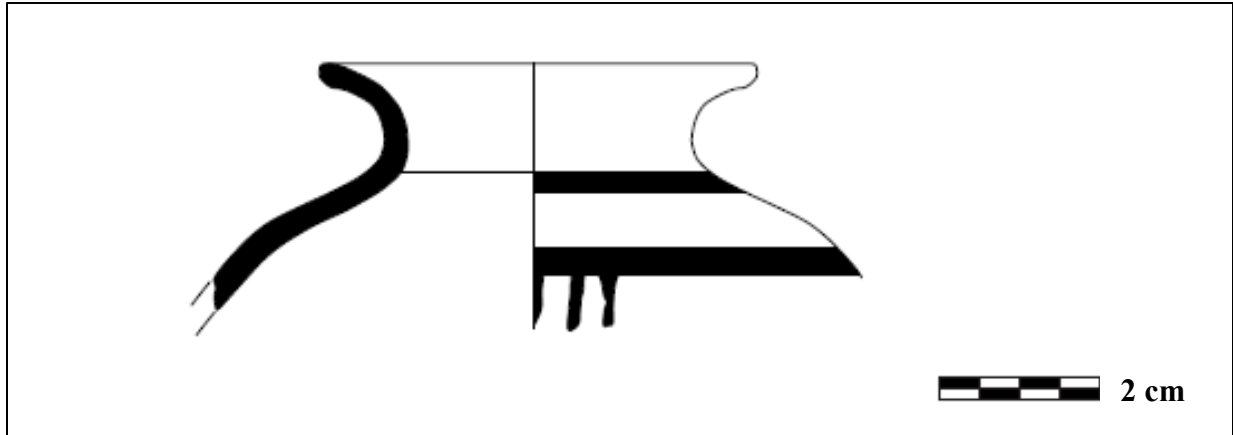


Figure 29. Black-on-Red UAN funerary jar. Feature 111273, mouth diameter = 5 cm. Medium-brown fabric without visible inclusions. Interior red-slipped to below neck. Exterior red-slipped with traces of back paint.

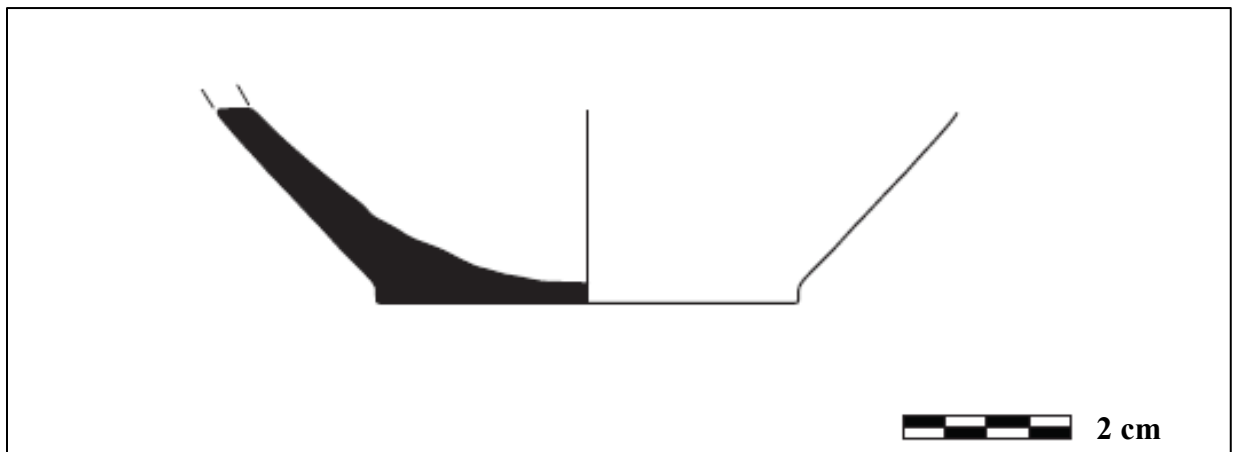


Figure 30. Umm an-Nar funerary vessel base. Feature 110987. Base diameter = 5 cm. Fabric is pink with few, very fine inclusions. Interior is thickly pink-slipped. Exterior is tan slipped.

Painted designs on Umm an-Nar vessels are generally linear; often either chevrons or trellis patterns below one or two horizontal painted bands at the neck. Nearly all paint is confined to the upper half of the vessel, and is carefully applied. The pierced hanging vessel so characteristic of the Umm an-Nar period is found in both domestic and funerary contexts; when associated with tombs they are likewise miniaturized.

Black-on-gray ware (**Figure 31**) is stylistically and formally assigned as Iranian imports (Méry 1996). The paste is fine and uniformly gray; decorations consist either of black paint

(hence “black-on-gray”) or incised designs.

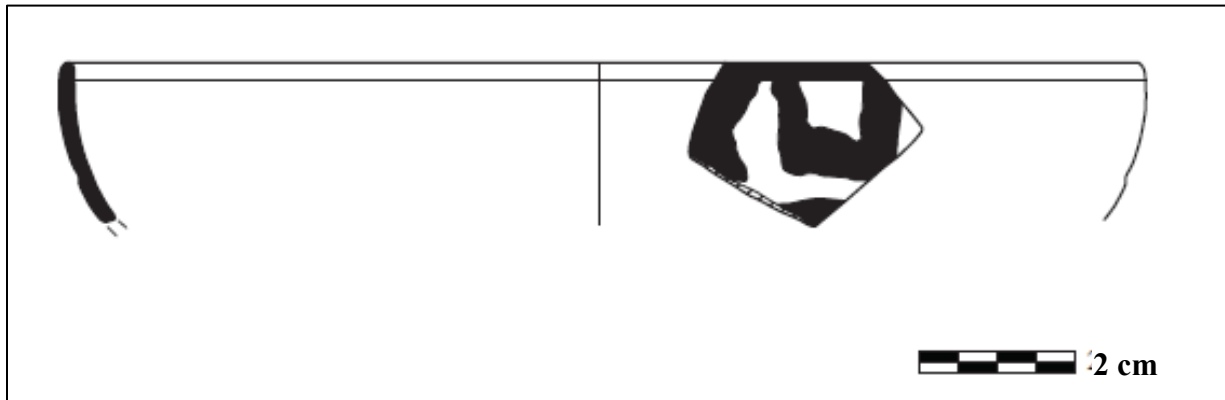


Figure 31. Black-on-gray ware. Feature 110968. Fabric is gray without visible inclusions. Interior and exterior black painted.

From the Indus there are several types of ceramic forms. These are likely to reflect domestic as well as mortuary contexts. They tend to be quite distinct in decoration. Nevertheless there appear to be numerous local copies, especially of the black-slipped-jar form, although these are thought to have been used for storage and trade and are usually associated with non-mortuary contexts. The “censor” – a cylindrical multi-pierced ceramic vessel of unknown purpose – is another form attributed to the Indus and which is found in Umm an-Nar contexts.

While ceramics may have been a foreign-borne addition to ancient Magan, such was not the case with ground stone artifacts. Much, if not all, of the raw material for these vessels were probably from the Oman Peninsula; however, sourcing is still underway (e.g., R. Lawler). By the Umm an-Nar, stone vessels in mortuary contexts were very common. Two distinct forms existed simultaneously: the open or closed bowl form, and the rectangular subdivided box (**Figure 32**). While the forms remained fairly static through time, the decorative techniques as well as the style change fairly dramatically from the Umm an-Nar to the Wadi Suq to the Iron Age. The Umm an-Nar style is quite clean, with few stray lines or irregularities in design. Designs tend to be less busy, as well: they focus on the repetition of two or three elements. By the Wadi Suq

period these elements have expanded to include what may be considered as decorative “fill”. In all periods the vessels have lids. These tend to have stylistic elements that match their associated vessels.



Figure 32. An example of a "circle-dot" groundstone box.

Human skeletal remains are sufficient to identify a feature as a tomb, but of course do not help in dating. (The reuse of third millennium tombs makes dating all the more problematic, but reiterates their function.)

Chipped stone from the third millennium BC is little studied. The lack of data on mortuary chipped stone artifacts may indicate either a focus on other mortuary materials, or may be a deliberate break from domestic and non-mortuary patterns.

Assigning a Form to a Feature

The tomb and tower formal descriptions were laid out in Chapters 2 and 3. For third millennium towers, these characteristics are sufficient in combination but not necessary: a diameter about 20 m; built of stone material, usually with large stone blocks and/or chiseled in such a way as to suggest a great deal of energy input; and a central well.

Assigning likelihoods to functional and dating categories

Where possible, all features were assigned an overall function and at least one date. Several data categories were important: specifically for dating is “Undateable”; this differs from “Unknown” in that it is likely that a collection of specialists could assign a date to a particular feature if it is “Unknown”, whereas “Undateable” truly has no characteristics that can be used as markers. “Not Applicable” and “Not Collected” are two further code categories maintained. These assignments were based on a number of specific factors and characteristics, and included qualitative and quantitative assessments. Since this research sought to determine the significance of landscape and situation to features, no locational data were used to assign dates to features. Each feature was assigned a single number describing its aggregated likelihood of belonging to the specific category: 0 was reserved for positively **not** belonging to that category; 1 is “possibly”; “2” is “probably”; and 3 is “definitely”. These overall assessments were made independently according to function (e.g., tomb likelihood 0–3), cultural tradition (e.g., Wadi Suq), and archaeological period (e.g., Hafit or Umm an-Nar). Regardless of the final number of observable characteristics, only a single characteristic was always sufficient to assign a feature to the “possibly” third millennium category. Probability categories 2 and 3 were weighted, depending upon the number and quality of observable characteristics. For example, data collection for a rubble-covered stone cairn may only involve information about stone size and type, and overall dimensions. Since

none of these characteristics are exclusive to third millennium features (i.e., certain characteristics are shared across different periods and feature types), such a feature would still receive only a rating of “1” for third millennium. However, a 50 cm section of roughly coursed stone walling visible on one side of the feature may be enough to consider it “probably” (2) dating to the third millennium. At the same time, those characteristics may also be used to assess feature function. In addition, certain characteristics – e.g., the presence of human skeletal remains – were alone enough to assess the function of a feature, but lent no weight towards assigning a date.

Because it was easier to assign a “1” – i.e., a possible date and a possible function – to a feature than to assign either a 0 (a true negative) or a 2 or 3 to any feature, of greatest concern here are features that are rated 2-3 according to dating and 2–3 according to form (i.e., tomb or tower). However, features assigned to either “1” category were added to initial and final trends in order to determine whether those trends become more or less clear, as this would aid in future feature identifications.

It was important to maintain the analytical distinctions between variables that were not applicable; in which data were not collected; in which the variable is unknown (i.e., cannot be determined from the available sources); and those whose data were negative (i.e., indicate a positive absence).

General Survey Results

Some general observations about the totality of the archaeological features are useful and necessary in order to understand the sub-groups defined below. Within the study area, 99.5 sq km (80% of the total survey area) were covered at 300 m survey intervals. Within this space 1497 features were positively identified.

In a cross-tabulation of features dating to the third millennium BC and functionally tombs (likelihoods 0–3), 204 were definitely third millennium tombs; another 63 features were definitely neither (**Table 2**). Of the 1497 features, those features that had any possibility of being third millennium or a tomb numbered 1106.

Table 2. Likelihood of Third Millennium BC Tombs by Date and Function.

Third Millennium BC feature likelihood	Tomb likelihood				Total
	0	1	2	3	
0	63	21	3	24	111
1	9	306	100	41	456
2	4	84	206	103	397
3	19	26	36	204	285
Undate-able – 66	129	101	5	6	241
Unknown – 99	3	0	1	3	7
Total	227	538	351	381	1497

Disturbance

As became clear, those places that were inhabited in the past are still more likely to be inhabited than others. The opposite is equally true: those places that were uninhabited in the past are likely to remain uninhabited, or at the very least its use is light. This has a dramatic effect on the archaeological record, as there is a great deal of overlap between modern and ancient land use.

Features Not Discussed Elsewhere

Of all of the features identified, 233 (15%) were non-mortuary (**Table 3**). These included settlement (both contemporary and later), processing points (e.g., lithic workshop sites), and later water systems. Several unusual features were found. Several cases of what may have been a circular stone platform were found south of Bat. In both cases the features were surrounded by third millennium tombs, Hafit and relatively undisturbed, suggesting that the features too date to the early third millennium BC.

Of the 1497 features, 111 of them were definitively not third millennium (and also not Hafit

or Umm an-Nar). A third millennium BC settlement immediately to the southeast of al-Khutm – on the southern slope of a ridge (currently identifiable by the satellite tower that caps it) – was located during survey.

Third Millennium BC and Tomb Features

Of the 1497 features found, 127 of them were assigned a score of 2 or 3 as third millennium BC, Umm an-Nar, and tomb features while 375 were assigned those same scores for Hafit *ceteris paribus*; as likelihoods were assigned independently to the Hafit and Umm an-Nar periods, the total number of features assigned to either period and scoring 2-3 is 469 (rather than 502) (Figure 33).

Table 3. Archaeological Features by Functional Type (Field Assessments).

Feature Types	Frequency	Percent
Antiquity	5	.3
Building(s)	19	1.3
Cemetery (cluster of graves)	14	.9
Possible field systems	1	.1
Lithic scatters, sources, and Workshops	5	.3
Mud brick village	1	.1
Tombs	1264	84.4
Platform	1	.1
Tower	12	.8
Unknown	123	8.2
Wall, falaj, or dam	52	3.4
Well	7	.5
Total	1497	100.0

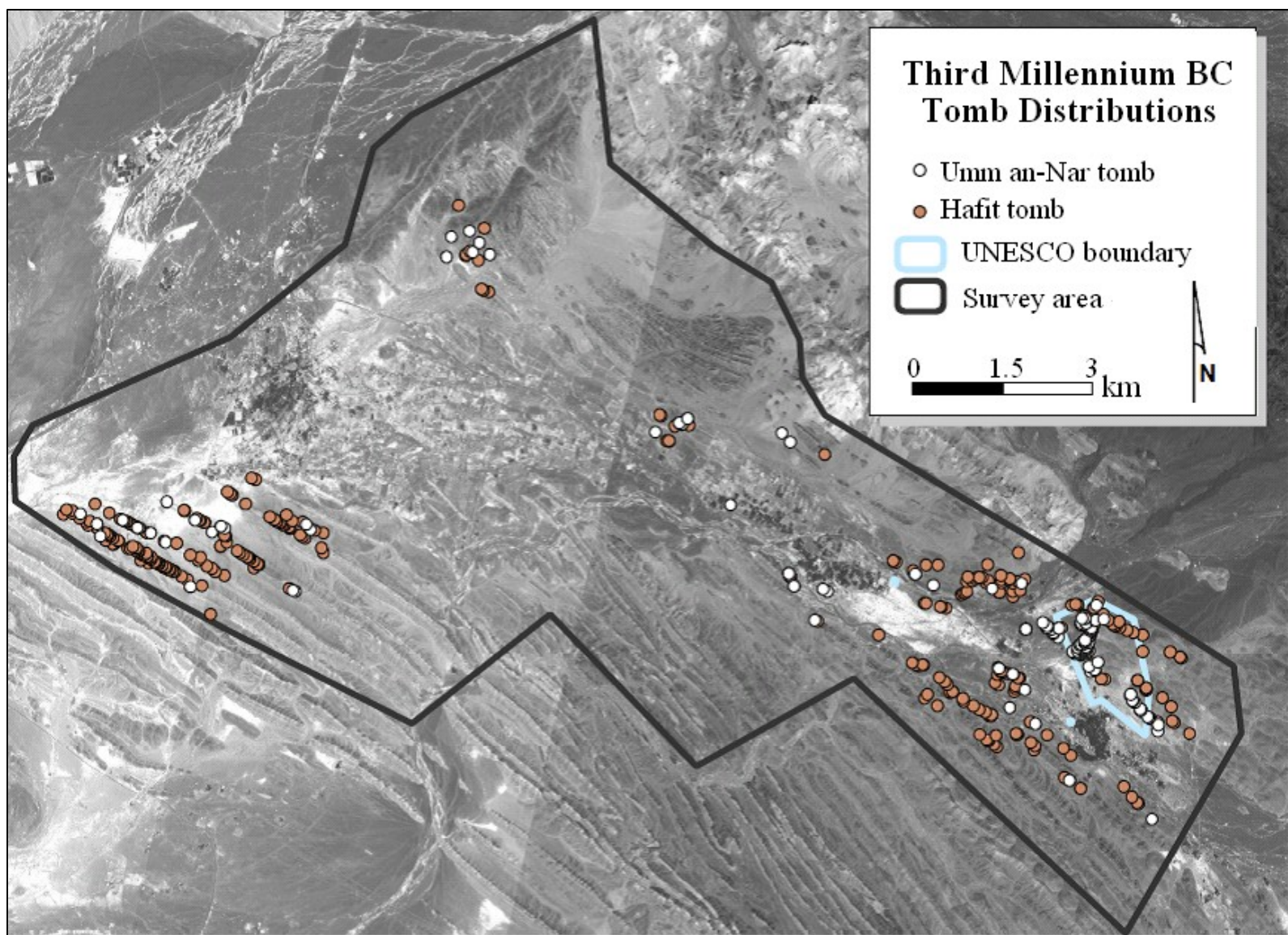


Figure 33. Location of Hafit and Umm an-Nar tombs in the study region.

Tomb statistics: dimensions

Of the data set, 363 tombs were not only Third Millennium (scored 2-3), but also Hafit (scored 2-3) and included data on the overall dimensions (**Table 4**). The average diameter of a Hafit tomb is a little less than 6 m, although the largest Hafit tomb is nearly 11.5 m in diameter. Only 122 Third millennium tombs (2-3) had dimensions, and also scored 2-3 as Umm an-Nar tombs. The two smallest features, 111353 and 111286, are more likely Wadi Suq re-use of Umm an-Nar material; this is a drawback of dating according to associated finds. These two features were removed from the data set (**Table 5**). In the Umm an-Nar case, average diameter is about one meter larger than the diameter of the Hafit tombs, but there is still a great deal of overlap; in fact, it is nearly complete.

Table 4. Hafit Tomb Dimensions, N-S and E-W.

Dimensions	N	Minimum	Maximum	Mean
Diameter N-S (m)	363	3.0	11.4	5.864
Diameter E-W (m)	363	3.0	11.4	5.946
Total	363			

Table 5. Umm an-Nar Tomb Dimensions, N-S and E-W (in meters).

Dimensions	N	Minimum	Maximum	Mean
Diameter N-S (m)	120	3.6	15.0	7.068
Diameter E-W (m)	120	3.3	14.2	7.081
Total	120			

Tomb clusters

Ad-Dariz South. In the southwest corner of the survey area a large cluster of ancient features were documented (**Figure 34**). Modern land use was fairly light in this area, except where (1) a few houses had been built (some, since pre-dissertation research in 2008, placed on now-absent tombs), and (2) a large modern garbage and sewage dump was in use. This not only obscured the previous landscape, but the burning and concentration of the remains by bulldozer had a considerable effect on the features in that space.

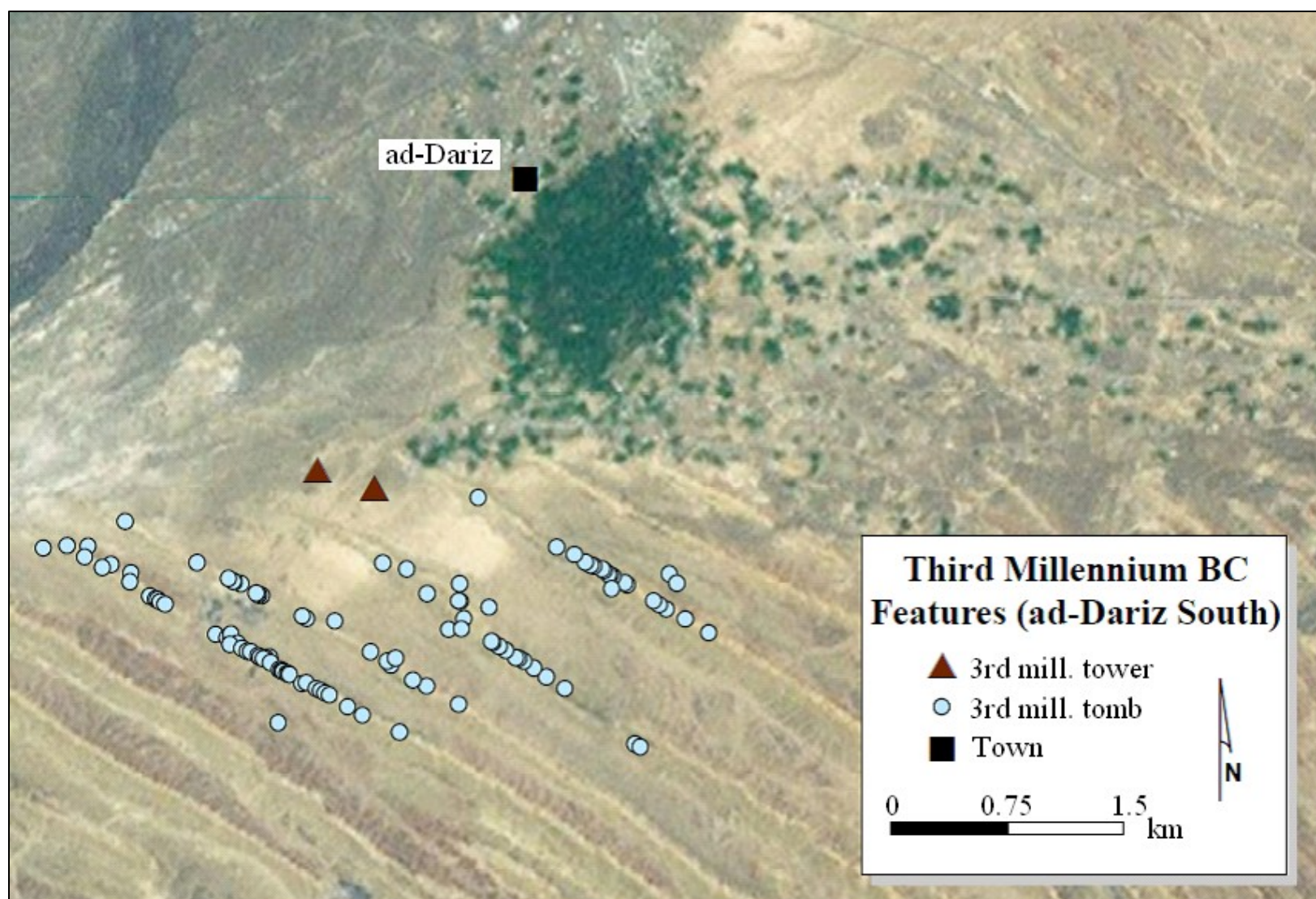


Figure 34. Third millennium BC tombs and towers at ad-Dariz South.

It is known that more third millennium tombs exist to the immediate southwest of the study region. However, this survey was intended to focus on the Wadi al-Hijr rather than the Wadi al-Kabir and therefore the survey area did not continue further in that direction even though preliminary exploration of that area suggested that another tower and tomb concentration is located several kilometers away. Therefore absolute numbers should be taken with some flexibility. However, even with that caveat there are several clear patterns.

First, the cluster is 2.6 km long, arranged NW-SE. Of the 366 total features in the ad-Dariz South cluster, only 5 were definitely not third millennium (although a further 28 were undateable). On the other end of the spectrum, 68 features were definitely third millennium, suggesting it was easier to positively identify third millennium features than to positively identify features as other than third millennium. With the features that scored “1” (“possibly”) and “2” (“probably”) third millennium, 111 and 154, respectively, a total of 333 of 366 were associated with the third millennium. Of the 366 features in this cluster, almost exactly half ($n = 186$) were rated 2-3 (“probably” and “positively”) as tombs **and** third millennium features. This is a considerably higher likelihood of being positively identified as a third millennium tomb than the overall likelihood.

There is a sharp drop in tomb density at both ends of the cluster. While this is expected on the northwest end, where the landscape is interrupted by a major wadi plain, it is quite startling on the southeast end, where no obvious topographic changes occur.

Of the 333 third millennium features, 322 and 19 were identified as at least possibly Hafit and Umm an-Nar, respectively. It was possible to distinguish very few Umm an-Nar period tombs. Those that *were* identifiable were located on the western end of the study region, much closer to the Wadi al-Kabir and to the ad-Dariz South towers. The majority of those third

millennium tombs that could be further identified were likely to be from the first half of the third millennium. An additional few features were unrecognizable. Notably absent were both modern and ancient settlements, with the exception of the remains of the small Islamic settlement already mentioned in association with ad-Dariz South 2. Well out on the southern edge of the alluvial fan of the Wadi al-Kabir, north of the cluster of third millennium features, the remains of the small, recent mud brick village of ad-Dariz was rapidly disappearing. This recent pre-modern settlement was clearly distinguishable from earlier (e.g., medieval) Islamic sites. The presence of cement-lined aflaj access points, now abandoned and empty, speak to a recent and dramatic drop in available subsurface water.

Although the two towers at ad-Dariz South are assumed to date to the Umm an-Nar period, very few contemporary features were found. There was no visible evidence of a settlement, and only 17 tombs were dated to that period in that area. There are several potential explanations for this:

1. The towers are the only visible and extant Umm an-Nar features beyond those 17 tombs;
2. The towers are later (or, alternatively, earlier);
3. Similarly, the tombs could be miss-dated or transitional (i.e., the Umm an-Nar tombs are late Hafit)
4. The towers have no necessary-and-sufficient spatial relationship to the tombs.

The first, and most likely explanation, is that the towers are the most visibly Umm an-Nar features in the area. The apparent silting of the wadis surrounding the towers makes this a likely area for buried third millennium settlement. Unlike the terraced areas surrounding Bat, ad-Dariz tends to be an area of greater extremes: there are ridges, and there are alluvial plains, and there is little in-between. It is therefore most likely that the more complex relationships we see between

landscape and third millennium feature location in the Bat area should be reflected in the ad-Dariz South area, rather than the converse.

The second and third explanations are always a possibility. However, while it is possible that one tower may have been mis-dated, it is unlikely that both towers would be. In addition, with the exception of the pre-modern and modern Islamic versions, towers are a third millennium BC phenomenon. Two notable exceptions to this trend are the Wadi Suq towers at Kalba and Tell Abraq. In the case of Tell Abraq, it appears that there may have been an earlier tower beneath the second millennium BC tower (Potts 1993a). It is probably also important to note that, along with Bidiyah, Kalba and Tell Abraq are two of only three sites with towers that are located on the coast, away from the piedmont of the Hajar Mountains (al Tikriti 1989). It therefore seems unlikely that the towers would not date to the third millennium BC, even if they were re-used in later periods. Although it is always possible that a single tomb feature has been misdated, it is unlikely that the overall number of Umm an-Nar tombs would either increase or decrease significantly.

Finally, in the past, although tombs have been found without towers, towers have not been found without contemporary tombs. Therefore it has always been enough to find a tower for the archaeologist to ask the question, “where are the Umm an-Nar tombs?” rather than “are there any Umm an-Nar tombs?”.

Ad-Dariz North. Two small clusters were identified north of the modern village of ad-Dariz. The two clusters were identified as ad-Dariz Na and ad-Dariz Nb, from west to east. ad-Dariz Na is made up of 37 features, and ad-Dariz Nb is made up of 68. Although not far apart, they are clearly clustered (**Figure 35**), with nearly a kilometer separating them.

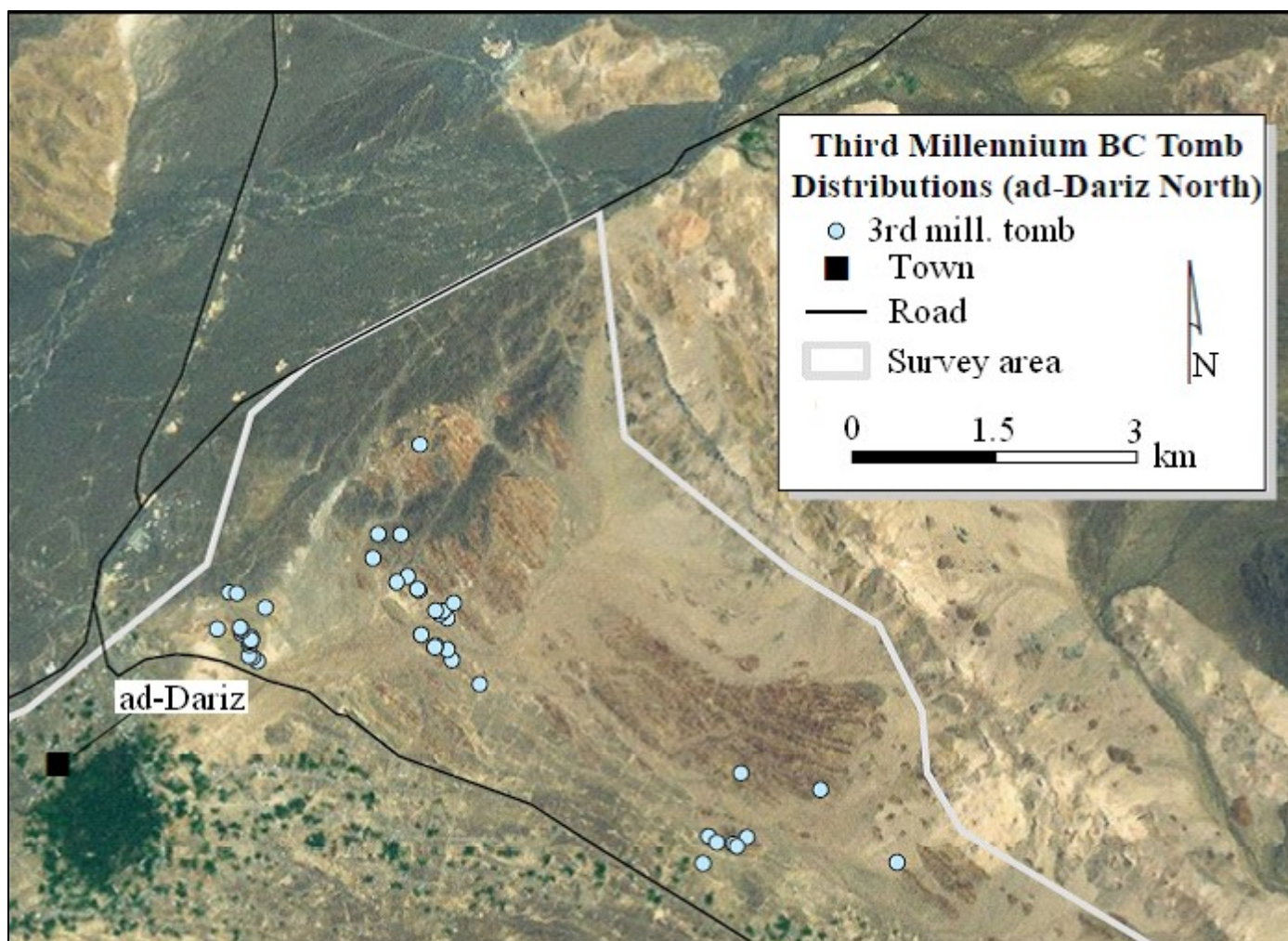


Figure 35. The ad-Dariz North third millennium BC tomb clusters (a) and (b) are small and spatially distinct.

Ad-Dariz Na is made up of 37 features, one of which is not third millennium and nine of which were not tombs. Of the remaining 27 features, only one scored 2-3 as both third millennium and a tomb.

Ad-Dariz Nb is made up of 68 features, 23 of which fall into the third millennium tomb 2-3 scored categories. Two features were not third millennium, and two others were definitively not tombs. Over half of the third millennium tombs in this cluster are located on ridges, albeit low ones. The other ten were even lower, frequently on low rises.

State of archaeological remains. Features tended to be in relatively poor condition. There were several contributing factors for this. Almost exclusively archaeological features in this area are located on the limestone vertical ridges, which are considerably lower (though not less worn) in this area than in ad-Dariz South. In addition, this area is more closely associated with modern settlement and agro-pastoralism. Taken together, this suggests that these features have experienced greater stone robbing, either for houses or seasonal pastoral camps. The features located closest to the paved road are almost completely gone, either through robbing or bulldozing and general modern landscape alterations.

It is possible that there is some relationship between the location of tombs and active floodzones: specifically, the tombs may be in slightly raised areas just above active flood zones. However a much larger survey area is necessary to study whether this is a phenomenon of the third millennium BC.

Wahrah Cluster. At first glance it is a misnomer to describe the archaeological features in and around Wahrah as a cluster (**Figures 36 and 37**); this issue, however, is immediately cleared up as dating separates out the features more clearly.

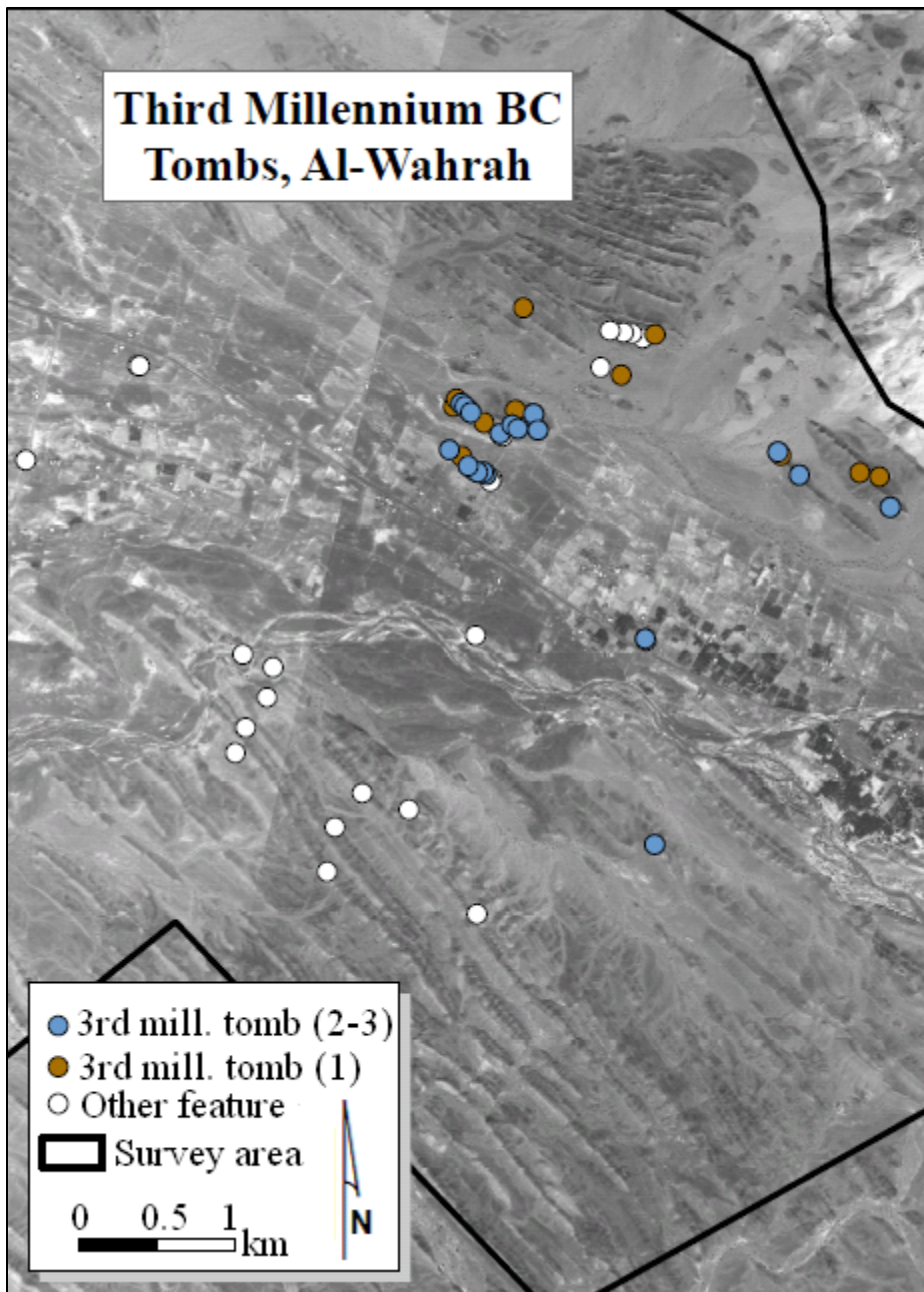


Figure 36. Archaeological features in the Wahrah area. Note the third millennium tombs on the northeastern side of the wadi.

Sixty-five features were registered in the Wahrah area in total; of these, 18 are third millennium BC tombs scoring 2-3, and 24 features were either not tombs or not dated to the third millennium BC. When the archaeological noise is removed, the Wahrah cluster becomes more distinct – though not as highly clustered as ad-Dariz South, for example.



Figure 37. Close-up of third millennium BC tomb cluster north of Wahrah. Note the evidence of modern agriculture to the south and pastureland to the north.

Bat Cluster. A total of 961 features make up the Bat clusters as a whole. Of these, 223 are definitively other than third millennium BC tombs. An overview of the third millennium BC tombs only (scored 2-3) demonstrates that, at least in the Bat area, if there is a natural component of the landscape that has a general influence on tomb location, it is the Wadi al-Hijr. To verify

this I decided to look outside of my study area to the south, specifically, following the wadi cross-cutting the ridges to the west-southwest of Bat (**Figure 38**). Although this area was not surveyed according to the methods used in my survey region and although features dating to other periods were found in some density, all were relatively recent (i.e., dating to the last 200 years).

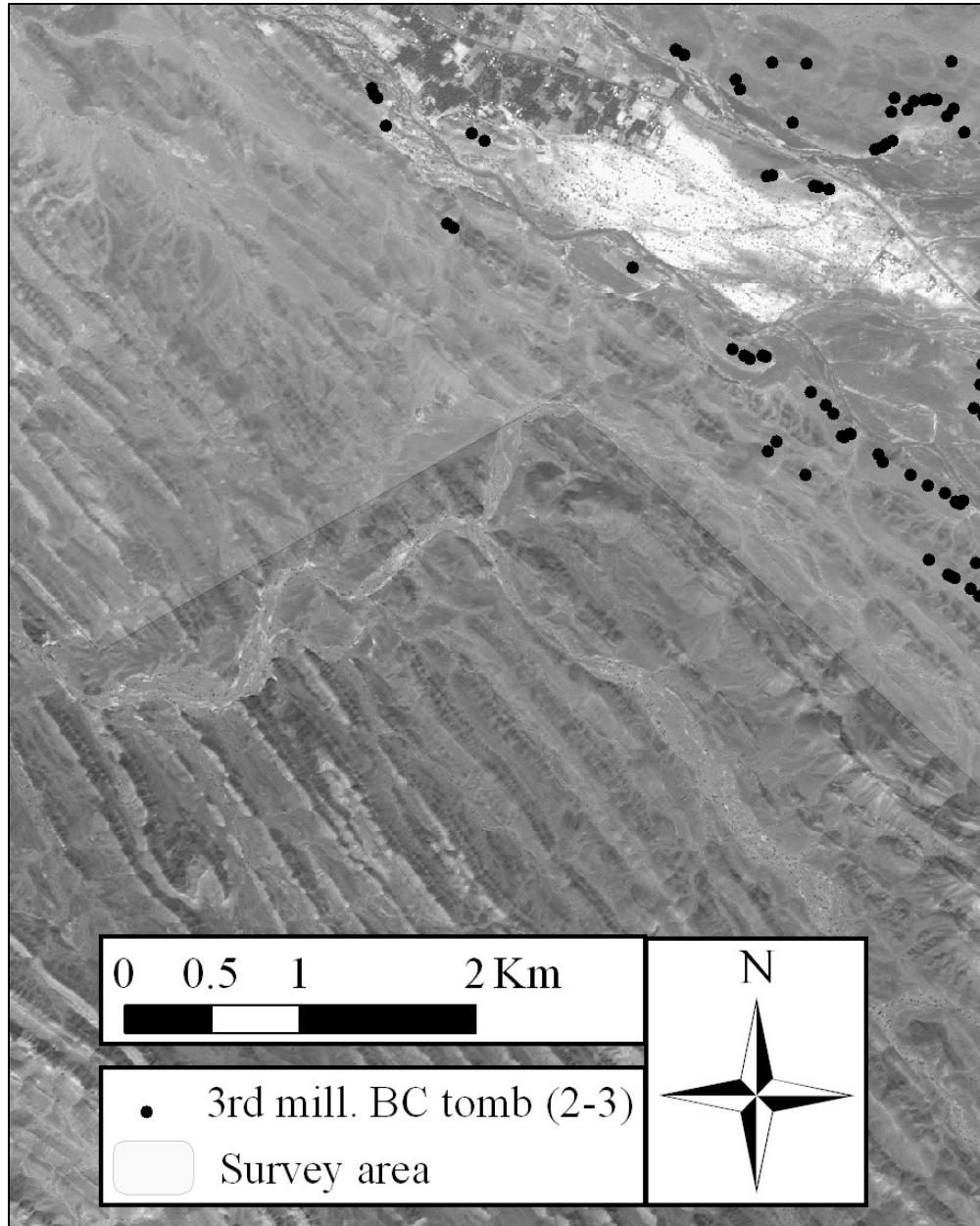


Figure 38. Further prospection on foot followed the wadis to the south and west of the study area (center).

Features other than third millennium or tombs. Bat contains evidence of occupation throughout history and prehistory. It is clear that there was a thriving community in Bat during the Wadi Suq and later periods, and there is equally clear evidence of Neolithic use of the landscape. Although those features dated to before or after are not discussed here, they are included in **Appendix A**.

Third millennium BC tombs. Both the north and south sides of the wadi have tombs on ridgelines. Of the 321 third millennium tombs in the Bat area, 210 are located on these ridges. Another 57 are located in the wadi itself – that is, in the wadi plain. The rest (n = 54) are on the plateau, on low rises, or on the ends of ridgelines facing the wadi.

State of the archaeological remains. The state of archaeological remains varies dramatically in this cluster. Within the World Heritage Site are the remains of some well-preserved tombs spanning the entire Hafit-Umm an-Nar period (as well as tombs from later periods).

Bat clusters. A number of archaeological features lie outside of the UNESCO boundaries, to the West, East, and South.

Bat NE. The area on the northern and northeastern edge of Bat village is bounded by a wadi plain to the north, west, and south. To the east limestone ridgelines continue to run northwest-southeast another full kilometer before descending to the plain of the Wadi al-Hijr, running east-west. This area includes the Bat “cemetery” and UNESCO site. Unlike nearly any other area, the Bat cemetery is a collection of tomb features dating to the middle and second half of the third millennium, and in close proximity to each other. Directly to the E-SE of the cemetery within the UNESCO boundaries are the remains of the associated settlement (**Figure 39**). A handful of tombs in this area have been excavated or partially excavated over the past 40 years.

Of the 489 features in this area, 174 can be positively dated to the third millennium. The

Hafit period tombs (n = 87) and Umm an-Nar tombs (n = 81) here tend to be in relatively intact.

Bat South. The features to the south of Bat are of a variety of periods and functions, from third, second, and first millennium BC tombs to post-third millennium pre-Historic settlement. However, those tend to be located within and immediately to the south of Bat village; features located further south are third millennium tombs. Almost exclusively, these tombs are located on ridge-tops and also date to the Hafit period.

Summary of the Tower Features of the Hijr Valley

There were 11 towers located in the survey area (**Figure 40**):

- ad-Dariz South 1
- ad-Dariz South 2
- Wahrah Qala
- al-Khutm
- Kasr al-Rojoom (1145)
- Kasr al-Khafajii (1146)
- Tower 1156
- Tower 110980
- Husn al-Wardi
- Matariya (1147)
- Kasr al-Sleme (1148)



Figure 39. Bat cemetery. Towers 1145 and 1156 (circled in red), and the “Settlement Slope” (outlined in blue). Tombs are visible as lines of dark brown dots in the center and northeastern portions.

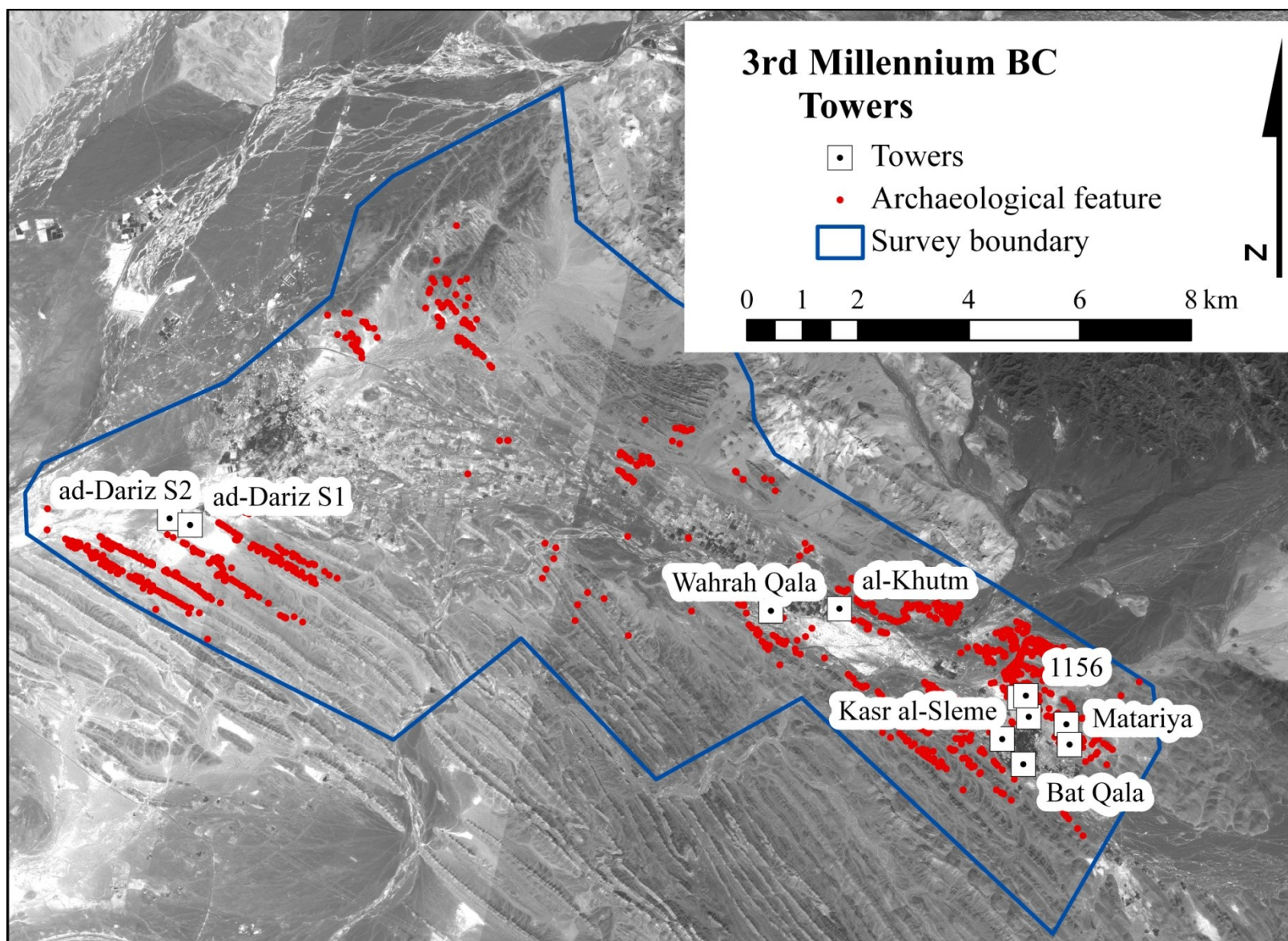


Figure 40. Third millennium BC towers in the study region.

Tower dimensions

There are 11 third millennium BC towers in the study area. Towers range in size from 16 m in diameter to 26 m, with an average of 21.5 m (**Table 6**). Average size of exterior stone walling varied dramatically, from 100-x-40 cm to half that size. Since height of the monument was difficult to assess for the majority of towers this was not figured for the group overall.

Table 6. Tower Dimensions.

Dimensions	Minimum	Maximum	Mean
Diameter (m) (N-S)	16.0	26.0	21.700
Diameter (m) (E-W)	16.0	25.0	21.409
Stone L (cm)	49.0	100.0	72.636
Stone W (cm)	25.0	88.0	51.182
Stone H (cm)	20.0	88.0	43.000
Total			

Bat towers

Many of the towers in the Bat area are known both by local name and by the feature number originally assigned to them by researchers in the 1970s and 80s. Due to considerable amounts of reuse dating of the towers by material assemblage alone was therefore quite difficult. The primary dating methods were (1) radiocarbon dating, summarized by Thornton and Mortimer 2012, and the construction style. While far less exact than the radiocarbon dating, third millennium construction is so markedly different from that which came before and after that it is sufficient at the broadest level.

Kasr al-Rojoom. One of the first third millennium BC towers excavated, and the first excavated in the Bat region, Tower 1145 (**Figure 41**) will here be identified as Kasr al-Rojoom. At the time of excavation (mid-1970s) al-Rojoom stood 2.5 m tall, above the alluvium. Reconstructions hypothesized by the excavator's evaluation of associated rock fall suggest that the tower was ca. 6 m tall before it fell. As it stood in 1974, there remained standing a "crenelated" stone ringwall. The interior structure included a stone-lined well near the center

(**Figure 42**), and internal stone walls between which mud was packed to create a solid platform ca. 2.5 m tall. Excavations of the immediate surroundings indicate neither an entrance nor a gate system, but a series of stone revetment walls – presumably created to stabilize the foundation, which was built on alluvium – were dug around the feature.



Figure 41. Kasr al-Rojoom. Courtesy of the Bat Archaeological Project.



Figure 42. Central well, Kasr al-Rojoom.

Kasr al-Khafajii. Tower 1146 (**Figure 43**) was the second tower at Bat to receive the attention of excavators. It is named Kasr al-Khafajii, and is a mere 500 m from Kasr al-Rojoom on the same alluvium. Unlike Rojoom, Khafajii is circular in plan and only the top 50 cm is visible. Excavations by Frifelt and Possehl et al. confirm that this tower is also only ca. 1 m tall. Like Rojoom, al-Khafajii has a slightly off-center stone-line well (although it is square in plan

instead of circular), a stone ringwall, and stone internal walling filled with packed mud, again forming a platform.

Kasr al-Khafaji underwent major changes during the Islamic period, when the south-eastern portion of the tower was partially disassembled to create an extended ramp (**Figure 44**). It is likely that better access to the square well was the aim of this: as was still common up into the 1970s and 1980s in Oman, water was drawn up from wells by means of a pulley system powered by cow, camel, or donkey aided in its efforts by an incline (**Figure 45**). Considerable artifacts have dated the secondary usage of al-Khafaji.

The 2008 and 2009 excavations within and beneath al-Khafaji indicate that the tower was built on Hafit architectural remains. Immediately adjacent to al-Khafaji are the stone foundations of Umm an-Nar period domestic structures: rectilinear walls faced internally and externally, with relatively large concentrations of Umm an-Nar sherds on floor levels.



Figure 43. Kasr al-Khafaji. Figure courtesy of the Bat Archaeological Project.

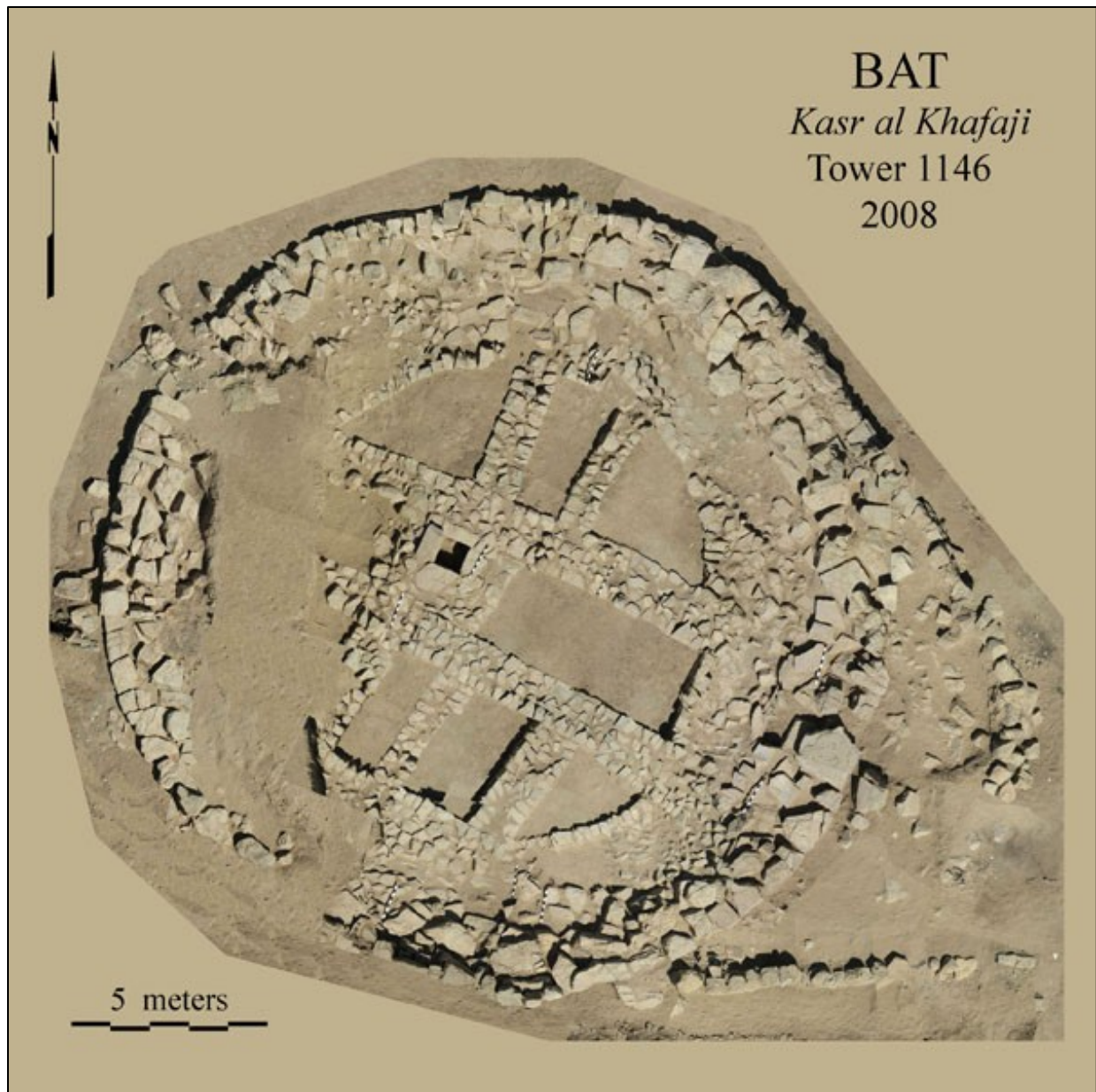


Figure 44. Kasr al-Khafaji, plan view. Courtesy of the Bat Archaeological Project.



Figure 45. Central well of Kasr al-Khafaji. Courtesy of the Bat Archaeological Project.

Matariya. Tower 1147 was not identified as a tower in local memory, and is therefore named by its location: Matariya (**Figure 46**). Brief excavations in 1980 yielded the information that this tower had no stone internal walling and was built upon mud brick. Further excavations (2008–2011) have ascertained that this very early tower also has a stone-lined well (**Figure 47**), and (like 1145 and 1146) has internal walling. The internal walling, however, is made of large mud bricks, while the spaces between were filled with cobbles, broken or wet mud bricks, and packed mud. In addition, Matariya went through several massive construction phases during the first half of the third millennium. The first phase was one completely of mud brick and, as with 1145, crenelated in plan (**Figure 48**). In the second phase, a circular stone ringwall was cut into and around the mud brick structure; and in the third phase of building, the stone ringwall was

expanded and faced with a larger stone ringwall. Matariya is one of the earliest of the Bat towers, and demonstrates the evolution of the monumental style.



Figure 46. Matariya (before excavation). Courtesy of the Bat Archaeological Project.



Figure 47. Central well of Matariya. Courtesy of the Bat Archaeological Project.



Figure 48. Matariya, plan view. Note the stone ringwalls, mud brick structure, and central stone-lined well. Courtesy of the Bat Archaeological Project.

Kasr al-Sleme. Tower 1148, or Kasr al-Sleme, is different from the three previously mentioned towers in several important ways (**Figure 49**). First, it is not located on the alluvium but rather on a small conglomerate hill in the center of the wadi; it is immediately surrounded on

three sides by alluvium, some of which is currently under cultivation, while to the immediate South there is an outcrop of the same conglomerate. It is likely that the conglomerate underlies the alluvium at least to the immediate west and east of Kasr al-Sleme.

Kasr al-Sleme is unique in several other ways. First, its average stone size is considerably larger than Matariya and equaled only by the largest stones of Kasr al-Khafajii. Second, built on a natural prominence Kasr al-Sleme is considerably elevated, standing ca.4 m above the surrounding alluvial floor (**Figure 50**). Interestingly, although unexcavated and elevated this tower appears to have a central well.



Figure 49. Kasr al-Sleme, looking east. Courtesy of the Bat Archaeological Project.

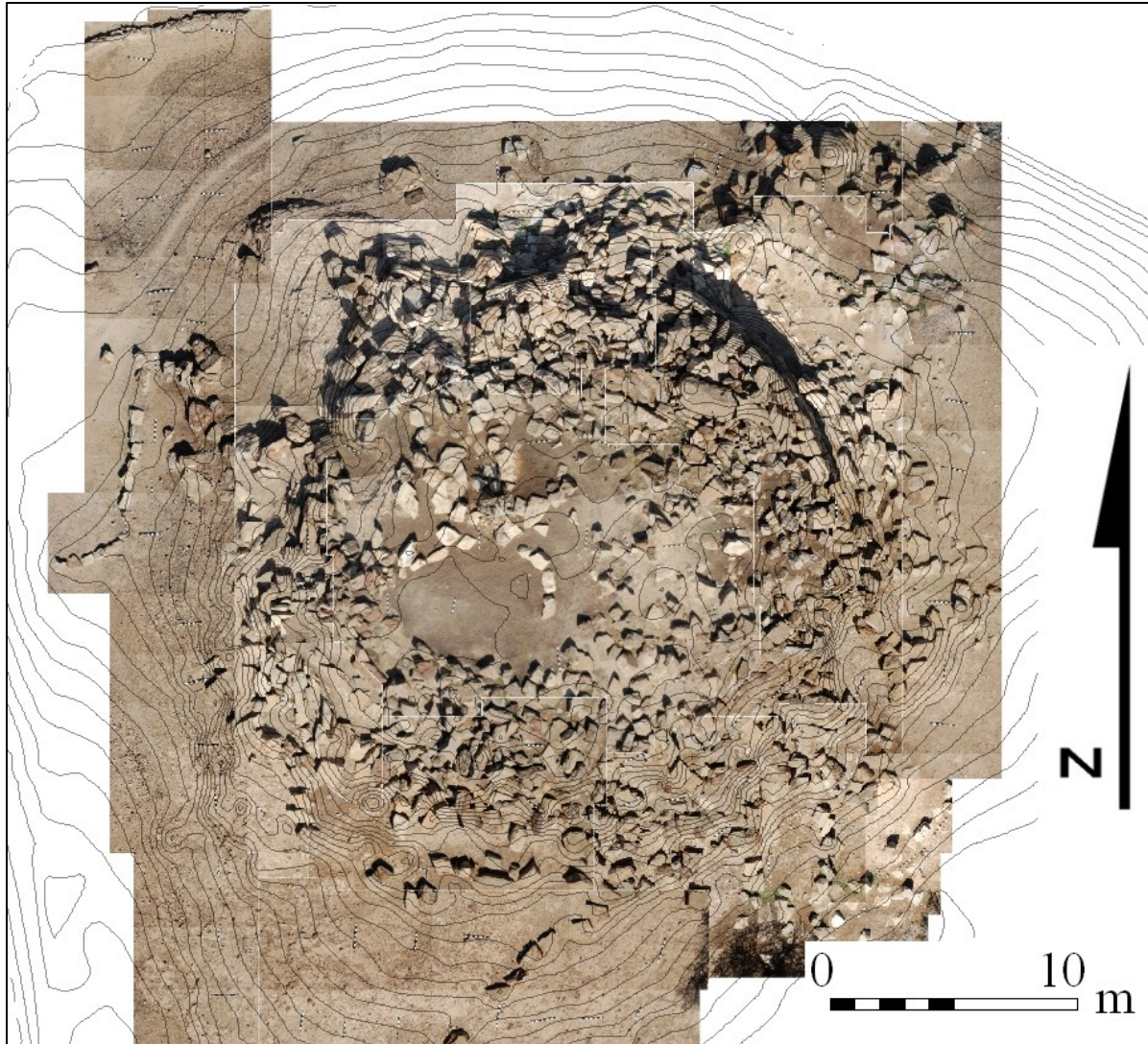


Figure 50. Kasr al-Sleme, plan view. Figure courtesy of Yasuhisa Kondo and AJBAP.

Husn al-Wardi. Bat Qala – known locally as Husn al-Wardi – lies near the center of the modern Bat oasis (**Figure 51**). Like 1148 it is built on a conglomerate outcrop (which is probably part of the same outcrop as lies beneath 1148). Although it has undergone extensive reuse – it was until very recently a village compound – elements of the original stone foundation are still clearly visible, and markedly different from the later construction techniques (**Figure 52**). Suleiman al-Jabri, research partner and Bat local, confirmed that a modern (i.e., mechanized pumping) well had been in use there until very recently. Partially abandoned now, the mud brick

superstructure and Islamic period modifications have rendered internal exploration difficult.



Figure 51. Husn al-Wardi, Bat village, looking Northeast. The base of this mud brick tower dates to the third millennium BC.



Figure 52. Husn al-Wardi. Note the transition from large, even blocks on the right to irregular, smaller stones on the left. Also note the bare conglomerate upon which it sits.

Tower 1156. A mere 200 m away from Kasr al-Rojoom, until quite recently it was not known whether 1156 was a tower, or some other circular stone structure (**Figure 53**). Charcoal from ditch fill associated with the tower is dated to the late Hafit (Thornton and Mortimer 2012). Like Matariya it has several concentric stone ringwalls, lacks stone internal scaffolding, appears to be quite an early third millennium tower, and is surrounded by what looks like a ditch. However it is unusually placed – on a slight rise at the foot of the settlement slope, between two ridges and the wadi basin – and as yet no internal well has been found. It was also apparently destroyed – or at the very least, significantly dismantled and put to domestic use – within a relatively short time after its construction.



Figure 53. Tower 1156, looking West. Note Kasr al-Rjoom in background. Photo courtesy of AJBAP.

Tower 110980. Five hundred meters north of Matariya, on top of a ridge prominence overlooking the Wadi al-Hijr, a seventh Bat tower was identified during this survey (**Figure 54**). It is of unknown age and has experienced the effects of time – the top is covered with stone rubble and second millennium graves – yet it is likely that this was once an even larger monument than Kasr al-Sleme. It has several stone ringwalls that take advantage of the ridgeline to increase its overall size (**Figure 55**). At this point little else can be determined for this monument, but it may be helpful to compare its remains to some of those found at Bisya (Cable and Thornton 2012).



Figure 54. Stone ringwall of Tower feature 110980.



Figure 55. Feature 110980, stone revetment wall downslope.

Al-Khutm. Several kilometers west of Bat is a tower known as al-Khutm (**Figure 56**). It is

circular in plan, sits on limestone bedrock, and is structurally similar to 1146 and 1147. There have been limited excavations of the interior of this tower due to the Iron Age tombs capping it, and have been left intact for research purposes at this time. Excavations by an Omani team of archaeologists in 2009 have cleared the exterior ringwalls and revetment walls (**Figure 57**).



Figure 56. Tower at al-Khutm, prior to excavation. Courtesy of the Bat Archaeological Project.

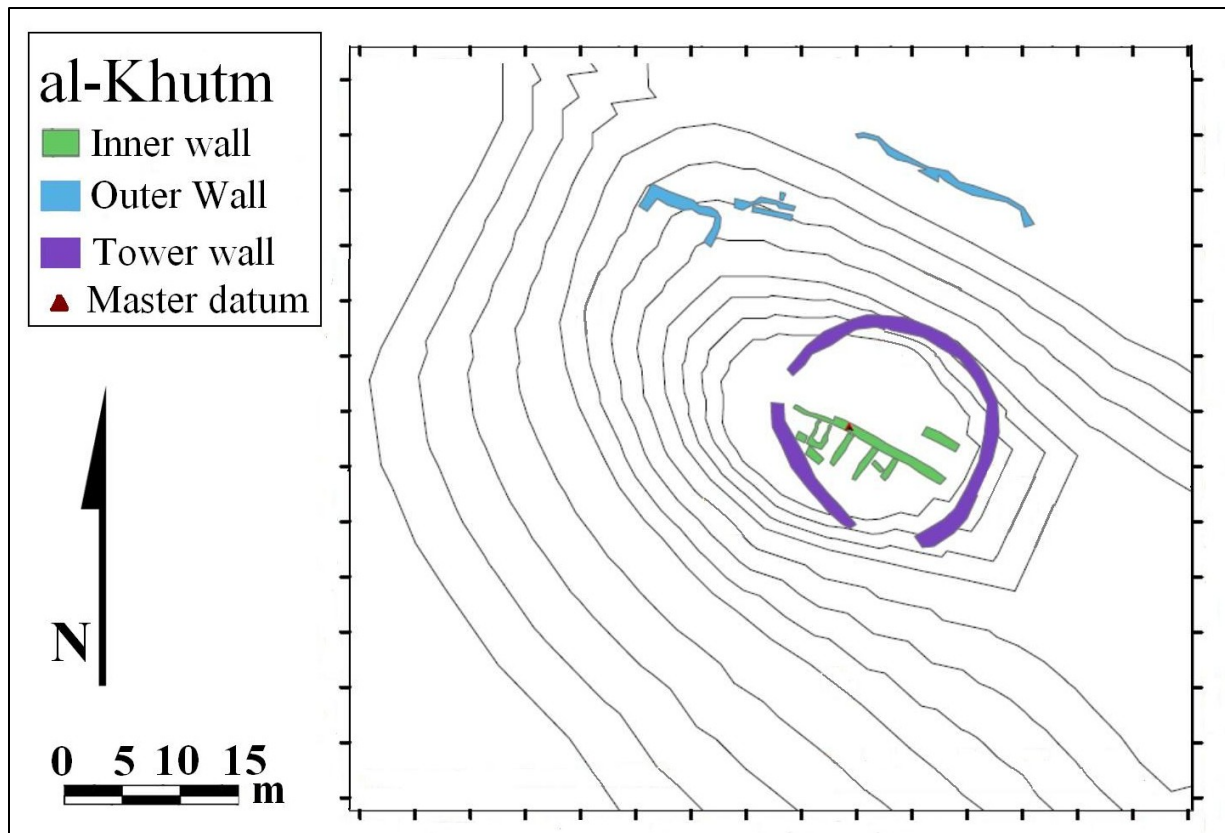


Figure 57. Al-Khutm, plan view. Courtesy of the Bat Archaeological Project. Contours at 0.5 m intervals.

Wahrah Qala. On the southern edge of the village of Wahrah, just to the west of al-Khutm, is Wahrah Qala (**Figure 58**). The structure is currently in use and it was never possible to visit the interior, so all assessments are based on exterior evaluations and extrapolations. The stone foundation has all of the characteristics of third millennium tower construction: stone size, coursing is even, and off-set stretcher stones all combine to form a well constructed stone base such as those of Kasr al-Rojoom, Kasr al-Khutm, Matariya, and all of the others. However, as with Husn al-Wardi the stone foundation has been altered in places (**Figure 59**). This has disrupted both the general shape of the tower – from circular to sub-circular – and altered the construction style.



Figure 58. Stone foundation of Wahrah Qala, with rockfall extending downslope. Courtesy of the Bat Archaeological Project



Figure 59. Wahrah Qala. Note the change in construction from the right to left. Courtesy of the Bat Archaeological Project.

Ad-Dariz South 1 and 2. One the far western end of the survey area, southwest of the main mosque in the modern village of ad-Dariz (and south of the pre-modern village remains, as discussed elsewhere), are two final towers (**Figures 60–63**). Located about 300 m apart, they are situated in the alluvium at the southern junction of the Wadi al-Hijr and the Wadi al-Kabir. No excavations have been undertaken on either, although AJBAP has extensively documented the visible remains. Ad-Dariz South 1 is circular in plan (**Figure 61**). Ad-Dariz South 2 is one of only two truly square towers known (**Figure 63**). It is located within the remains of an Islamic period settlement, including a small cemetery, and was used as a platform or foundation for later mud brick structures. However, based on the construction style it is likely that this tower, too,

dates to the third millennium.



Figure 60. Ad-Dariz South 1.

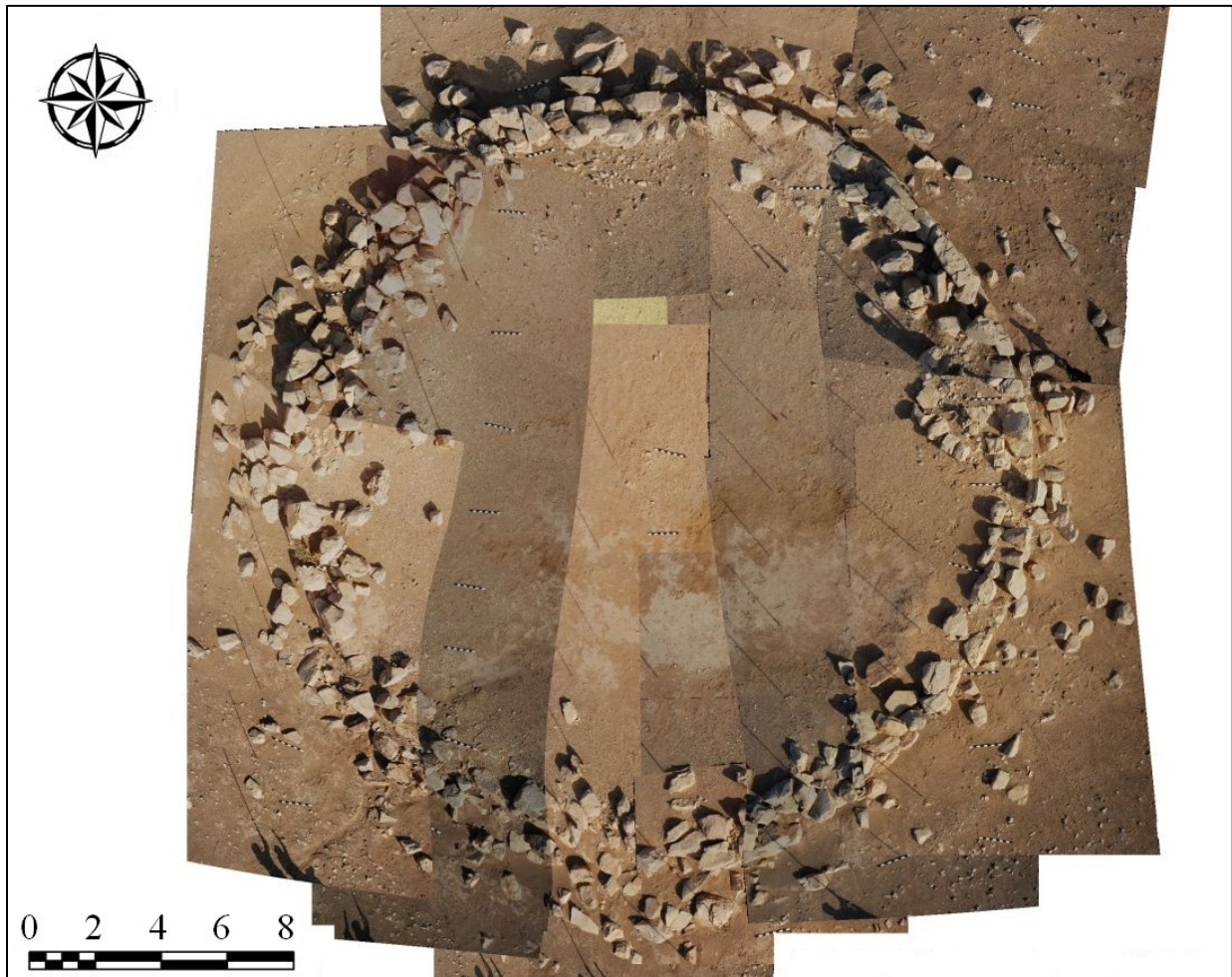


Figure 61. Ad-Dariz South 1, plan view. Figure courtesy of the Bat Archaeological Project.



Figure 62. Ad-Dariz South 2. Courtesy of the Bat Archaeological Project.

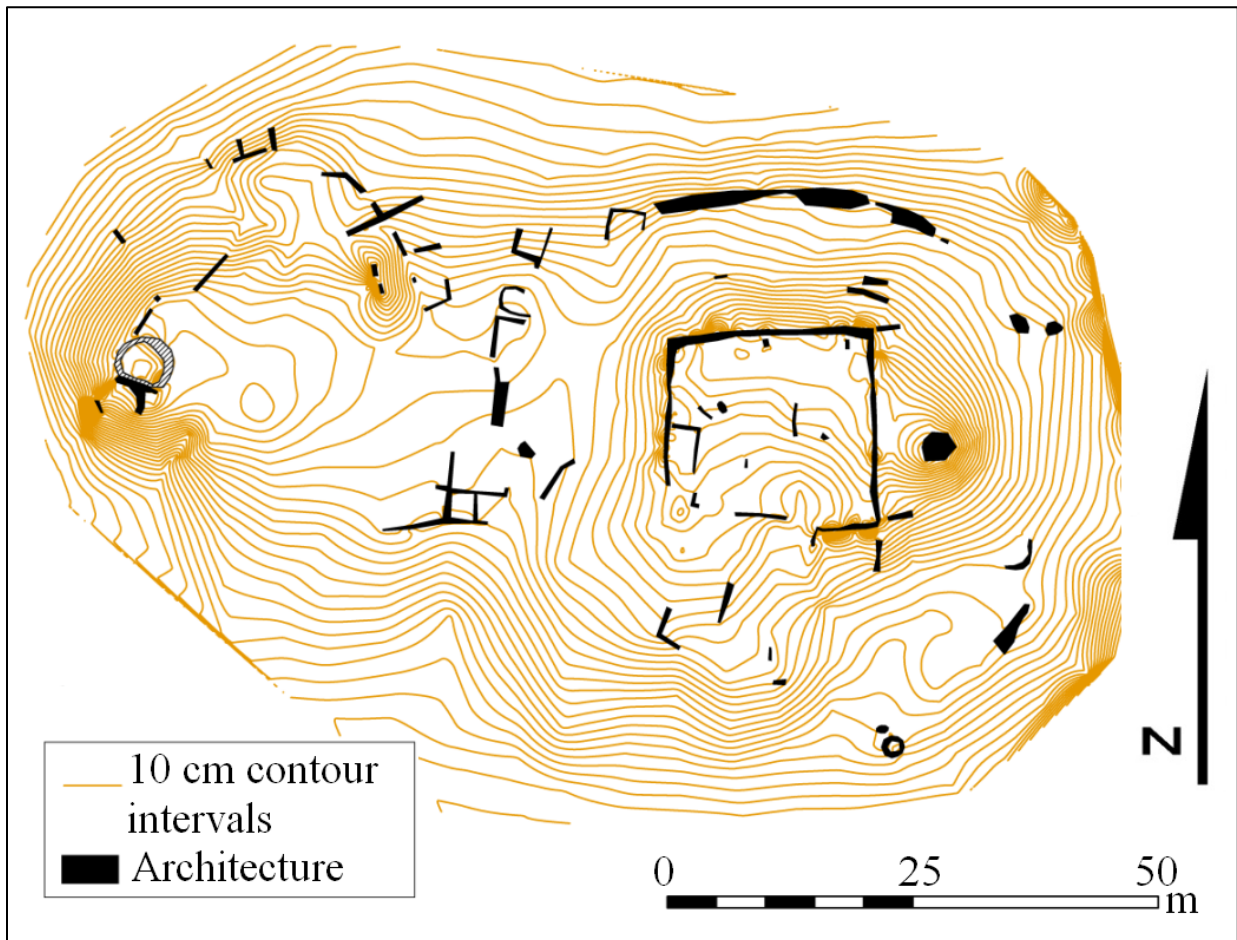


Figure 63. Ad-Dariz South 2, plan view. Courtesy of Yasuhisa Kondo and AJBAP.

Tower functions

Few artifacts are found in direct association with these features. There are several explanations for this. First, the archaeological remains of these towers tend to consist of raised platforms, so that excavating their interiors is merely excavating construction material. In a few cases the remains of artifacts and midden material were included in the building fill, but only in small amounts. This is consistent with the creation of a deliberate, energy-intensive multi-person effort and the mass manufacture that would have accompanied such a big work effort.

At Matariya we have metal refining fragments, which points again to the integration of sites and settlements. Within the original monument, an apparent imitation of one of these JN/ED I–II forms was found; within the tower proper fill, a “true” JN/ED I–II rimsherd was found.

Outside the towers – particularly within the “destruction layers” it is possible to see later use. The top of the towers tend to exhibit one or several later periods of reuse. In the case of 1146, there was a period of reuse in the Iron Age, and a major restructuring of the monument in the Islamic period to make use of the central well.

Tower dating

Four of the 11 towers in the study region have associated C14 dates (**Table 7**).

Tower 1156. Recent excavations at tower 1156 yielded several charcoal samples used for radiocarbon dating. None of the samples from the earliest phases were from hearths or distinct deposits, so dates should be used with care. However, all four date to the late Hafit (i.e., 2800–2600 BC) (Thornton and Mortimer 2012).

Matariya. A number of charcoal samples were taken from hearths at Matariya for radiocarbon dating. Calib.Rev.5.0.1 (2-sigma) gives a date range from directly below the mud brick walls as 3110–2900 (98%) BC.

Kasr al-Rojoom. Three radiocarbon samples were run from fireplaces in strata underlying Kasr al-Rojoom. Using Calib.Rev.5.0.1 the updated dates range from 1970–2700 BC, with overlap occurring 2600–2220 BC.

Kasr al-Khafaji. Dates taken from directly within Kasr al-Khafaji date the structure above to the Umm an-Nar period (Cal BC 2600–2280 (97%), Calib.Rev.5.0.1(2-sigma) (Thornton et al. 2011:259).

Table 7. Bat Tower Dates (continued on following page). Based on Possehl et al. (2010) and Thornton and Mortimer (2012).

Sample No.	Tower	Period	Conventional 14C Age	Calibrated Date (BETA)	Calib.Rev.5.0.1 (2 sigma)	Bat Lot Number / Location
K-5470	1147	Late Hafit	4200 +/- 60 BP	Cal BC 2885–2679	2910–2613 (100%)	Trench 2
Beta 244213	1147	Late Hafit	4260 +/- 40 BP	2910–2860, 2800–2750	2944–2851 (83%), 2811–2660 (17%)	2008 Tr 470569
Beta 260667	1147	Late Hafit	4190 +/- 40 BP	2890–2830, 2820–2630	2890–2830 (26%), 2820–2660 (72%)–	090826
Beta 260666	1147	Medieval	360 +/- 40 BP	Cal AD 1450–1650	AD 1450–1640 (100%)–	090611
Beta 260665	1147	Late Hafit	4140 +/- 40 BP	2880–2580	2880–2620 (97%)	090419
Beta 277516	1147	Hafit	4390 +/- 40 BP	3090–2900	3110–2900 (98%)	103603
Beta 277517	1147	Hafit	4300 +/- 40 BP	3000–2880	3020–2870 (100%)	103604
Beta 260664	1146.B	Umm an-Nar	3850 +/- 40 BP	Cal BC 2460–220	2460–2280 (97%)	090310
Beta 260663	1146.B	Umm an-Nar	3900 +/- 40 BP	Cal BC 2480–2240	2480–2280 (97%)	090308

Table 7 (cont'd)

Sample No.	Tower	Period	Conventional 14C Age	Calibrated Date (BETA)	Calib.Rev.5.0.1 (2 sigma)	Bat Lot Number / Location
Beta 260660	1146.A	Umm an-Nar	3820 +/- 40 BP	Cal BC 2450–2140	2460–2370 (13%), 2370–2140 (87%)	090110
Beta 260661	1146.A	Late Hafit	4330 +/- 40 BP	Cal BC 3020–2890	3030–2890 (97%)	090136
Beta 260662	1146.A	Late Hafit	4070 +/- 40 BP	Cal BC 2850–2810, 2750–2720	2860–2810 (14%), 2700–2480 (81%)	090137
K-2795	1145	Wadi Suq	3510 +/- 55 BP–	1920 BC	1975–1690 (100%)	1145.CL
K-2796	1145	Wadi Suq	3260 +/- 55 BP –	1610 BC	1660–1430 (100%)	1145.CM
K-2797	1145	Umm an-Nar	3980 +/- 80 BP –	2570 BC	2700–2220 (96%)	1145.CO
K-3207	1145	Umm an-Nar	3860 +/- 115 BP –	2400 BC	2625–1970 (100%)	1145.IY
K-3208	1145	Umm an-Nar	3900 +/- 85 BP	2455 BC	2600–2130 (100%)	1145.IX
Beta 316675	1156	Late Hafit	4080 +/- 30 BP	Cal BC 2890–2500	2850–2810 (10%), 2750–2550 (84%), 2540–2500 (6%)	1255158
Beta 316679	1156	Late Hafit	4190 +/- 30 BP	Cal BC 2890–2670	2890–2840 (27%), 2830–2670 (73%)	1255244
Beta 316680	1156	Late Hafit	4210 +/- 40 BP	Cal BC 2900–2670	2900–2670 (100%)	1255253
Beta 316677	1156	Late Hafit	4130 +/- 30 BP	Cal BC 2880–2620	2870–2780 (32%), 2780–2600 (68%)	1255197

Summary

This chapter outlines the results of the field survey and data collection. The function and age of

individual features were assessed independently and according to (1) architectural characteristics and (2) associated artifacts, in the field and post-fieldwork. A summary of third millennium BC and mortuary architectural characteristics is included here. Similarly, this chapter details the highlights of those artifacts used in assigning dates and functions to the associated features.

Archaeological features were assigned independent likelihoods for (a) function and (b) periods of use, from 0 (unlikely) to 3 (highly likely). Of 1497 features, 1106 (74%) were at least somewhat likely (i.e., rated 1) third millennium tombs, with 549 (37%) and 204 (14%) features rated third millennium BC tombs with likelihoods of 2 and 3, respectively. It was qualitatively clear during data collection that tombs tended to cluster, and were located on low ridges and hills. Significantly, the distribution of third millennium BC features closely resembled the distribution of modern settlement. This suggests that similar social and/or environmental factors were at work in the third millennium as compared to the twentieth century AD. Towers were far fewer – 11 were found – and are likely to date to the third millennium BC. Wells were found in the center of four of the 11 towers. All four towers with identifiable central wells are located in the oasis of Bat; several had been in use in later periods, one within living memory.

CHAPTER SIX: LANDSCAPE METHODOLOGY, CLUSTER ANALYSIS, AND SPATIAL AND ENVIRONMENTAL CHARACTERISTICS

Introduction

This chapter covers the spatial and non-spatial analyses run on all of the collected survey data.

My research questions were:

1. What are the spatial distributions of third millennium BC monuments in the Wadi al-Hijr?
Do they differ?
2. What are the relationships between tombs, resources, and social inclusion or exclusion?
How do these relationships change over time?
3. How can we account for formal and spatial variation in third millennium BC towers?
4. What is the relationship between towers, resources, and social inclusion or exclusion, as it develops through the third millennium BC? How does this change over time?

Specifically, the following questions were asked about spatial relationships between monuments:

- Do formal, bounded areas for the exclusive disposal of the dead exist during the Hafit period, the Umm an-Nar period, or both?
 - o If so, what nearby resources might be marked by these clusters?
- How do distributions of Umm an-Nar tombs compare to those of the Hafit period?
- Is there a difference between tomb and tower distributions?

The first step was to determine the basic relationships of tombs to tombs, tombs to towers, and towers to towers. This was formal and spatial, and visual as well as statistical. Unlike traditional statistical methods, spatial statistics incorporate spatial relationships (e.g., proximity) into their mathematics (Bailey and Gatrell 1995). The number of towers ($n = 11$) is too small for statistically valid analyses, so simple visual assessments were used to relate towers to each other

and to other archaeological features. The spatial relationships between tombs were analyzed using spatial statistics (cluster analysis), and using non-spatial statistics on spatial point data collected in the field. An example of the latter kind of data is the visibility of other archaeological features in all cardinal directions from each feature, data which were collected in the field.

The GIS Environment

All GIS data storage display, and analysis employed the Universal Transverse Mercator (UTM) Zone 40 coordinate reference system on the World Geodetic System 1984 (WGS84) datum.

Although there is a recognized Oman Datum, it is rarely used in archaeological research and for certain statistical analyses UTM, which uses meters as the horizontal unit of measurement, was important. A geographic information system (GIS) was created (1) to coordinate data collected in the field with data collected elsewhere (e.g., archives); (2) to manage large amounts of spatial data; (3) to assess the relationships between numerous environmental and cultural factors; and (4) for the discovery and interpretation of spatial distributional patterns of archaeological remains.

Satellite imagery for this was made available by Dr. Ryosuke Nakamura (AIST, Japan) via Yasuhisa Kondo (JSPS Research Fellow, Tokyo Institute of Technology). The Japan Aerospace Exploration Agency (JAXA) launched “DAICHI” Advanced Land Observing Satellite (ALOS) in 2006 and completed its observations in May 2011 (JAXA 2012). The satellite has three sensors. The Panchromatic Remote-sensing Instrument for Stereo Mapping (PRISM) is a panchromatic radiometer with 2.5 m spatial resolution at nadir. Its extracted data was designed to provide a highly accurate digital surface model (DSM) and was therefore appropriate for this research. For information about transformations and other pre-processing the reader is referred to

the *ALOS Data Users Handbook: Revision C* (March 2008).

Three tiles of raster datasets, each covering sections of the study area, were processed using ERDAS IMAGINE by the MSU Remote Sensing and Geographic Information Science (RS&GIS) Research and Outreach Services in 2011. A Digital Elevation Model (DEM) with 2.5 m resolution was created from the imagery. A DEM is a grid of cells with cell values equal to the land surface elevation and is therefore useful for research which takes into account an uneven surface. Relief in the Wadi al-Hijr is quite abrupt, and therefore a fine measure of the landscape elevations (and changes between them) are important. It was used to create a slope raster (in degrees) in ArcGIS 10.0.

Cluster Analysis

The first step in cluster analysis is always a visual assessment of the displayed feature data. As patterns can be masked by “noise” – from the archaeological record, the natural environment, modern land use, etc. – it is equally important, where possible, to check these visual assessments using spatial statistical methods.

Ripley's K Function

Ripley's K Function Statistic is a second-order analysis used to determine whether incident data are spatially clustered, random, or dispersed over a range of scales (Longley et al. 2005). It is particularly appropriate as a measure of the relation among objects (at a range of distances) rather than as independent objects (Getis 1984) and is therefore especially useful for spatial analysis of archaeological settlements (Bevan and Conolly 2006). Mathematically, $K(d)$ is defined as the expected number of points within a distance d of an arbitrary chosen point, divided by the density of points per unit area (Longley et al. 2005:347). The ArcGIS 10.0 tool, Multi-Distance Spatial Cluster Analysis, implements a common transformation $L(d)$ of Ripley's

K Function. In it, the expected result with a random set of points is equal to the input distance.

The Multi-Distance Spatial Cluster Analysis Tool was run using the Ripley's edge correction formula; with 10, 50, and 100 distance bands; and with and without the tomb likelihood (2 or 3) as weights. The tool computes the average number of neighboring features associated with each tomb; neighboring tombs are those closer than the distance being evaluated. Generally speaking, as the evaluation distance increases, each feature will have more neighbors. If the average number of neighbors for a particular evaluation distance is higher (larger) than the average concentration of features throughout the study area, the distribution is considered clustered at that distance. The results of third millennium BC tomb distributions are displayed and discussed in Chapter 7. The difference between the expected and the observed k values were mapped, and the “peaks” – the distances at which the spatial correlation is the strongest – were assessed as likely distance bands. Based on these scores and the size of the survey area (16-x-8 km) 2.3 km distance bands were chosen for kernel neighborhood and point pattern radius.

Density Analysis

Density analysis – specifically, Point Pattern and Kernel density – are used to identify whether occurrences are inter-related (Longley et al. 2005). In the case of third millennium BC towers and tombs in the Wadi al-Hijr, point pattern analysis is a useful way to determine whether tombs are spatially clustered, random, or dispersed. The Kernel Density tool in ArcToolbox calculate the density of point features around each output cell on a raster by calculating a magnitude per unit area from point features and using a kernel function to fit a smoothly tapered surface to each point (Conolly and Lake 2006). The result is a map showing the densities of points over space (ESRI 2012; Longley et al. 2005).

Feature Location Classification

Since the landscape is hypothesized as a crucial variable in determining tomb and tower locations, a great deal of locational data was collected for each feature in the field. Primary locations, which referred to the landform on which the feature was situated, originally consisted of over 30 options. These were then collapsed into 4 weighted categories, according to distance from the wadi floor. The secondary location expressed where on the primary landform the feature was located, and these too were later collapsed into four weighted categories. Finally, notes were taken regarding the location of each feature and retained throughout analysis, so that future data aggregation could be checked easily against the original description. The result, for each feature, was a set of ordinal expressions for relative distance from the wadi floor, and for global (i.e., Primary) and local (i.e., Secondary) locations (**Tables 8 and 9**). These data were used for Exploratory Data Analysis and visually displayed in ArcMap 10.0.

Table 8. Primary Location Reclassification.

Field classification	Numerical Assignment
Foothill	3
Low rise	2
Plain	1
Plateau	2
Prominence / Hilltop	4
Ridgeline	4

Table 9. Secondary Location Reclassification.

Field classification	Numerical Assignment
Base	1
End-slope	3
Foothill	3
Low rise	2
Mid-slope	3
Plain	1
Plateau	2
Prominence / Hilltop	4
Ridgeline	4
Saddle	3

Resource Access

A second research goal was to understand the relationship between monuments and resources. To this end, landform and land use classes were identified using a combination of relatively coarse, modern land use maps; field data on modern land use and geology; and ethnographic literature (Wilkinson 1977). As has already been attested ethnographically, land use and land ownership are frequently not congruent. However, combinations of modern land use and ownership may be useful ways to understand the complexities of an environment as varied as the western al-Hajar piedmont. While admittedly crude, it is important to attempt some description of feature placement on the landscape in relation to potential land use.

Land Classification

In desert environments, land use and land cover classifications are quite similar. A 300 m land cover map, derived from the 2009 time series of global MERIS (MEdium Resolution Imaging Spectrometer) FR mosaics as part of the ESA GlobCover 2009 Project, was initially used to determine land use classes. Of the 22 land cover uses defined with the United Nations (UN) Land Cover Classification System (LCCS), only four are found in this area (Herold et al. 2009) (**Figure 64**). As LCCS is a classification system (as opposed to a land cover legend) (Di

Gregorio 2005), two of the four classes are found in the same spaces: (20) mosaic croplands/vegetation (n = 2.5% of the survey area); and (30) mosaic vegetation/croplands (n = 0.2% of the survey area). The other two classes – (150) sparse vegetation (n = 4.3% of the survey area) and (200) bare areas (n = 93% of the survey area) – make up over 97% of the survey area. However, this is as much an issue of scale as anything else, and to be expected: 300-x-300 m pixels provide considerably coarser resolution than would reflect the sort of resource patchiness found in this area. Therefore current land cover, hydrological, and topographical data were collected for the landscape adjacent (i.e., within several hundred meters) to each archaeological feature and assessed using Wilkinson (1977).

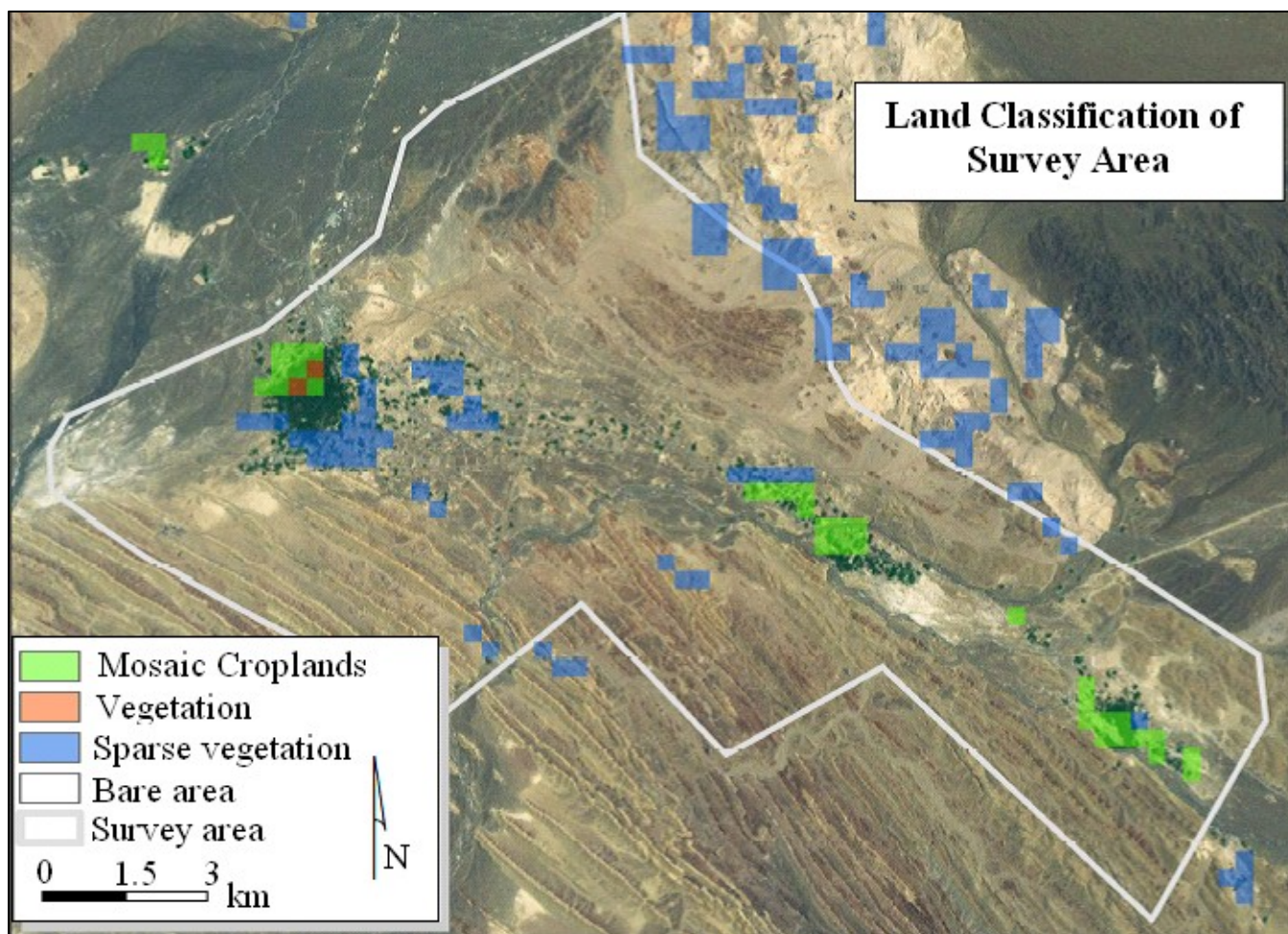


Figure 64. Land classification in the study area.

Wilkinson (1977) describes land use classes in addition to land ownership classes. What is interesting about these two different classifications is that there is very little overlap between them: ownership and land use are not exclusive, but neither is there any sense that they refer to the same thing.

While one can assume that ownership allows for access to certain parts of the landscape it is not, in fact, necessary or sufficient as a way to describe land use access, or even land use.

Wilkinson (1977) observed the following division in modern **land use**, extending in concentric rings out from the village center (**Table 10**), while Islamic law concerns itself with six **land ownership** classes (**Table 11**):

Table 10. Land Use Classes.

Land Use Class
Village center
permanent cultivation*
seasonal crops
village grazing
mixed herding
camel herding

*from less financially reliable sources (e.g., alfalfa)

Table 11. Land Ownership Classes.

Land Ownership Class	Brief Explanation
<i>aradi</i>	economically valuable
<i>atlal</i>	literally “hills”: the barren parts of the landscape
<i>ashjar</i>	large plants and cultivated fruit trees
<i>miyah</i>	all wells
<i>aflaj</i>	irrigation systems
<i>sawaqi</i>	distributary irrigation channels

There are two other divisions of land ownership: *haram* (village grazing rights) and *mar'a* (general grazing area, further away from village, and un-owned). As is clear from a glance at these lists, the two sets (land use and land ownership) are not congruent. The land ownership classes are based in Islamic law, but that law is itself a reflection of social practice. The land use

classes are more informal, and are primarily from the perspective of the villagers.

Land **use** classes were based on Wilkinson (1977). As this survey area does not include desert – that is found several kilometers further to the west, and is suitable only for camel herding – the land use classes do not include specific camel herding. This is unlikely to be problematic, for even though camel herding is found in the survey area today, (1) it is unknown exactly when the camel was domesticated, and (2) the herding landscape is best suited for any number of different types of herd animals.

Of the land **ownership** classes the *aflaj* and *sawaqi* may be disregarded, as those are linked to more recent irrigation technology (Wilkinson 1977). The relevant distinctions in the research area are between *aradi*, *atlal*, and *miyah*, although *ashjar* are clearly important and linked to both *aradi* and *miyah*. Perhaps of greatest significance are the more general types of land ownership: *haram* and *mar'a*. These categories are easily distinguishable today, as the study region is under combinations of active pastureland, which is rain-fed, and multiple agricultural land uses, from date palms to alfalfa.

Slope (measured in degrees) was calculated using the DEM, in degrees, and divided into 4 classes. These were classified geometrically, modified to account for qualitative difficulty of travel, and verified visually. The four categories were: 0-10 degree slopes; 10-20 degree slopes; 20-30 degree slopes; and 30-90 degree slopes. A 30-degree slope is quite steep, both in terms of ascension and in terms of foundation construction; for every four meters along a flat surface it is necessary to travel five, and considerable geotechnical effort is necessary to level a tomb's foundation.

Visibility

As described in Chapter 4, visibility information was collected from every feature for all four cardinal directions, specifying what archaeological, natural, and modern features were visible. These functionally non-spatial data were explored in conjunction with spatial queries and in SPSS.

Maps for were created using ArcMap 10.0 and are found in **Appendix C**. A digital repository was created for all survey results (see **Appendix D**). All field and laboratory documentation that was not born digital was scanned; all data were ingested into the digital repository.

Summary

Data on the survey region's archaeological features dating to the third millennium BC were managed, queried, and displayed using a GIS. Visual clusters were verified using cluster analysis. Environmental and land use characteristics regarding the landscape within and immediately adjacent to the clusters were combined to identify resources available in the third millennium. It was then possible to compare clusters according to their attributes and situation on the landscape. Feature clusters were assessed in combination and according to period (i.e., Hafit vs. Umm an-Nar) and monument type (Tower vs. Tomb).

CHAPTER SEVEN: RESULTS AND DISCUSSION OF SPATIAL AND STATISTICAL ANALYSES

Third Millennium BC Tomb Distributions

According to Saxe (1970) and Goldstein (1981) there is a relationship between critical resources and burial of the dead where the spaces themselves are exclusively mortuary. Therefore we can assume this relationship was true in the third millennium BC Wadi al-Hijr if tombs (1) cluster and (2) exclude non-mortuary features.

Ripley's K Function

Using the ArcGIS 10.0 Multi-Distance Spatial Cluster Analysis Tool, which uses a common transform of Ripley's K Function, I was able to explore the nature of the tomb distributions on the landscape. I used the Ripley's edge correction formula; with 10, 50, and 100 distance bands; and with and without the tomb likelihood (2 or 3) as weights. As a comparison I also ran the Multi-Distance Spatial Cluster Analysis Tool using all third millennium BC tombs (likelihoods 1–3). The results are found in **Appendix C**. In the case of all third millennium BC tombs – whether Hafit, Umm an-Nar, combined, or totaled (i.e., including those third millennium BC tombs not assigned to either the Hafit or Umm an-Nar periods) – there was a significant amount of clustering at all measurable distances, but was particularly strong from 2.3 km to 2.8 km, where differences between expected and observed densities range from 1940 to 2604.

Third Millennium Features

There is a clear tendency for third millennium BC archaeological features to cluster spatially (**Figure 65**). However, it is important to remember that of the 682 features dated to the third millennium BC, only 25 (3.7%) are non-mortuary (**Figure 66**), and this overall clustering is itself a function of tomb clustering.

In the Hafit period there is a very strong association between tombs, such that the presence of one tomb in an area is an excellent predictor for the presence of many more contemporary tombs

(Figure 67).

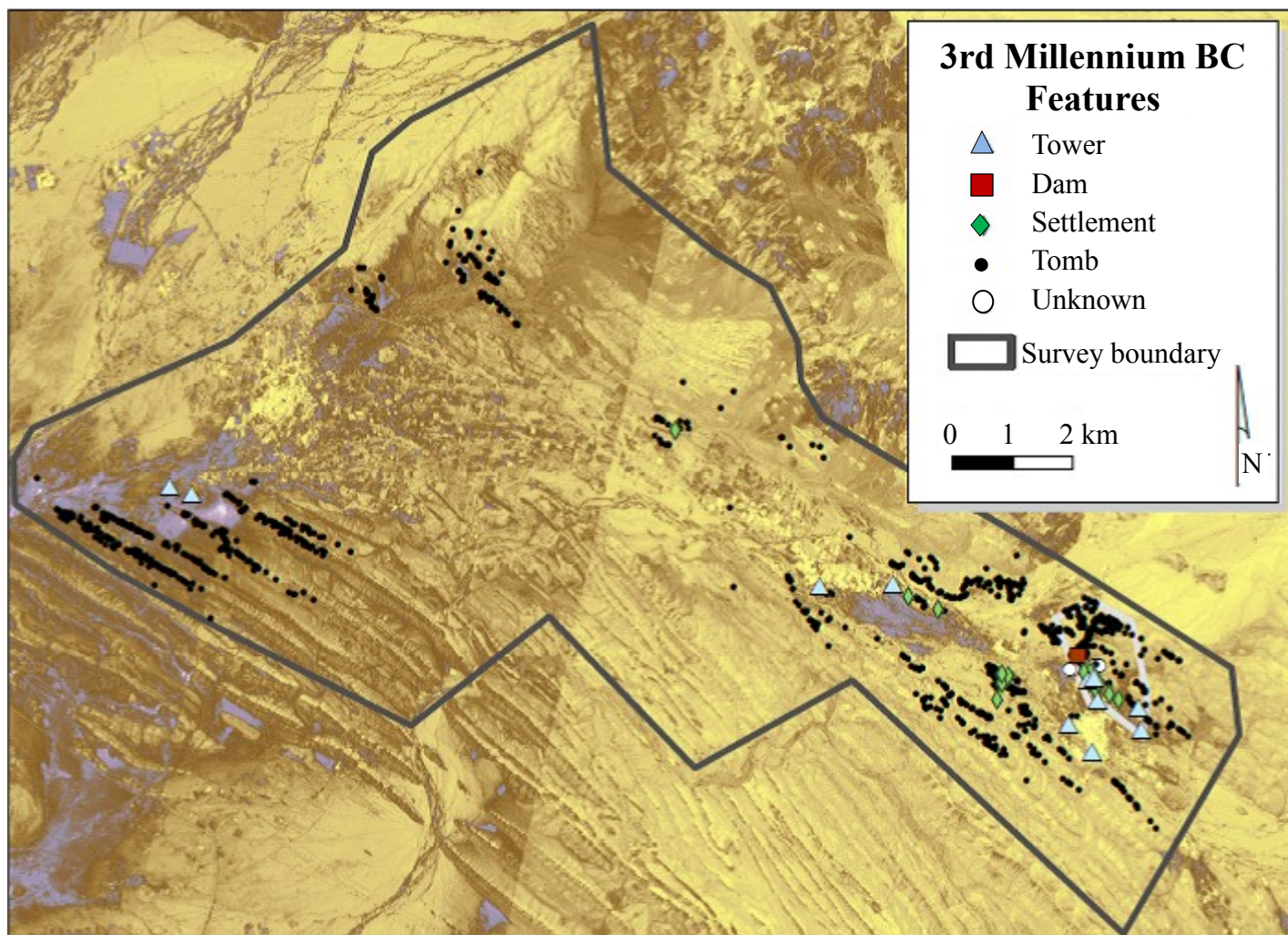


Figure 65. Distribution of all third millennium BC features.

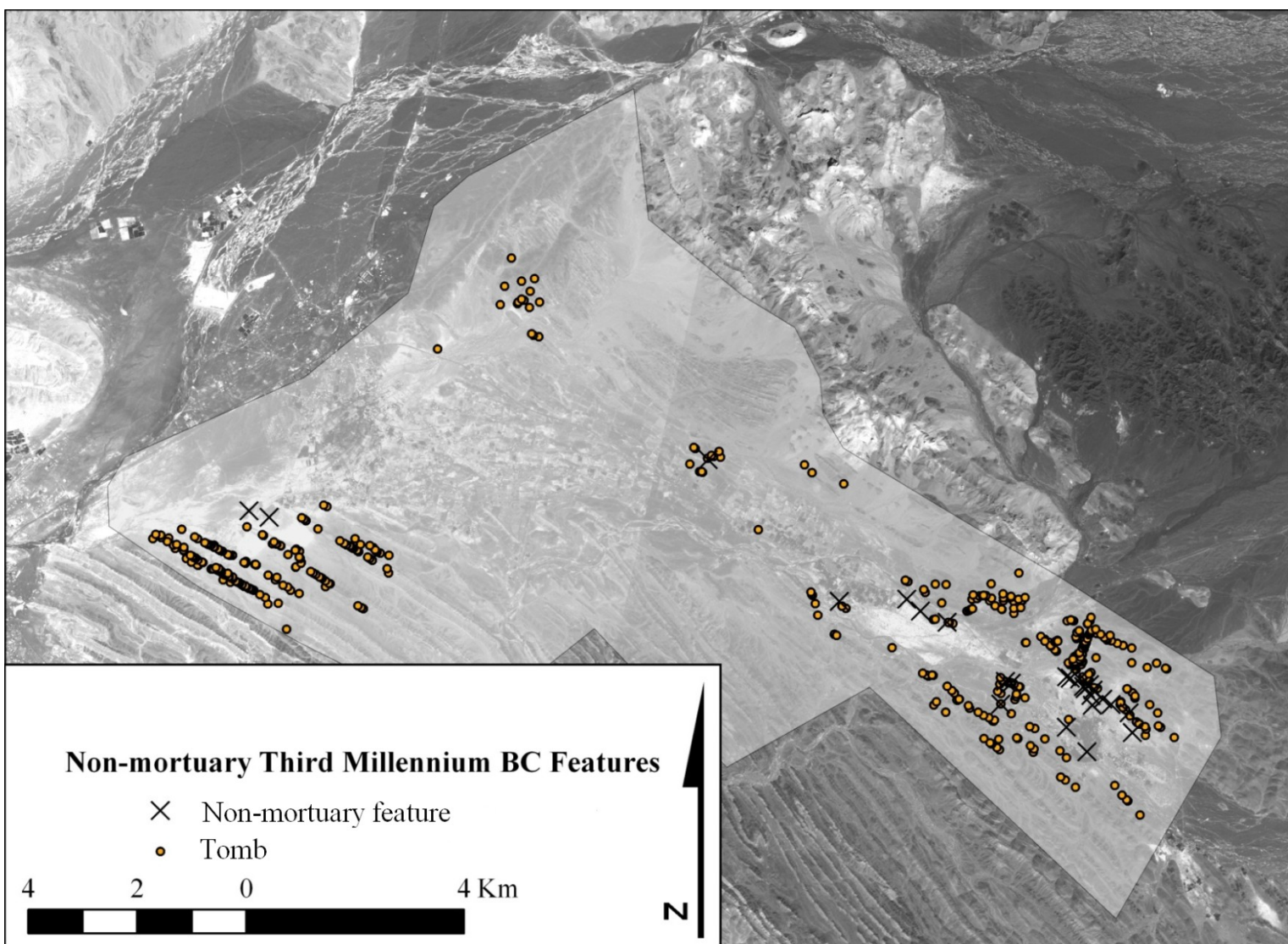


Figure 66. Distribution of third millennium BC features (Mortuary and Non-mortuary).

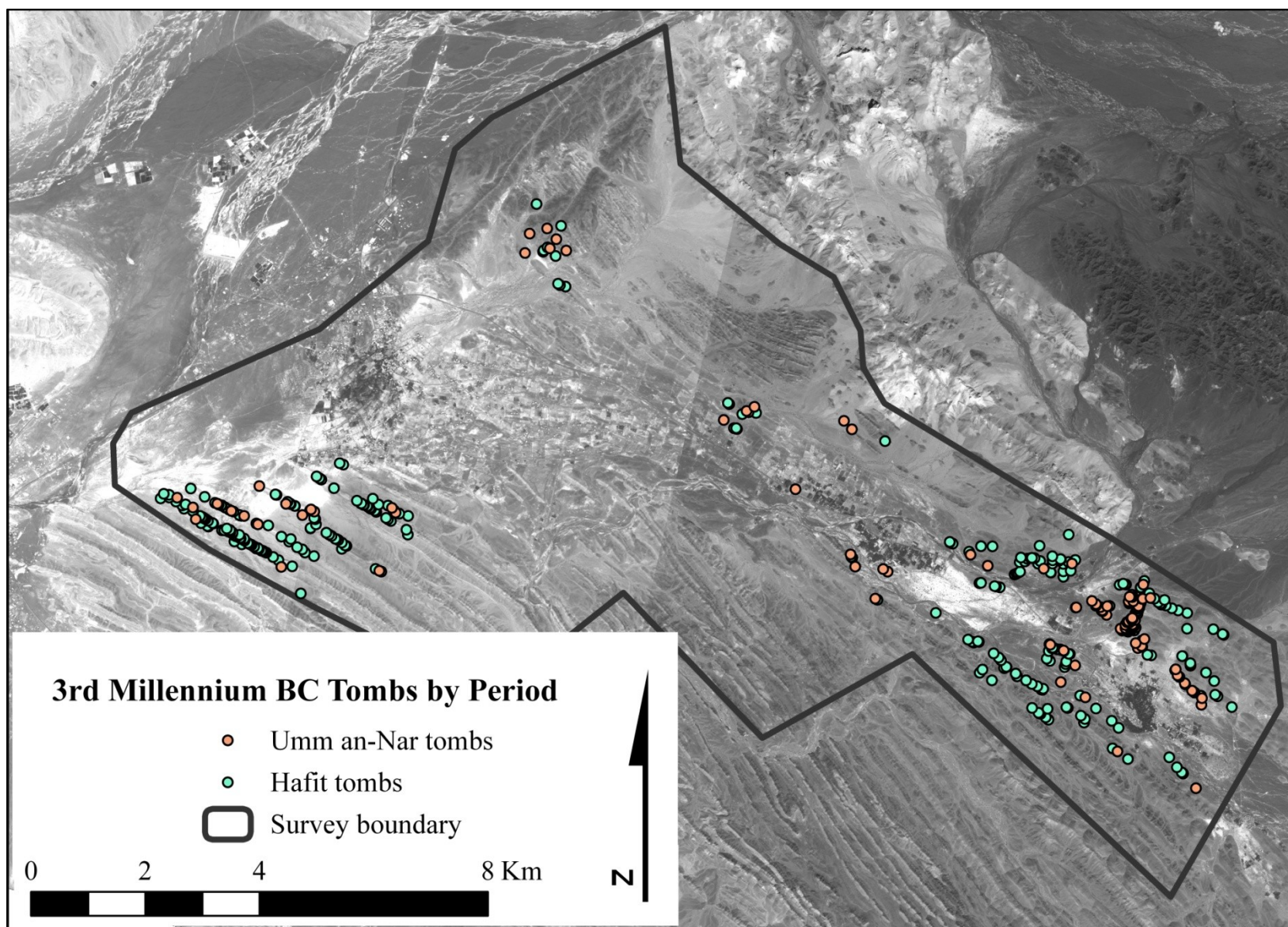


Figure 67. Third millennium BC tombs by period. Hafit period tombs are found in association with other Hafit tombs. Umm an-Nar period tombs are found in association with Hafit period tombs, and also cluster with other Umm an-Nar period tombs.

Examples of three Kernel Density Estimations – for Hafit period tombs only (**Figure 68**), for Umm an-Nar period tombs only (**Figure 69**), and for all possible third millennium BC tombs, weighted by tomb likelihood (**Figure 70**) – demonstrate the high degree of clustering already visible on the maps of distributions.

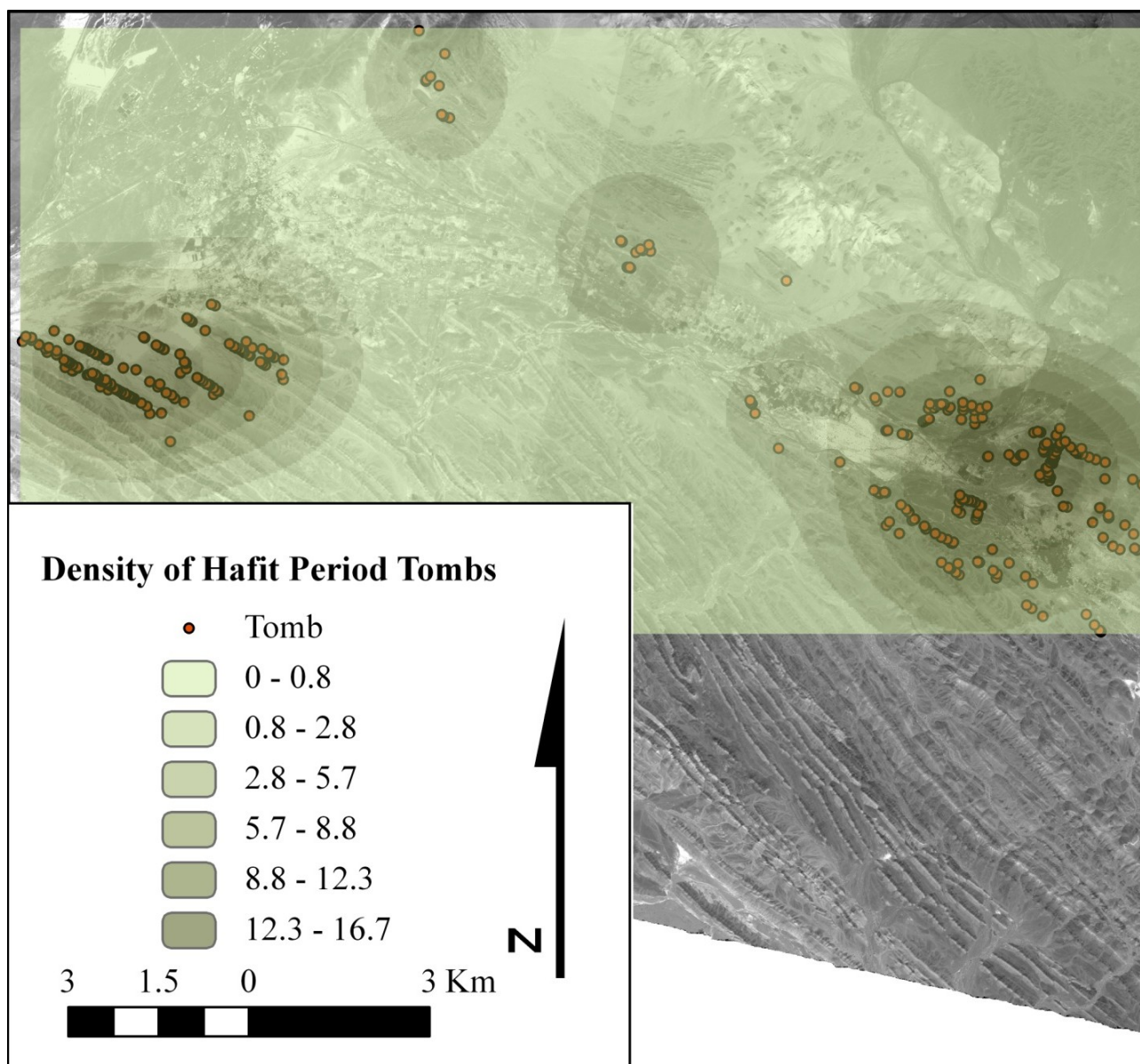


Figure 68. Kernel Density Map (2.3 km kernel) of Hafit period tombs. Natural Breaks classification.

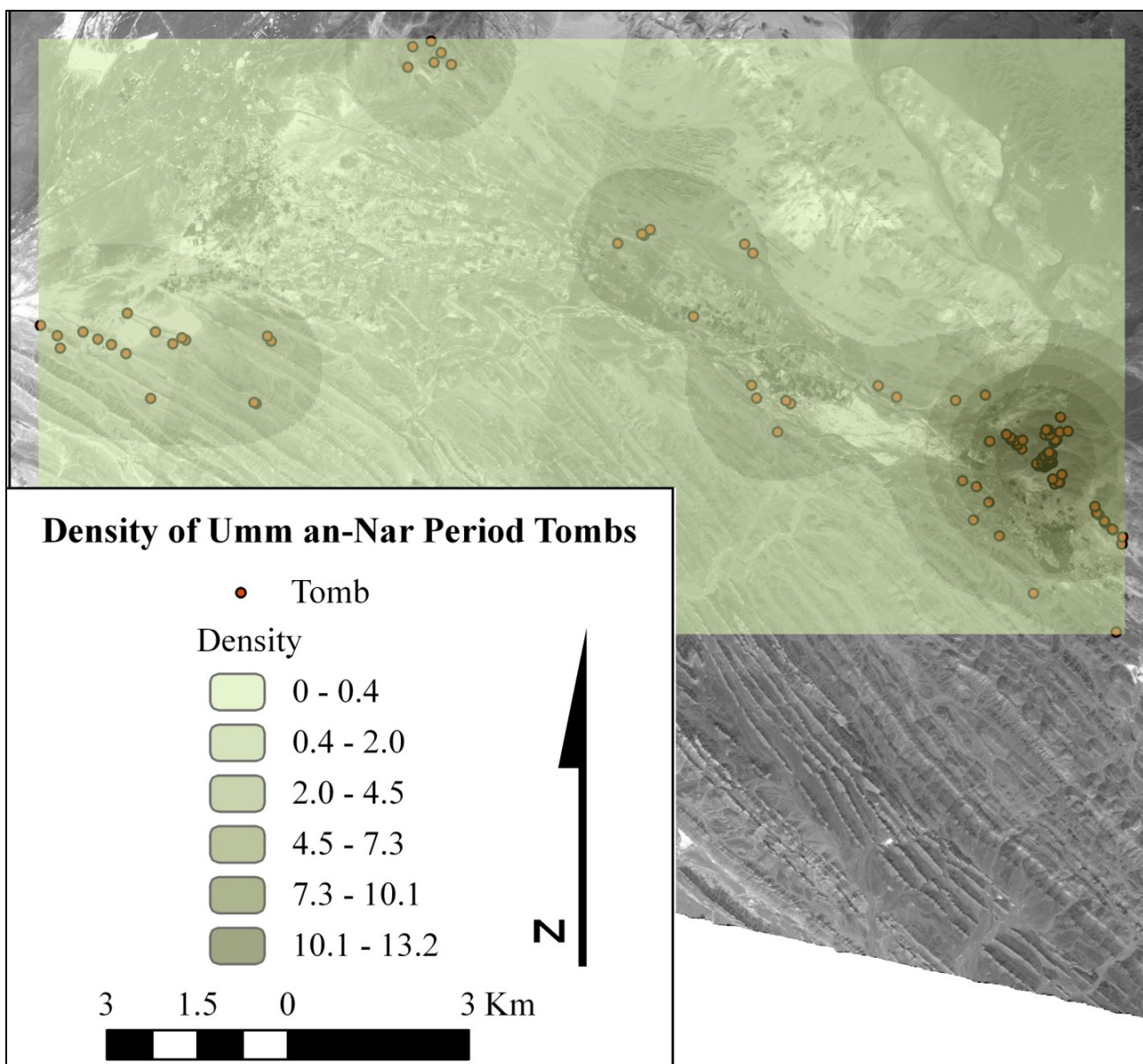


Figure 69. Kernel Density Map (2.3 km kernel) of Umm an-Nar period tombs. Natural Breaks classification.

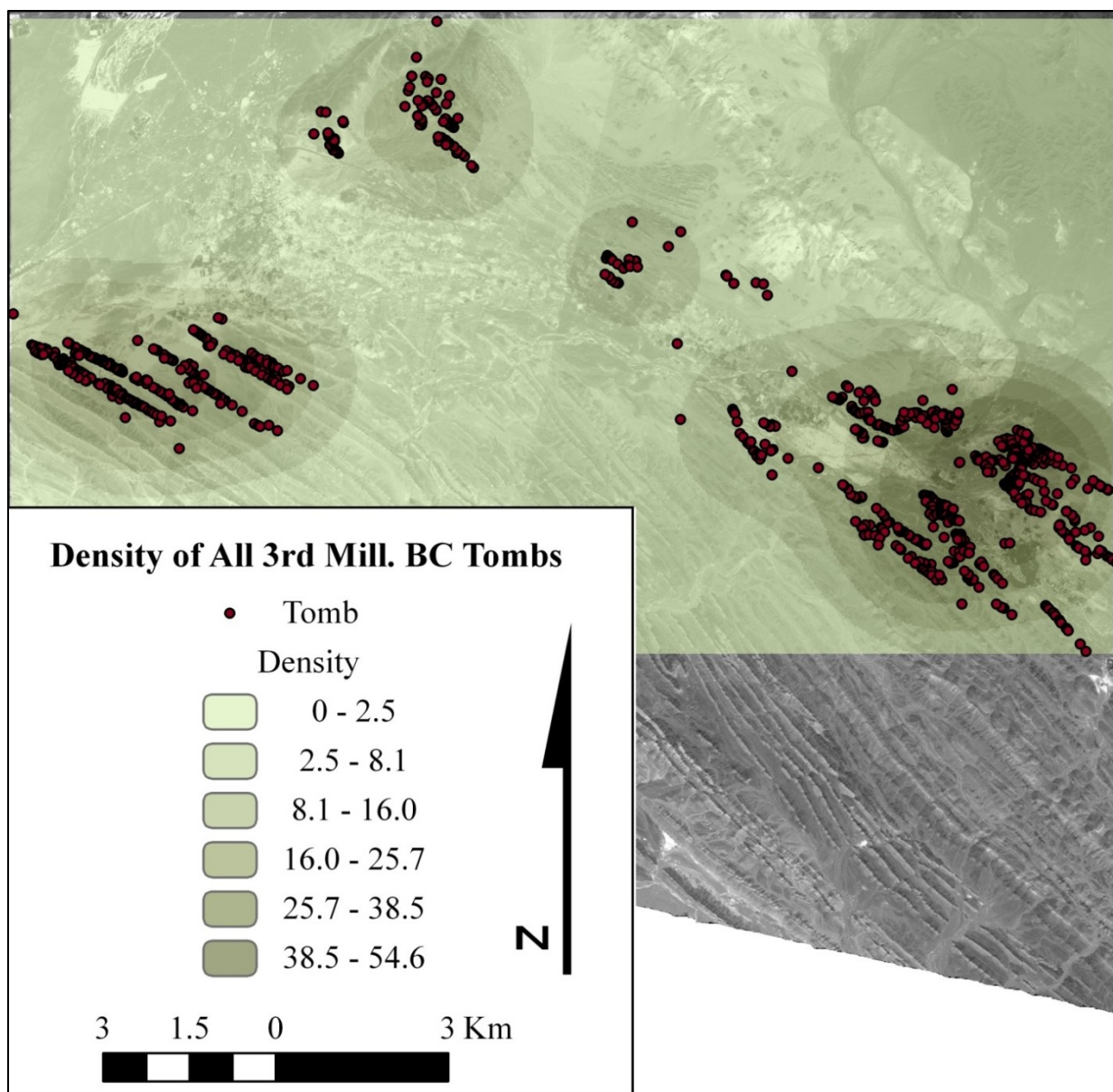


Figure 70. Kernel Density Map (2.6 km kernel) of all third millennium BC tombs. Natural Breaks classification.

In order to assume that the Saxe-Goldstein hypothesis is in effect it is equally necessary that these clusters of features be exclusively mortuary in nature. There is numerous archaeological evidence of features located along-side the features I have identified as being highly likely (2-3) to be third millennium tombs. However, there is no evidence that these features are either contemporary **or** non-mortuary in nature. That is, these features are indeterminate by the standards of this analysis. In a few cases features that are probably some sort of platform are located within Hafit period tomb clusters, and which may be Hafit; however, there is nothing to indicate the function(s) of these platforms.

In his research in the Wadi Andam region in central Oman, al-Jahwari (2008) indicated that even through excavation a number of cairns were inconclusive, in dating and in function. In no case were these cairns found to be definitely contemporary **and** non-mortuary. For the moment, at least, the Hafit tombs of the Wadi al-Hijr hold to Saxe's (1970) and Goldstein's (1981) specifications for the use of an exclusively mortuary space as marking access to critical resources.

Umm an-Nar Tomb Distributions

Umm an-Nar period people are culturally contiguous with the earlier (Hafit period) people (Cleuziou and Tosi 2007; cf. Orchard and Stanger 1994). However, since the Hafit period cemeteries were already positioned on the landscape, Umm an-Nar period tombs cluster, in part, with Hafit tombs as much as they do with each other (**Figures 71 and 72**), and the presence of Hafit tombs acts as an indicator for the presence of Umm an-Nar tombs. Taken together, then, third millennium BC tombs are strongly clustered.

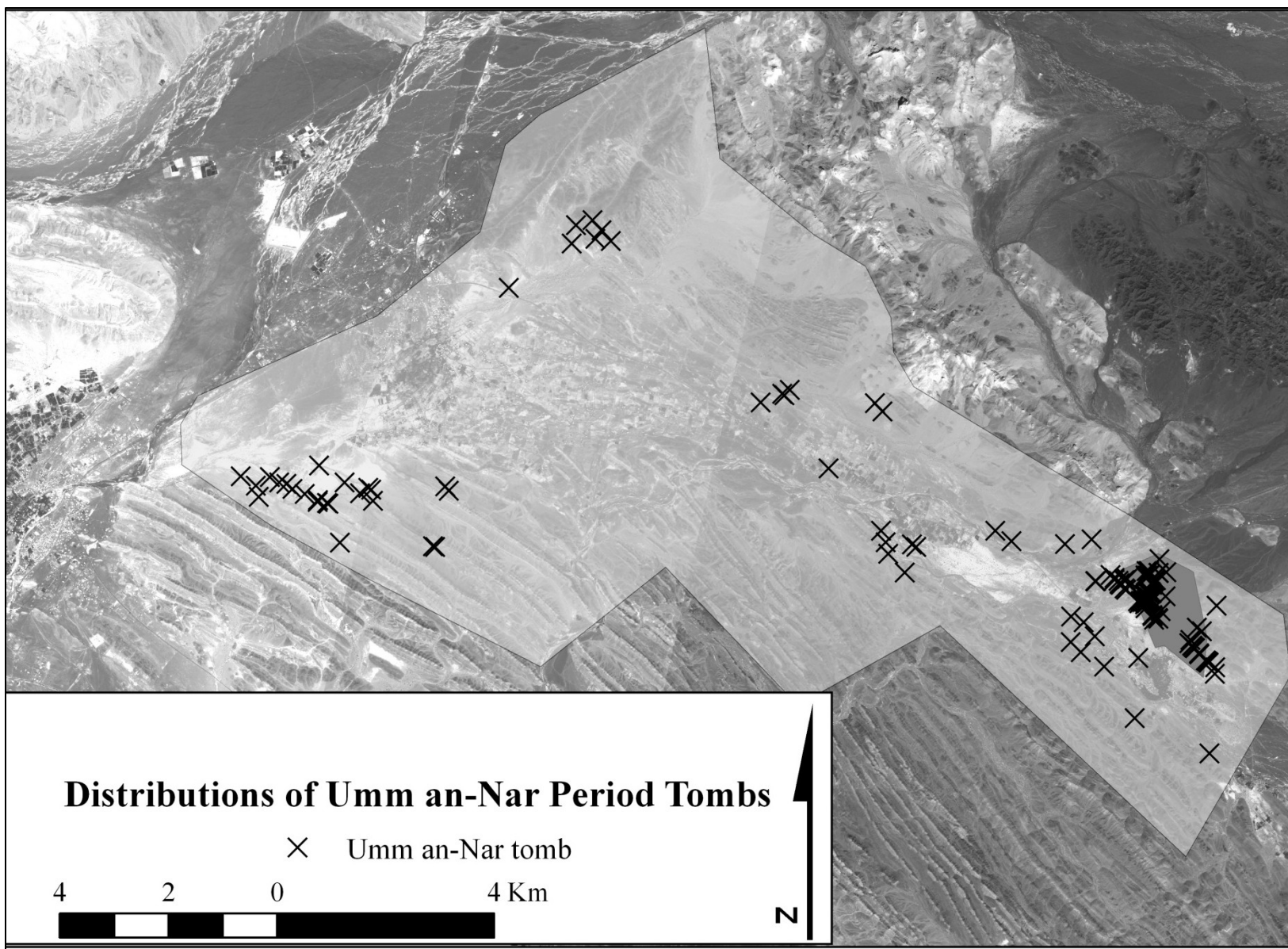


Figure 71. Distribution of Umm an-Nar period tombs.

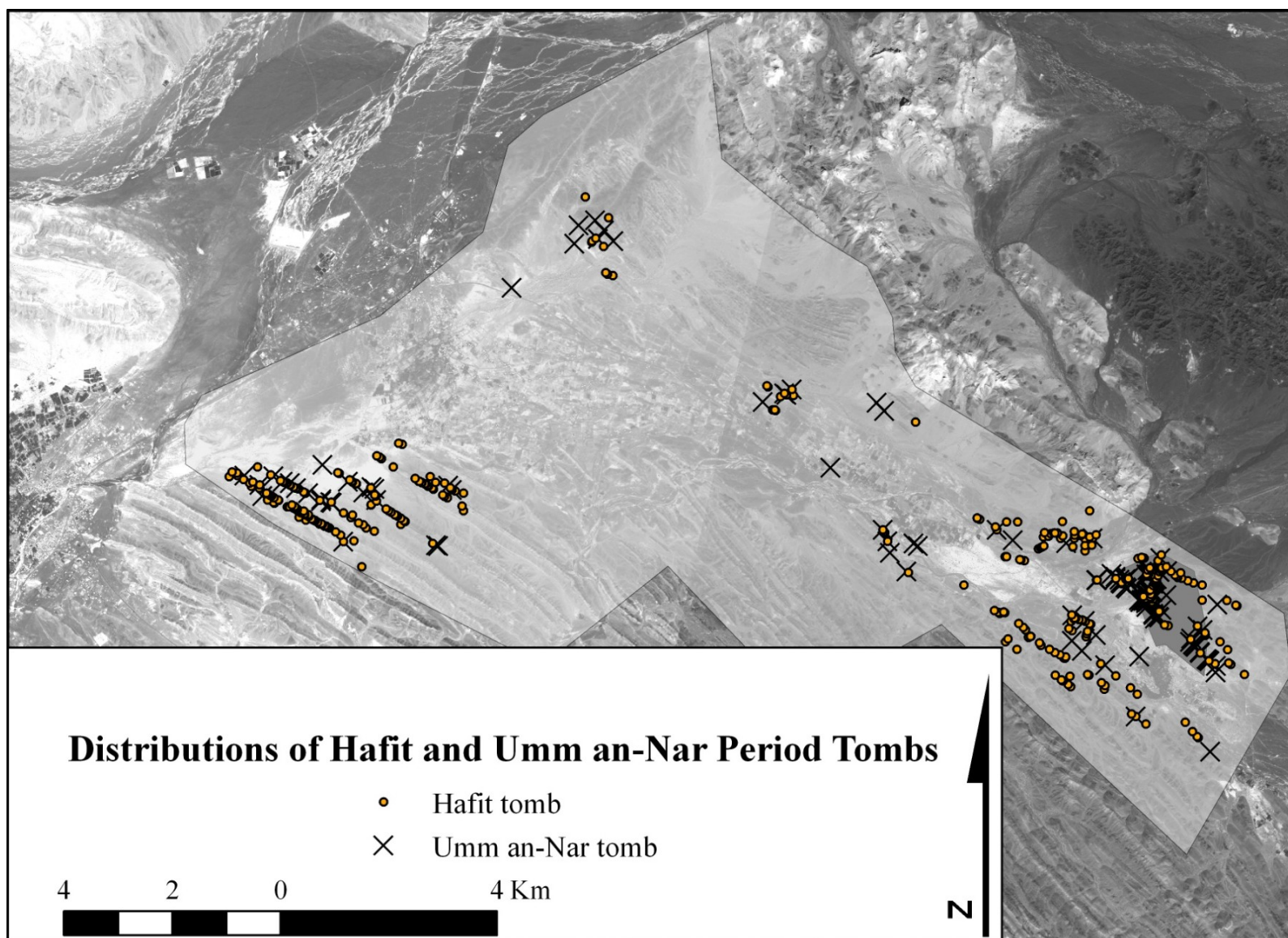


Figure 72. Distributions of Hafit and Umm an-Nar tombs

These clusters are based not only on tomb proximity to other tombs, but also to local topography. According to most researchers (e.g., Cleuziou and Tosi 2007; Giraud 2009), Hafit period and Umm an-Nar period tombs are located on different relief.

Tomb type: formal clusters

Literature to-date suggests that there are two types of third millennium tombs, and that these are distinguished by period. Although my data support this, there are a few points of interest relating to tomb construction and style.

Some Hafit tombs found on steep slopes are built on top of platforms constructed to level them out, making possible building in an area that would otherwise be too steep. An extension of this is that the tomb itself is raised. However, there is very little expertise involved in the construction of these monuments. There is a clear Umm an-Nar preference for lower locations over higher; this may be pragmatic, since their footprint can be greater, but not significantly so.

Tomb locations on the landscape

Tombs were displayed according to their situations on the landscape (**Figures 73 and 74**). Neither Hafit nor Umm an-Nar tombs regularly occur mid-slope, but this is as much a function of the slope itself (and the structural engineering difficulties such slopes provide). In addition, of the 375 Hafit tombs only 32 (8.5%) were located in the wadi or plain, and only 19 (5.0%) were located on the lowest parts of the landscape (i.e., the primary and secondary locations were both “1”). Of that 19, six are equally likely to be Umm an-Nar as Hafit, suggesting that they are transitional. Therefore, there is a Hafit preference for locating tombs on ridges.

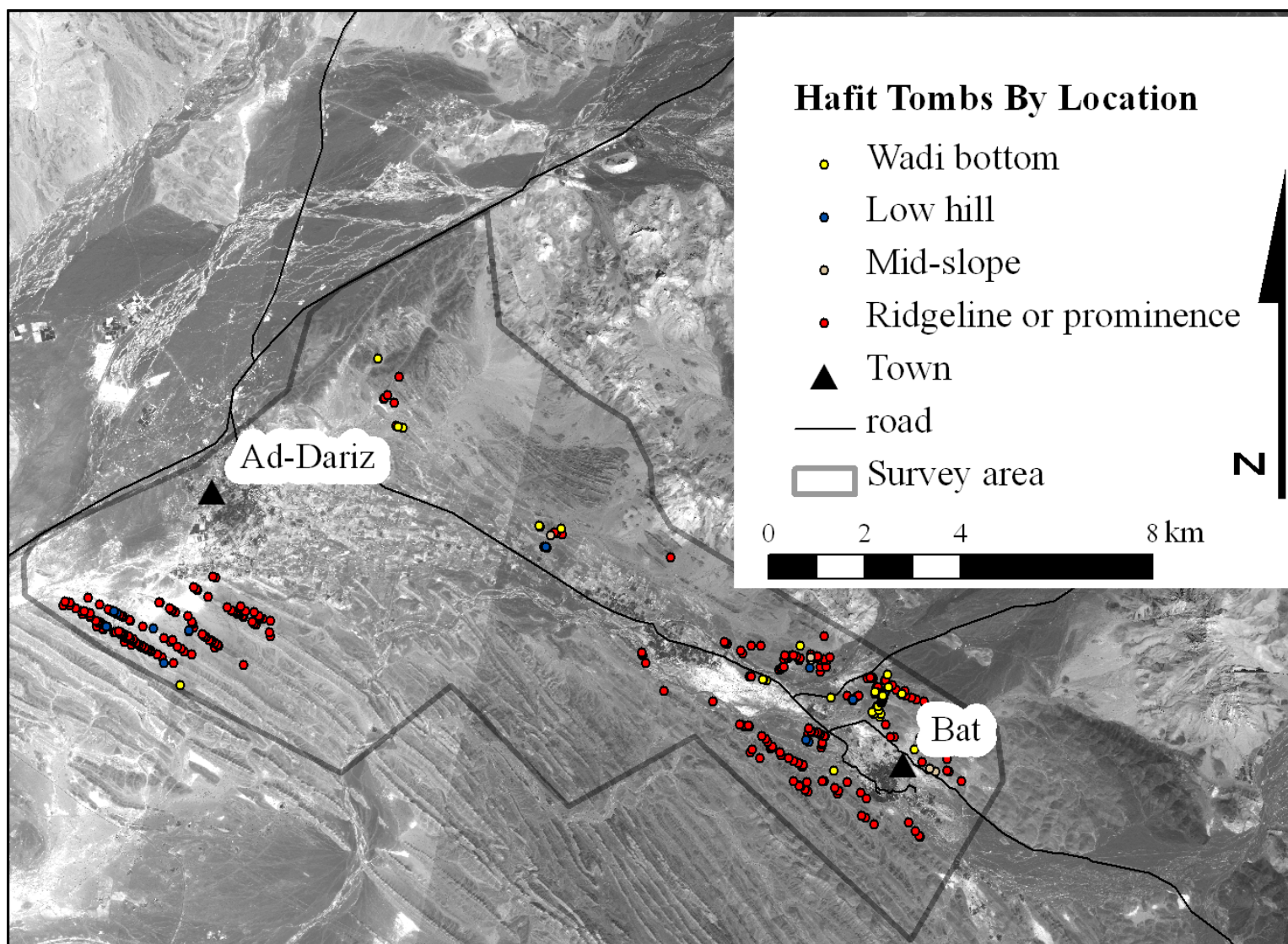


Figure 73. Map of Hafit period tombs by primary location.

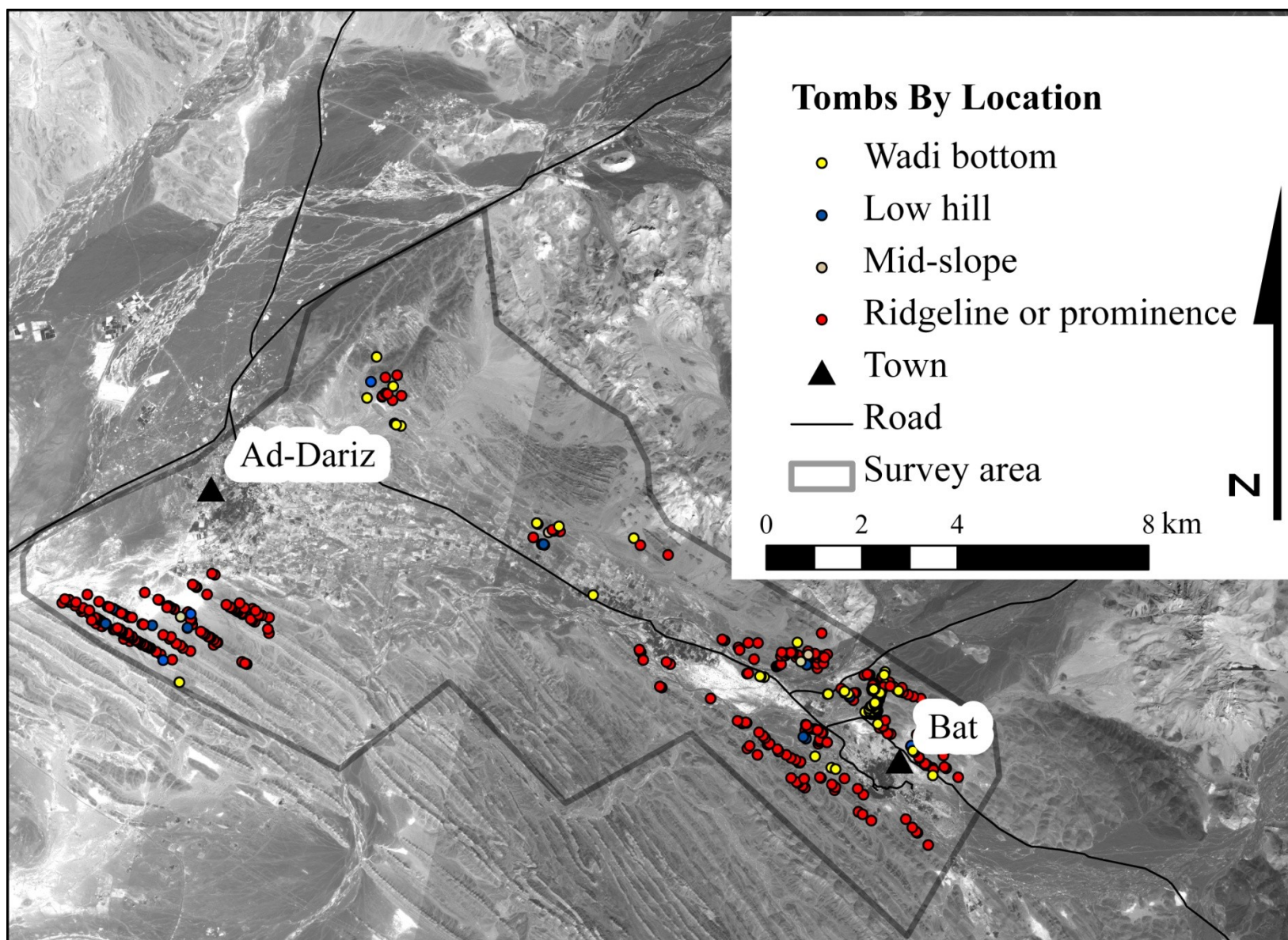


Figure 74. Map of Umm an-Nar period tombs by primary location.

But where on ridges? This question becomes even more important when considering the local topography: ridge slopes tend to be very steep, often-times near-vertical, while the crest of the ridges is relatively flat (**Figure 75**).

Strictly in terms of locations upon which to build a stone structure, the ridge crests provide much more level surfaces. In addition, access to the ridge crests is relatively easy when approached from the end (i.e., along the strike of the bedrock), as opposed to from the sides. The ridgeline in **Figure 75** runs NW-SE, with the ridge sloping down to meet the valley floor on the northwestern end. As is clear in the figure, approaching the ridge from the northwest end it is possible to ascend the ridge quite quickly without having to traverse slopes that are at least twice as steep along the northeastern and southwestern faces.

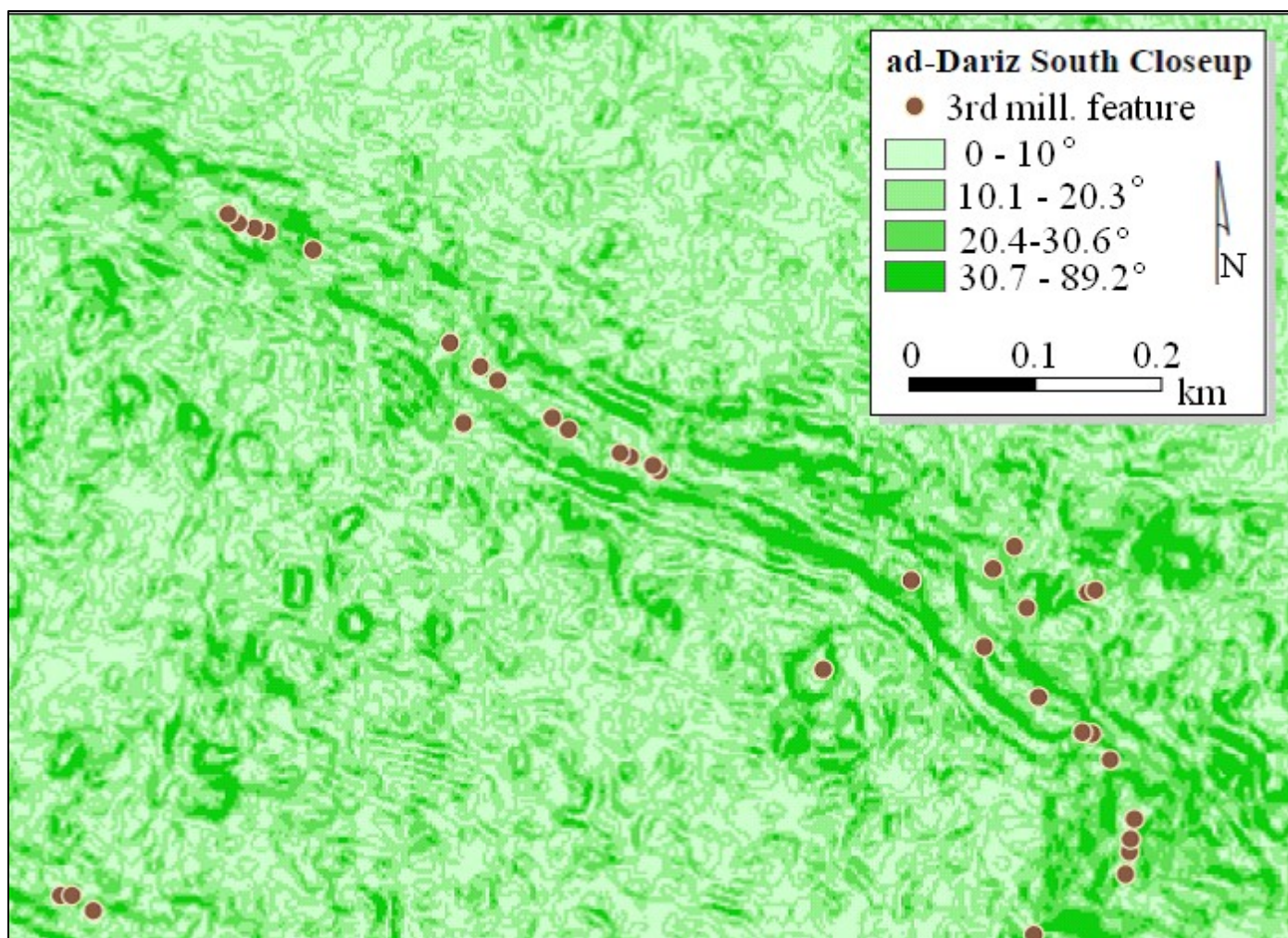


Figure 75. Close-up of location of third millennium BC tombs (ad-Dariz South). The tombs sit on relatively flat areas on top of the ridge (signified by parallel dark lines on both sides of a lighter gray central line).

Visibility

It is inaccurate, however, to suggest that the tombs are placed only in terms of convenience and limited-use space. Specifically, it has been proposed that visibility— either to or from — these features is important, and this does appear to be the case. Specifically, it is possible to see the valley floor quite clearly, and vice-versa. The tombs in the area in Figure 75, ad-Dariz South, are arranged on steep slopes that nevertheless do not extend particularly high up off of the valley floor. They have excellent local views (ca. 500 m) in most directions — the exception being looking along the strike. There are two reasons for this: first, it is sometimes difficult to identify tomb features from the natural bedrock, as the tombs are less likely to be outlined against the sky, and therefore their obtrusiveness is relatively low. Secondly, the ridge itself obstructs views from its crest along its strike (in this case, to the southeast).

At other locations it is possible to see quite clearly that once a relatively flat location is found on limited-use landforms, the choice about where to locate a tomb is related to visibility. In **Figure 76** tombs are preferentially lined up on the southern edges of the hilltops, overlooking an active flood zone in the valley. The hills themselves are gentler, and views to the north are of low stony plateaus and hills before Jebel Shuwā'ī encloses the viewscape.

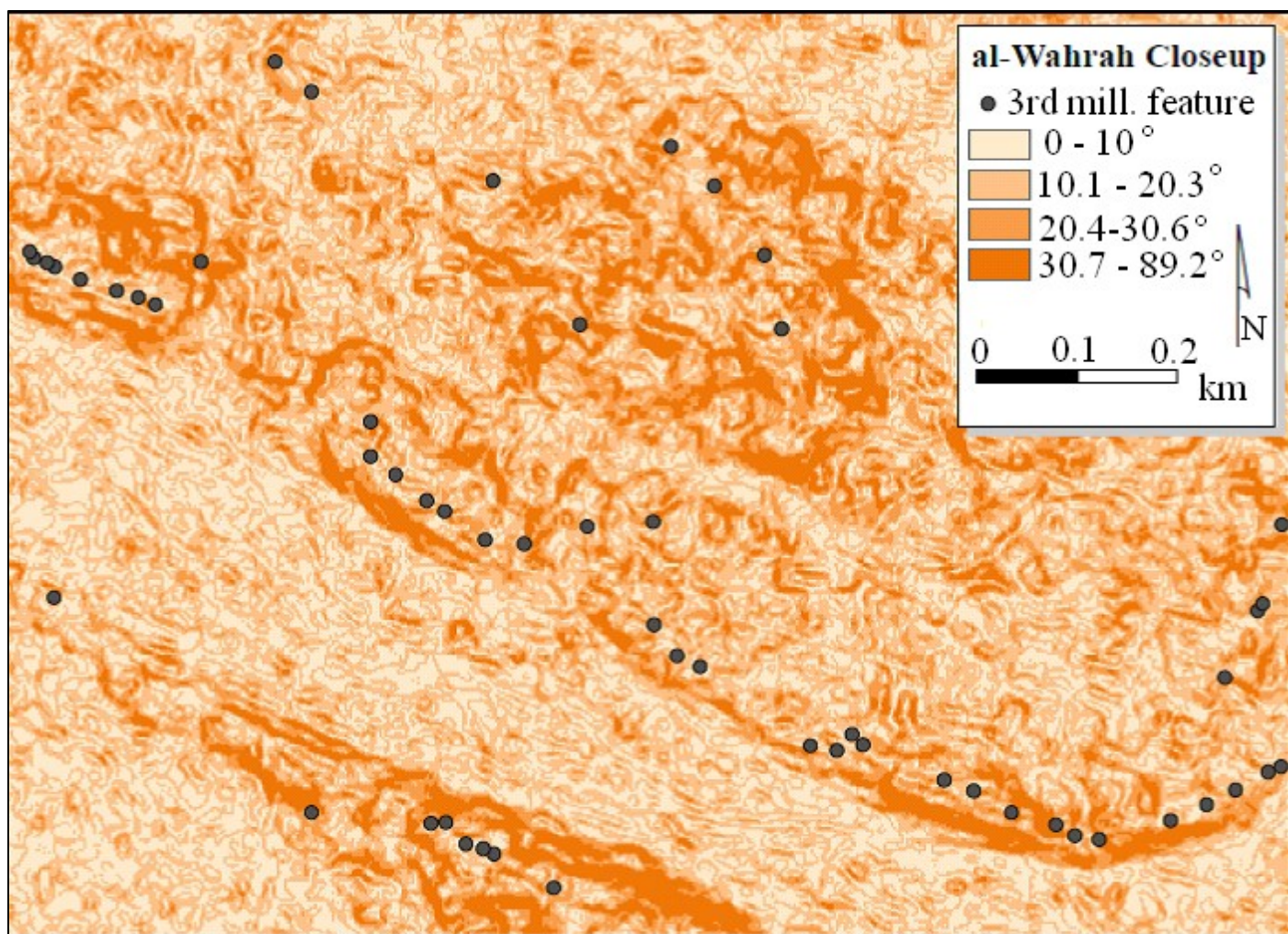


Figure 76. Detail of tomb locations north of al-Khut. Note the location of the tombs overlooking the wadi (center).

Besides the landscape, the third millennium tombs themselves may be points of visibility to each other. Out of all of the third millennium tombs (n = 549), **all** of them were visible to at least one other tomb. As tombs cluster so extensively this is not particularly surprising. The same is true of the towers: at least one tower is visible to and from one other tower. In the cases of ad-Dariz South 1 and 2, and al-Khutm and Wahrah Qala, these are “exclusive” pairs; ad-Dariz South 1 and 2 are only visible to each other, as are al-Khutm and Wahrah Qala. In addition, over one third (n = 220) of the third millennium tombs are within sight of one or more towers.

“Transitional” Tombs

Of the 549 tombs scoring 2-3 for the third millennium BC, 33, distributed randomly throughout the study region, appear to have a combination of Hafit and Umm an-Nar characteristics. As small as this group is these features are situated regularly across all of the landforms. For example, out of 375 Hafit tombs (including the 33 transitional tombs) there are 60 (16%) on any of the low spaces compared to 51% of the transitional tombs. While 272 (73%) of the Hafit period tombs are on the highest places only 36% of the transitional tombs are in that same locational range; and 40 (11%) of the Hafit tombs fell in the mid-range, compared to 15% of the transitional tombs. This strongly suggests that the transition from ridgeline to wadi plain occurred simultaneously with transitions in tomb style.

Formal Variation in Hafit Tombs

The attribution of certain tombs to a “transitional” category suggests variation due to temporal change. However, there are also numerous examples in the Wadi al-Hijr of variation in Hafit period tombs. Among those variations are (1) variation in the exterior wall construction style; (2) variation in the number of exterior ringwalls; and (3) integration of bedrock into the tomb exterior walling.

There is considerable variation in the construction of the external “ringwalls” (outer walls

enclosing the interment). It is common for tombs of the Hafit period to have “skins”; that is a ringwall built of a single width of stones and laid directly against another ringwall, so that the walls are abutting rather than interlocking (**Figure 77**). Sometimes these skins are coursed, as in the previous figure, while on other occasions they are haphazard (**Figure 78**). There are also numerous examples of Hafit period tombs that appear to have variations of the skin-to-skin construction style: either ringwalls in which an internal ringwall, faced to the exterior, was later covered by another layer of walling but with rubble fill between the two faces (**Figure 79**); or a single wall, faced to the interior and exterior, with rubble fill (**Figure 80**).



Figure 77. Hafit period tomb, feature 111122. Note the tomb "skins".



Figure 78. Feature 100866 - note the uncoursed wall. This Hafit tomb was also built on a platform.



Figure 79. Remains of wall construction, feature 111261. Note that the inner and outer ringwalls both have exterior faces.



Figure 80. Feature 100864. Note the un-coursed ringwall in profile on the south side of the tomb, and the rubble fill pouring out where the ringwall has been removed.

Secondly, the number of ringwalls varied. Multiple ringwalls of 145 Hafit period tombs were visible in the survey region; they varied in number from two ($n = 135$) to four ($n = 1$) ringwalls per tomb. Third, on numerous occasions the tomb construction either incorporated the local topography into the tomb construction, or appears to have been constructed **in spite** of the local topography. It was quite common to find the naturally occurring vertical bedrock incorporated as exterior walling (**Figure 81**). On the other hand, at least seven Hafit period tombs in the ad-Dariz South cluster are built on their own individual platforms (**Figure 82**). The common factor in all of this appears to be the end result: a stone cylinder with a smooth profile, particularly effective when viewed from several hundred meters or more away and silhouetted against the sky.



Figure 81. Hafit period tomb feature 100888. Note the use of bedrock in the southwestern side of the ringwall.



Figure 82. Feature 100861: Hafit period tomb over a platform built specifically to provide a level foundation.

Tower Visibility

Before discussing visibility it is important to bring out one point. On an open landscape visibility is of course quite high, and vice-versa. We do not know when date palms were introduced (and actively cultivated) in Oman oases such as Bat. However, it is likely that these oases would have had relatively dense vegetation to some height. For towers located within the oases this may have limited visibility. However, this would have had little impact on those towers and tombs located on prominences.

All towers can see at least one other tower. There are a few cases in which one tower is able to view several others. From Tower 1145 it is possible to see 1156, 1146, 1148, and Feature 110980, and from Feature 110980 it is possible to see 1147, 1146, 1145, Bat Qala, and 1148 (i.e., the entirety of the Bat tower system). For the most part, however, there is only dual intervisibility.

In general, tower visibility is quite high, even in the wadi plain. That is because, even without a bedrock prominence, the towers themselves are raised platforms, so that standing on top of even the remains of one of these towers increases the viewer's range. Even Tower 1156, the only tower located mid-slope, is elevated enough off the wadi plain to see across much of the western half of the Bat area, toward al-Khutm (although al-Khutm itself is not visible).

Tower-Tomb Visibility

Some of the Hafit and Umm an-Nar tombs can see (and be seen by) all of the towers. However, in no place are **all** tombs able to see a tower, or vice-versa. It is possible to view the towers from 65 out of the 127 Umm an-Nar tombs.

Distances between towers and their furthest visible tomb varies dramatically from tower to tower. Unsurprisingly, the tower with the shortest visibility range is Tower 1156. On the other hand, somewhat surprisingly, Of the eight tombs furthest from the towers, it is probably quite

significant that only three are Umm an-Nar; the others are “transitional” (both Hafit and Umm an-Nar). In no case is the furthest tomb a Hafit tomb. A small number of tombs scoring 2-3 for both Hafit and Umm an-Nar period characteristics – which I have tentatively called “transitional” tombs – are the greatest distances within sight of the towers, and nearly all can see towers (**Table 12**). This suggests (1) that they may have been built after (or at least simultaneously with) the towers and/or (2) that their situation was deliberate. Another transitional tomb, 100328, is the furthest tomb able to see either Wahrah Qala or al-Khutm.

Table 12. Tower-Tomb Visibility. Note that many of the tombs within sight of a tower but furthest away are "transitional".

Tower	Furthest tomb ID	Distance	Transitional tomb?	Tomb location	Tower location
Ad-Dariz S1	100739	1247 m	Y	Mid-slope	Wadi plain
Ad-Dariz S2	100644	1183 m	N (UAN)	Plateau	Wadi plain
Wahrah Qala	100328	1878 m	Y	-	Prominence
Al-Khutm	100328	647 m	Y	-	Prominence
1145	100076	1281 m	N (UAN)	Prominence	Wadi plain
1156	111185	556 m	N (UAN)	Plateau	Hill base
1146	100076	1495 m	N (UAN)	Plateau	Wadi plain
1147	100273	1522 m	Y	Prominence	Wadi plain
110980	100273	1891 m	Y	Prominence	Prominence
Bat Qala	100238	655 m	Y	Prominence	Prominence
1148	100597	1659 m	Y	Mid-slope	prominence

Comparison of Tomb Types by Location

Regardless of time period, one-quarter to one-third of the features found in the survey area were located on lower features. This survey dramatically under-represents later archaeological periods in terms of space covered, particularly for Islamic and pre-Modern features. This has to do, primarily, with a dramatically different archaeological footprint: while Umm an-Nar settlement was confined to two main locations, Islamic period use of the landscape was more extensive on the lower parts of the landscape. In keeping with data collection methods applied for the third millennium settlement, for example, only a single feature entry was made for the collective whole of an Islamic settlement. This is comparative issue is not unique to this survey, and no attempt was made to quantify feature densities according to, for example, feature footprint. Therefore the mud brick village located to the southwest of al-Khutm covered .75 sq km, as compared to the extant third millennium settlement nearby. While this is not problematic when comparing third millennium (or other period) land use, it is important to recall when considering the success of the survey methodology overall. This indicates that use by third millennium BC

people of hilltops and ridgetops for tomb location is not a side effect of survey methodology, but a cultural preference. Since tombs from both the Hafit and Umm an-Nar periods are located below ridgelines (e.g., on low terraces) this is not, however, an exclusive preference.

Third millennium tombs of both periods are located on all landforms, from the wadi plain to ridges and prominences and in-between. It is likely that, after the primary land form is chosen, a major factor is the potential of the location as a solid foundation.

When the landscape is taken into account – specifically, areas where it would be nearly impossible to have a tomb on one part of the landscape are removed from consideration – tomb clustering increases dramatically. For example, the Wahrah-Khutm tomb and tower groups become a single group with the Bat groups (see, for example, **Figure 76**) which themselves collapse into a single group. The same is true of ad-Dariz South. All of these have towers.

The significance of landform on preferred Hafit tomb location is most clearly visible for ad-Dariz South, where the spaces between Hafit tombs are nearly all correlated with archaeologically “empty” wadi plains. However, the thickly silted wadi plain between the ridges suggests that there may be a great deal of alluvial buildup in this area, and may have sealed a number of lower – and therefore statistically more Umm an-Nar – archaeological features.

But this does not distract from the overall cluster; if anything, the potential for locating more tombs between the archaeologically dense ridges would merely increase the overall density of the cluster, which is already quite high. It is important to note that, in general, the further southeast along the ridges of the ad-Dariz cluster one goes, the less alluvial buildup (and therefore the rockier and less arable) the between-ridge plain is (**Figures 83 and 84**). That the two ad-Dariz South towers are located on the agriculturally rich northwestern end of the cluster is something that will be discussed later.



Figure 83. The western end of the ad-Dariz South tomb cluster. Note evidence of farming.



Figure 84. The eastern end of the ad-Dariz South survey area, looking southeast. Note the dark mid-ground, evidence of undisturbed rocky sediment

While the tombs of ad-Dariz North (a) do not cluster statistically – there are too few tombs (6 Umm an-Nar and 9 Hafit) – visually they appear to do so (**Figure 85**).

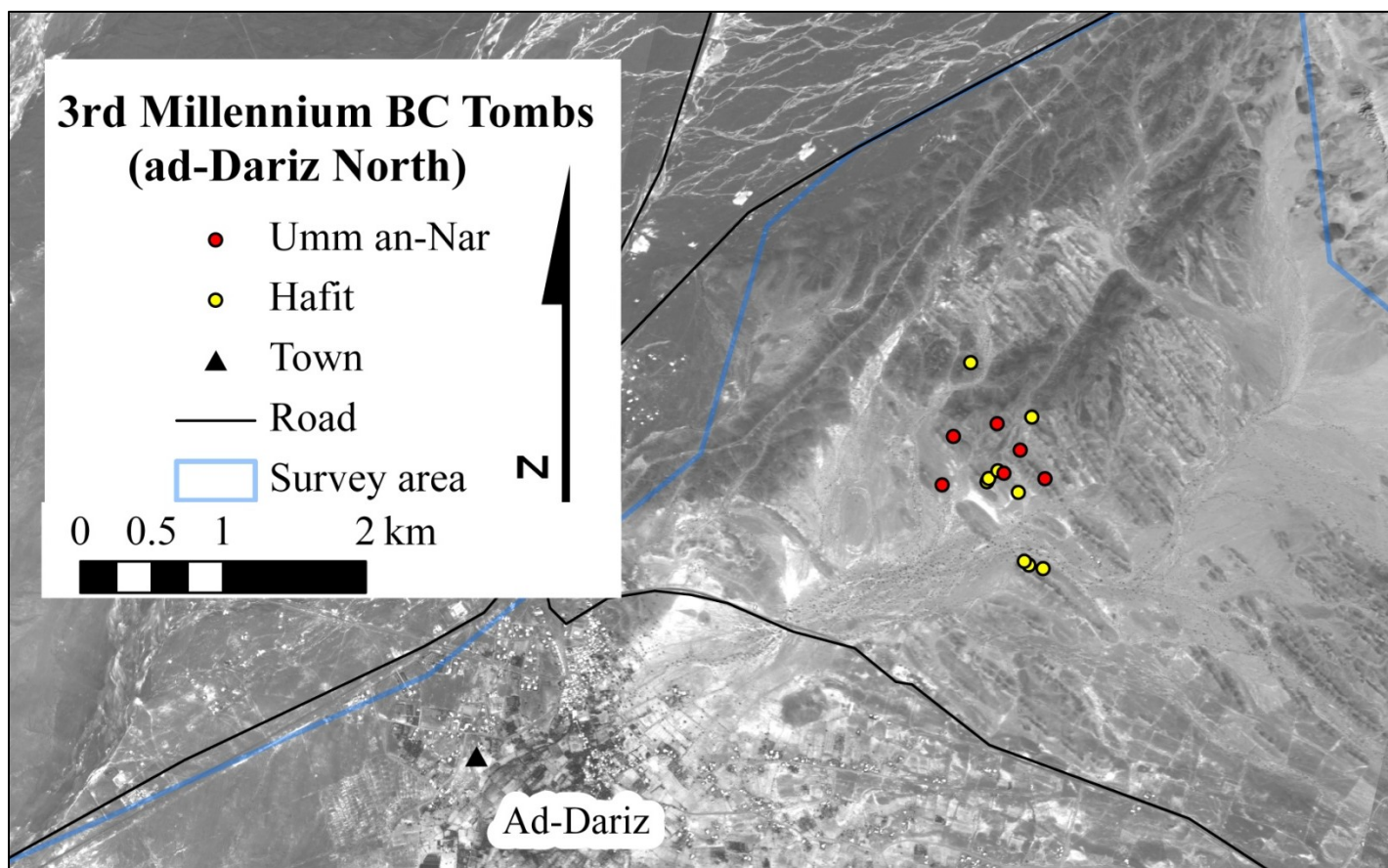


Figure 85. Ad-Dariz North (a), Hafit period and Umm an-Nar period tomb distributions.

Summary

It has been generally established that the Umm an-Nar tombs are more “impressive” than Hafit tombs. At the risk of circular reasoning, this was true of those tombs in this survey area as well. The distinctions between Hafit and Umm an-Nar tombs are not as clear as tend to be stated in the literature. However, there are nevertheless clear trends in this study region that support the general views.

In terms of landform location Hafit tombs were far more likely to be situated on the tops of ridges, where they are silhouetted against the sky, than elsewhere. They are also less finely finished on their exterior faces and make use primarily of local stone. The result is a feature that looks quite impressive from an easy distance of 300–500 m or more.

Umm an-Nar tombs, on the other hand, tend to be located on lower features (although they, too, are found in a few cases on ridges) (see **Figure 74**). They also tend to cluster less regularly. Their overall visibility – i.e., from a distance – is therefore considerably lower than the visibility of Hafit tombs. However, their finer external construction suggests that they are intended to be seen up close. Together, this suggests that **the distances at which Hafit and Umm an-Nar tombs are meant to be viewed are different.**

Tomb Locations and Resource Associations

Why these differences in locations? According to Hypothesis 8, this suggests that Hafit tombs – as opposed to Umm an-Nar tombs – may have been marking access to resources. In order to understand this aspect of decision-making there are two further concerns: (1) during the Umm an-Nar period people were using something other than their contemporary tombs to mark resources (if resources were being marked); and (2) there should be resources in close proximity to Hafit tomb clusters.

The ad-Dariz South Cluster

The wadi plains of Ad-Dariz South show several different types of evidence for potential agriculture. First, a modern system of wells, running along the southeastern edge of the Wadi al-Kabir, proves that the water table was relatively high even into the last 20 years in the ad-Dariz area. Second, field systems are still evident on the plains, despite regular seasonal flooding and erosion (see **Figure 83**).

The ad-Dariz South cluster is remarkable partially because, as was noted in Chapter 5, most of the features seem to date to the Hafit period. Another remarkable aspect of this area is the divide between features located on the ridges and those located elsewhere (**Figure 86**): while 171 third millennium tombs were located on ridges, only 15 were found on plains, plateaus, or foothills (i.e., anything **other** than ridgelines). That there are two towers located in this area – and, therefore, probably signal some Umm an-Nar presence – it is possible that a number of late third millennium BC features are under the alluvium.

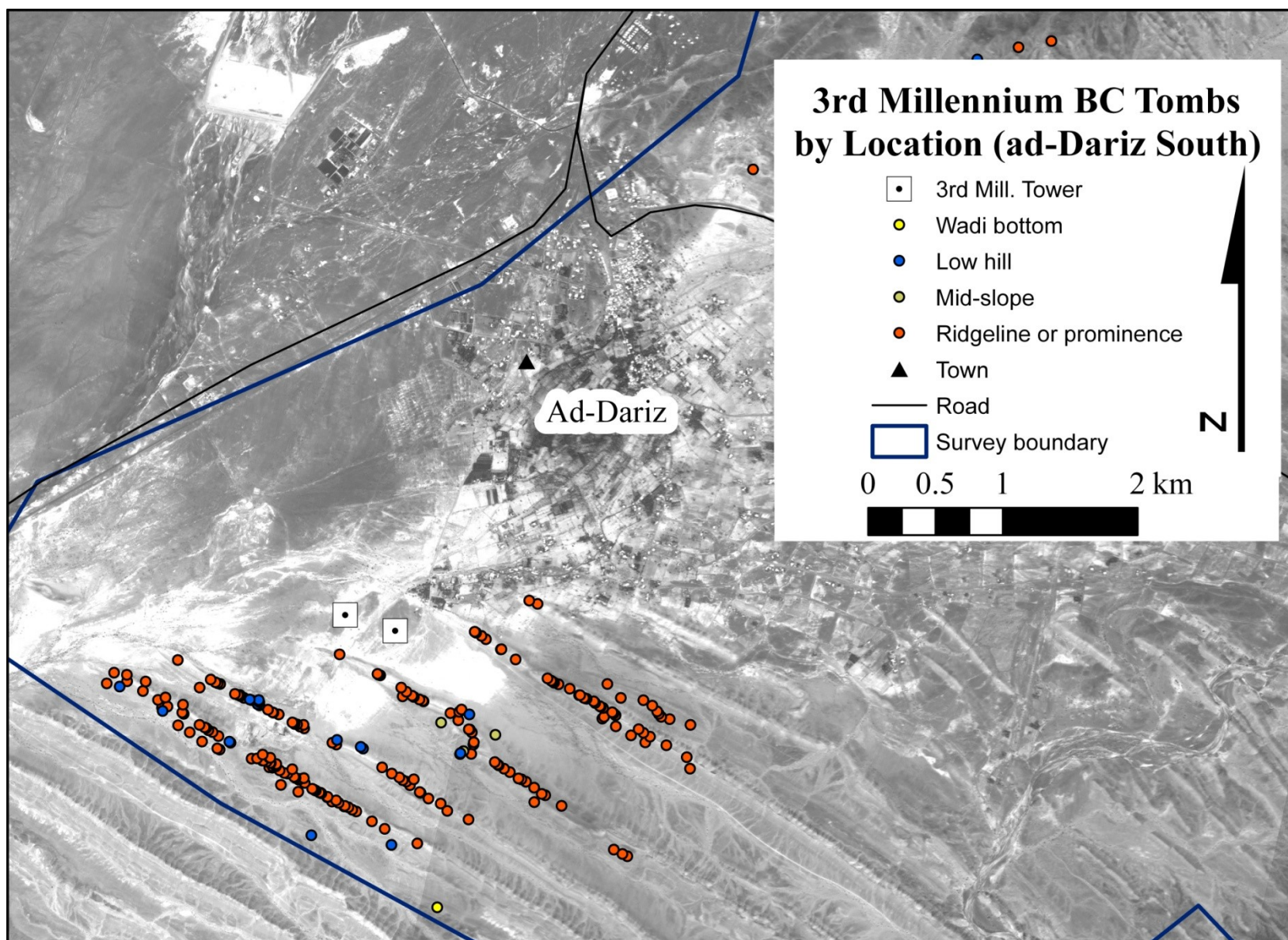


Figure 86. Third millennium features in the ad-Dariz cluster, according to location.

The ad-Dariz North Cluster

Two small clusters of third millennium tombs were located to the northeast of the modern village of ad-Dariz (**Figure 27**). The environmental context for these features is markedly different from that of the ad-Dariz South cluster. The ridges in this area are a combination of the al-Wahrah series, limestone vertical ridges similar to those near Bat and ad-Dariz South, and Pleistocene riverine deposits (i.e., large cobbles). It is also bounded on the northern side by the limestone Jebel Shuwā'ī, boulders of which collect along its base. The area is less likely to be used for agriculture: There is little alluvial silt build-up in that area except in the immediate flood zones. The result is a patchy landscape of bare rock with some scrub, to active flood zones with full-grown trees and scrub. These both make good grazing zones but generally very poor agricultural zones (**Figure 88**).

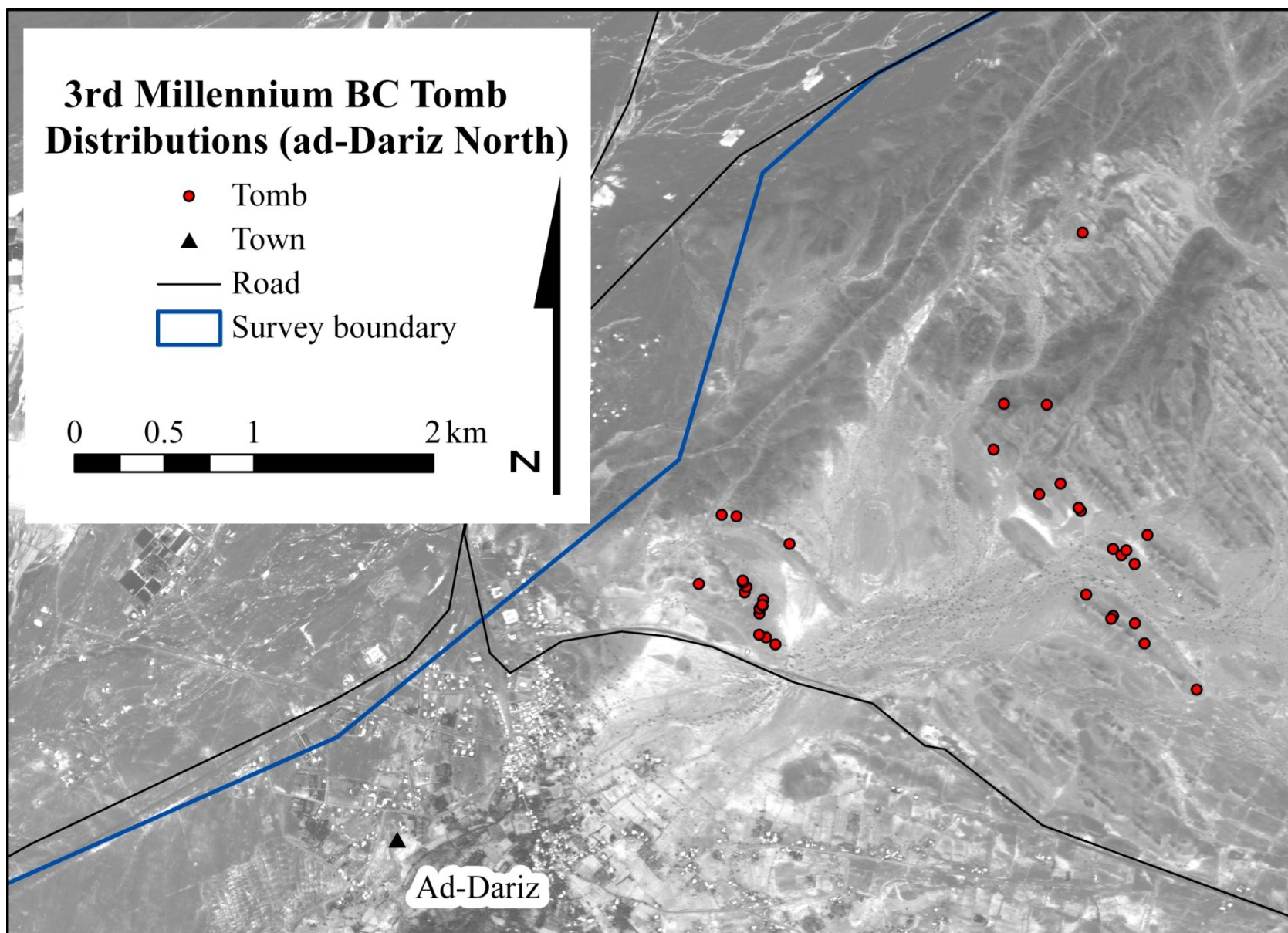


Figure 87. The ad-Dariz North feature clusters.



Figure 88. Ad-Dariz North and Wahrah North landscape, looking north-northwest.

The Bat Cluster

As was argued earlier, the Bat, al-Khutm, and Wahrah clusters can, for the most part, be considered as a single group – or perhaps more accurately, as a major cluster and a hinterland (**Figure 89**). The geological make-up of the southern and northern sides is quite different on each side, which accounts in part for the “messier” distribution of tombs (e.g., there are fewer linear ridgelines north of Bat village). A Pleistocene conglomerate – which surfaces in only a few places but notably under Kasr al-Sleme and Husn al-Wardi – divides the two halves of Bat along the southern side of the wadi plain, near the modern active flood zone. Although the limestone schist in both areas is similar and are similarly vertically shifted, the northern ridges (i.e., surrounding and east of the Bat cemetery) in part contain fewer chert extrusions and have weathered more quickly (**Figure 90**). The result has been gentler hills on the northern side of Bat valley, and far more steeply sloped ridges (visible by their dark red ridgetops) to the south. This has clear implications for the distribution of tombs: in this sense, the Bat cemetery space is unique in occurring both directly adjacent to a seasonally flooding arable plain and on a far gentler landscape than much of its surroundings. No doubt these two characteristics helped to simplify third millennium decision-making in regards to tomb location.

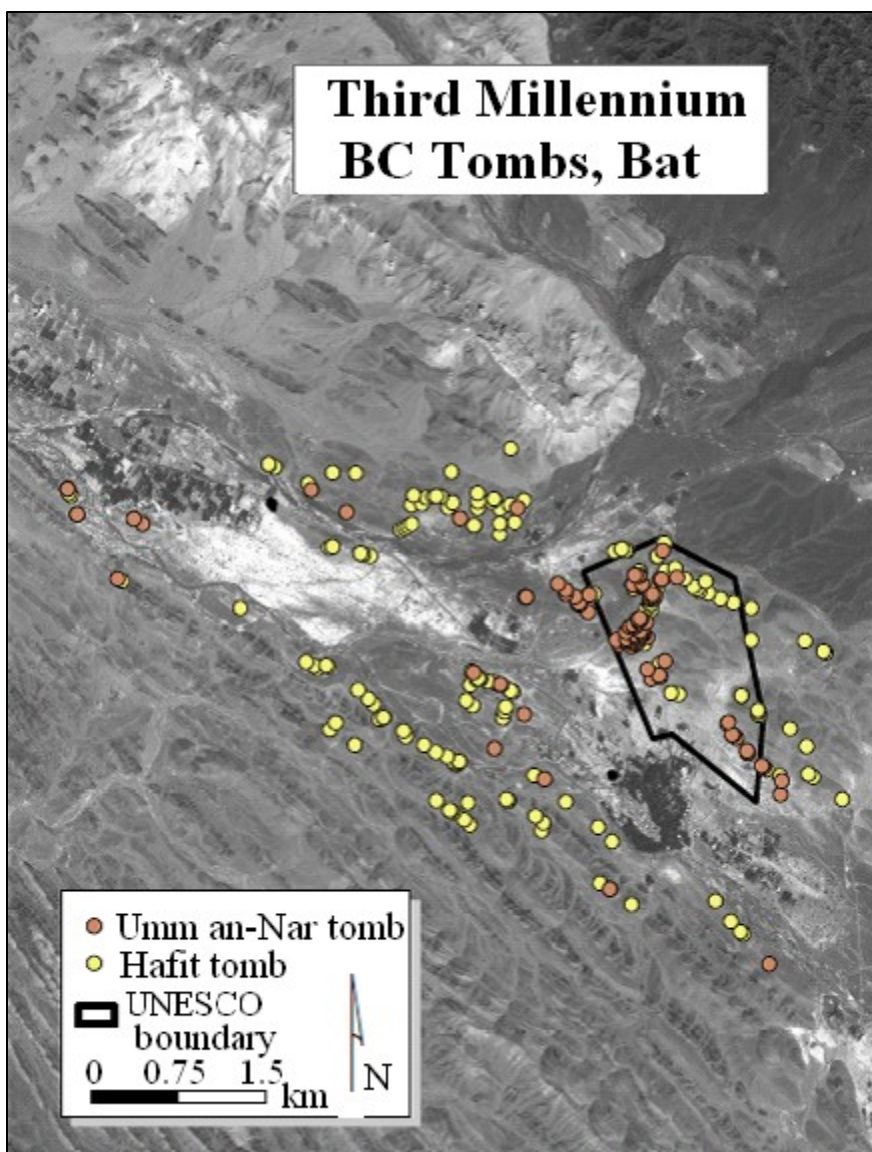


Figure 89. Location of third millennium tombs in the Bat area.

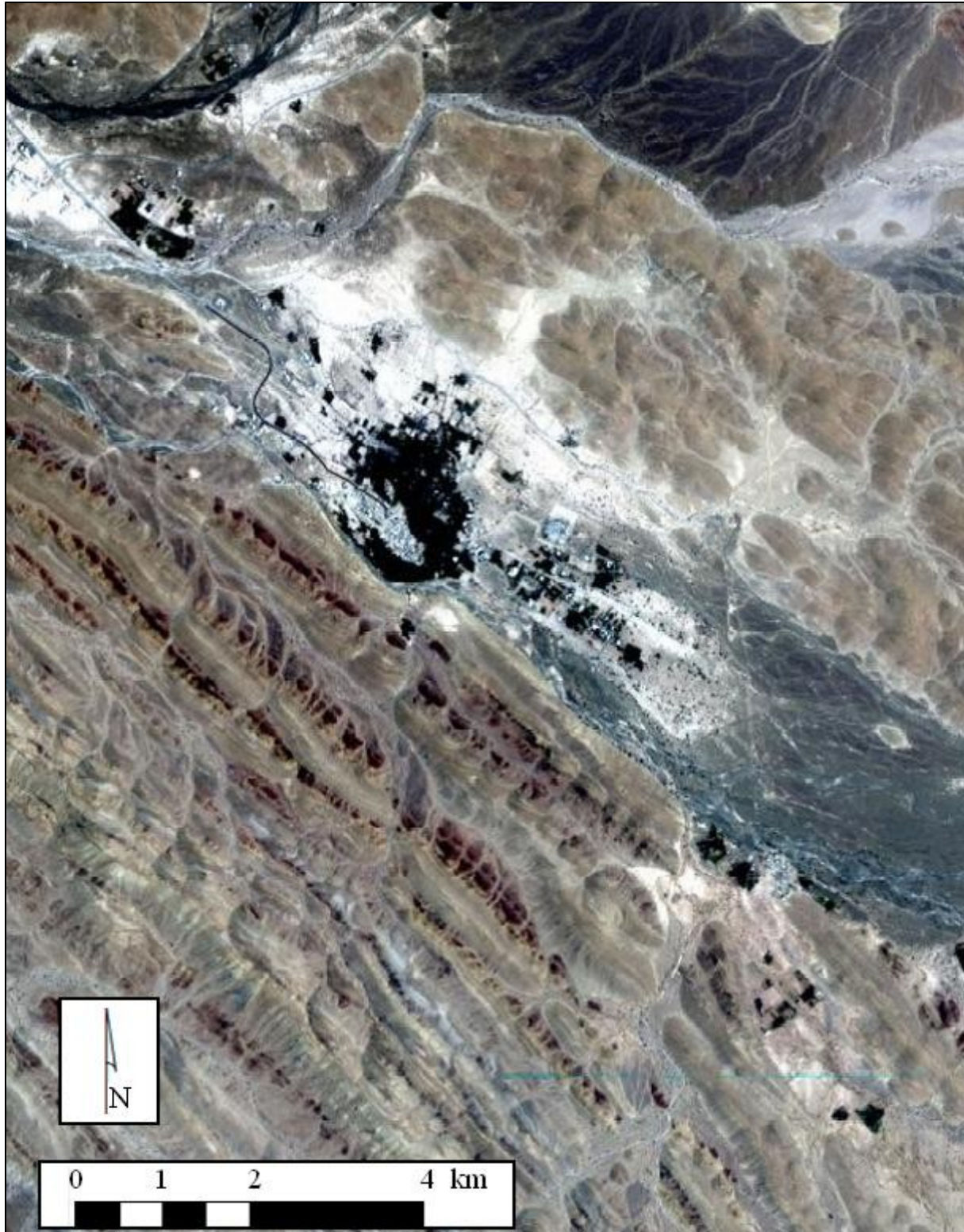


Figure 90. The geology of the Bat area. To the south are red-tipped ridges; to the north are visibly gentler hills.

The Significance of Negative Data

As Hafit tombs are located near several different kinds of resources and therefore mark general access to resources, the opposite must also be true: there should be a noticeable lack of resources visible where **no** Hafit tombs are located. Although it is difficult to quantify, there is a case to be made that **where there are no resources to mark, there are no third millennium tombs**. The notable exception to this is chert. Abundantly available across the bedrock outcropping areas, particularly in the ridges to the south of the Wadi al-Hijr, there is little evidence for third millennium marking of this raw material (although lithic workshops from other periods were noted). As it is by far the most abundant resource in the area – and across much of the al-Hajar piedmont region – it was perhaps unnecessary to mark this local resource. The lithic assemblage collected in association with third millennium features reflects a broad range of cherts, some of which were probably local but others from unknown sources. This is an important area of future research.

Before continuing it is equally important to note the relative distributions of third millennium BC tombs and towers. As has been noted, tombs are found in association with a wide variety of resources which, together, form an integrated subsistence matrix of agro-pastoralism. Towers, on the other hand, are associated only with oases: towers ad-Dariz South 1 and ad-Dariz South 2 near the ad-Dariz oasis; the Wahrah and al-Khutm towers near the al-Wahrah oasis; and all six of the Bat towers within a few hundred meters (at most) of the Bat oasis (see **Figure 40**). In nearly all cases the towers are situated within and surrounded by irrigable land. The two exceptions to this are 1156, which is mere meters away from agricultural fields, and 110980, which overlooks the entire Bat oasis.

Formal Tower Types

In order to understand the towers as a monumental type it is necessary first to determine whether they are, indeed, of one type. It is tempting to group tombs according to one of their most obvious characteristics, but with the knowledge at hand it is unclear which one(s) (**Table 13**).

Table 13. Tower Characteristics.

Tower	location	Material	Central well (poss.)	Ext. structures	Super-structure	Entrance
1147	Wadi plain	Mudbrick, stone	Y	Y	Y	N
110980	Local prominence	Stone	Unknown (N)	Unknown (Y)	Unknown	N
Bat Qalah	Local prominence	Stone	Unknown (Y)	Unknown	Unknown	Unknown
1146	Wadi plain	Stone*	Y	Unknown	Unknown	N
1148	Local prominence	Stone*	Unknown (Y)	Y	Unknown	N
1156	Mid-slope	Stone	Unknown	Y	Unknown	Unknown
1145	Wadi plain	Stone	Y	Y	Y	N
Al-Khutm	Local prominence	Stone	Unknown	Y	Unknown	Unknown
Wahrah Qala	Local prominence	Stone	Unknown	N	Unknown	Unknown
Ad-Dariz South 1	Wadi plain	Stone	Unknown	Unknown	Un-excavated	N
Ad-Dariz South 2	Wadi plain	Stone	Unknown	Unknown	Un-excavated	N

*denotes blocks of the largest size

“Superstructure” refers to the probability that the stone ringwall was originally taller or created a separate superstructure above the current height of the tower. This is based on their surrounding rockfall, which has only been known to have accumulated at Kasr al-Rojoom and Matariya. In both cases large amounts of stone, of similar size and finish as the intact ringwalls, were uncovered during excavation. Only ad-Dariz 1, ad-Dariz 2, and Kasr al-Khafaji have any significant deposition at their bases, and it is known in the case of Kasr al-Khafaji that extensive

remodeling and reuse occurred up through the middle Islamic period. The other towers are both situated in currently developed lands and/or perched on prominences, from which any superstructure fall would have quickly been used for nearby more recent construction. Although their original heights are unknown, it is possible, if not likely, that they were all considerably taller than they currently stand.

Many of the towers have central wells; several others may have wells; but certain others are highly unlikely to be so structured. Of note in this discussion is Tower 1156. It is unusual on a number of counts. It is the only tower to have been built mid-slope, and it was partially deconstructed during the Umm an-Nar period to make space for more rectilinear structures (and therefore presumably settlement). Although it is unlikely that it has a central well (based, in this case, strictly on the immediate hydrogeology), recent excavations by the American-Japanese Bat Archaeological Project have uncovered what may be a stepped system of water channels, ending at the lowest point in a stone-lined cistern (Thornton et al., 2012). Finally, as suggested by its deconstruction during the Umm an-Nar period, Tower 1156 was also a very early monument.

Proposed Tower Chronology

It does not appear, at least at this point, that any one set of characteristics – beyond a 20m-diameter semi-circular base – is held in common by the towers in the study area. Instead, using known tower construction dates it may be possible to develop a tower chronology.

Specifically, we have radiocarbon dates from four of the 11 towers in the survey area: 1145, 1146, 1147, and 1156 (see **Table 7**). These have been published in excavation reports by the American team (Thornton and Mortimer 2012), and their construction and chronology is relatively neat. Dates from levels immediately beneath the mudbrick of the earliest tower, Matariya, date to ca. 3110–2900 (98%) BC (Calib.Rev.5.0.1, 2-sigma). This tower consists of 2–

4 construction phases, probably in relatively short succession. The first two were of mud brick, followed by a stone ringwall construction phase, and finally followed by a ringwall construction of stones ca. twice the size of the earlier (now internal) ringwall stones. The stone-lined central well construction is consistent with the earlier construction periods' style rather than the later phases, suggesting that both it, and the mud brick platform within which it is situated, are early aspects of the tower's construction. The stone ringwall appears to have originally been considerably taller, suggesting that this very early tower may once have been quite impressive.

Tower 1156 is perhaps as old as Matariya (see **Table 7**). As already mentioned, although it is unlikely it had a central well, it may have been associated with water catchment. It was soon abandoned and, more strikingly, restructured as part of the "settlement slope" (Frifelt).

The next oldest towers are Kasr al-Rojoom and Kasr al-Khafaji. Kasr al-Rojoom is still quite tall, and would have been several meters taller (Frifelt). It also has a central well – as does the Kasr al-Khafaji. That the central well in Kasr al-Khafaji was still usable in the medieval Islamic period is a testament to its success as a permanent access point for water.

As these towers progress through time, they begin as mud brick, become stone, and the ringwall stones become continually larger until their surface area is over 1.5 meters square. This suggests an intensification of labor. It is likely that Matariya is unique, and most towers were built as single events.

Towers as Monuments and Resources

Nearly half ($n = 5$) of the towers in the survey region were located on the wadi plain, with an equal number located on prominences. Only 1156, nestled between the settlement slope and the cemetery, is situated mid-slope. One of the towers – 110980 – is very unlikely to have an interior well, or anything functionally to do with water. Of the other ten towers, three (i.e., Kasr al-

Rojoom, Kasr al-Khafaji, and Matariya) are known to have wells; one other (1156) has what may be a water channel around it; another (Husn al-Wardi) has a modern (pump) well; a sixth (Kasr al-Sleme) has surficial evidence of a central well; and the remaining four others (ad-Dariz South 1 and 2, al-Khutm, and Wahrah Qala) are unknowns. Overall there is a probable correlation between water resources and towers.

Of the dated four towers, it is notable that they all have access to water. In addition, with the exception of Tower 1156 – which, notably, was quickly abandoned – the access was to **permanent** water sources. In addition, in at least two of the three known cases, such access would have been quite limited; if the ringwalls of Matariya and Kasr al-Rojoom were as tall as proposed, Matariya would have been ca. four meters tall and Kasr al-Rojoom perhaps as many as five meters tall, raising both considerably from off of the wadi plain. With the current foundations intact, it is possible to assert that **there was no easy access to either monument**.

From admittedly rather meager data, it may be possible to present a picture of the third millennium BC tower as one that, from early on, was strongly associated with restricted access to a – perhaps **the** – permanent water source. With such limited access and such monumental structures, it takes no jump in the imagination to suggest that there would have developed an association of monumental circular stone architecture 20 m in diameter with permanent water. Those who had access to this water – via access to the monument – would have been in one of a limited number of powerful positions. In addition, the association of permanent water – and the significance such a resource would have had in an environment such as Oman’s – with the monument may have outstripped the actual presence of wells. That is, the monument itself may have come to signal resource security **even in the absence of those resources**. If access was, indeed, limited, it is not difficult for the concept of abundance to be maintained within the

monument, particularly if the monument was maintained as another part of that system of abundance. That towers with wells persisted throughout the third millennium suggests that this was, indeed, key to the functional and ideological aspects of the tower as a monument type.

Conclusion

All archaeological features in the survey area are clustered, suggesting that the same areas on the landscape have been reused for the past 5000 and more years. Hafit tombs are the most distinct feature type, both in terms of form and location. They cluster most clearly on ridges, where they can be seen from relatively great distances. Their form suggests that their primary role was to be viewed from those greater distances. Their relatively simple form may have required the combined effort of a small group, but in general would not have required much technological expertise. Hafit tombs are always located near resources, but the resources themselves vary.

Umm an-Nar tombs are located near agricultural land, usually on low plateaus, and nearly always in close proximity to Hafit tombs on ridgetops. Together, this suggests that Hafit tombs were used to mark a variety of resources, and Hafit tombs called upon their proximity to Hafit tombs to lay claim to those same resources. Umm an-Nar construction is considerably finer than that of the Hafit tombs; this, combined with their decreased visibility in comparison to Hafit tombs, suggests that they were intended to be viewed close distances. That Umm an-Nar tombs are frequently located in close proximity to contemporary settlement structures in addition to towers, the effect is one of a constant reminder of Umm an-Nar mortuary ideology.

When relating towers and tombs, towers are always found near tombs, but not necessarily vice-versa. Ad-Dariz North, for example has no tower. It is possible that this is somewhat related to tomb frequency: a tower may only occur at locations where there are great numbers of tombs. However, Wahrah Qala is part of only a small and loosely organized cluster of third millennium

tombs. While this may be somewhat dependent upon pre-historic to modern land use – Wahrah Qala itself was inhabited in recent memory – it is also true that tomb clusters exist outside of the western piedmont (see, for example, Giraud’s (2009) work in the Ja’alan). It is therefore unlikely that tombs correlate directly with the presence of towers.

Summary

Exploratory data analysis made evident the strong general tendency for like features to cluster with like features. Different patterns characterize the different types of monuments and resources. This is much stronger with third millennium tombs than with contemporary towers. Cluster analysis indicates that tombs were highly clustered, and towers were only located in association with groups of tombs (the opposite was not true).

Northeast of the village of ad-Dariz, small clusters of tombs were found. This semi-open landscape, currently pastureland, receives seasonal flooding (sayl). South of ad-Dariz tombs array on the ridgelines to the south and east of two towers. The distance between the furthest tombs and closest tower is less than 2.6 km. Tomb clusters near Bat are made up of a combination of tomb types. Current land use demonstrates that tower wells would have readily accessed ghayl and provided year-round water for oasis agriculture.

In addition, while the majority of tombs were located on resource-deprived locations, they were within 350 m of usable land (usable identified as arable land and pastureland). Pastureland was never associated with towers; only clusters of tombs. In areas where there was no pastureland or arable land, no third millennium BC tombs or towers were found.

Hafit tombs have a different distribution than Umm an-Nar tombs and tend to cluster more. Umm an-Nar tombs are usually found in association with Hafit tombs. Towers are always associated with Hafit and Umm an-Nar tombs, although the opposite is not true. Towers

themselves cluster (this is not statistically significant). Towers are located either on local high points or on wadi plains. Hafit tombs are concentrated on local high points, but located on all other major landforms and elevations. Similarly, Umm an-Nar tombs are concentrated on low plateaus but are located on local high points and mid-slope as well.

CHAPTER EIGHT: INTERPRETATION, SUMMARY, AND FUTURE RESEARCH

At the beginning of this research I asked the following questions about monuments, their relationship to each other, and the ways in which they “triangulate” between landscape, culture, and resources:

1. What are the spatial distributions of third millennium BC monuments in the Wadi al-Hijr?
Do they differ?
2. What are the relationships between tombs, resources, and social inclusion or exclusion?
How do these relationships change over time?
3. How can we account for formal and spatial variation in third millennium BC towers?
4. What is the relationship between towers, resources, and social inclusion or exclusion, as it develops through the third millennium BC? How does this change over time?

Why Mortuary Monuments?

I argue that the third millennium BC tombs of the Wadi al-Hijr served two critical, related roles for the people of ancient Magan: first, they provided the **medium** by which to mark access to a wide variety of disparate resources; and second, they provided the **means** by which social integration was achieved, enacted, and made visible in the world.

Spatial and social maintenance systems are not discrete (Casimir 1992:13). Thus, it is possible for both exclusionary and integrative tendencies to be in play at the same time, particularly if they have social functions at different scales. These two are also responses to regularizing access to different things: while a territory can mark out a space within which lie a variety of different types of land and resources (Dresch 1989:81; Janzen 1986; Wilkinson 1983b), a cemetery space – the “permanent, specialized bounded area” (Goldstein 1981:61) for

the dead – correlates instead to rights over an adjacent resource. We see this in the Hafit period tombs of the Wadi al-Hijr. These tombs cluster spatially and create exclusively mortuary spaces. This research supports current ideas of early third millennium BC mortuary practices which suggest that during the Hafit period, tombs were located near resources. Specifically, tombs were located near a variety of resources, which were of varying importance depending upon the horizontally differentiated sector of society in question. In addition, this research suggests that Hafit tombs are **only** found in association with resources.

Clusters of Hafit tombs are associated (i.e., within a few hundred meters, at most) with crucial and limited resources – of which there are many in the Wadi al-Hijr. These include regular, dependable water sources (both *sayl* and *ghayl*); land situated above flash flooding zones; and arable soil. Collections of resources in different parts of the landscape have different uses in different seasons, but together they form a complementary subsistence system of pastoral and agricultural land use that is successful because of its inter-reliance.

Umm an-Nar period tombs demonstrate continuity with Hafit period tombs through their spatial association with Hafit tomb clusters (i.e., within or on the edges of Hafit tomb clusters). In doing so I argue that the Umm an-Nar period people of the Wadi al-Hijr sought to maintain access to these same resources. Small, exclusive clusters of Umm an-Nar tombs near contemporary quarry sites, which provided access to highly prized white limestone, confirms that the mortuary realm marked a widening social understanding of resources.

Monuments and the mortuary realm provide opportunities for expressions – both ritual and physical – of social integration (Blake 2002; O’Shea and Milner 2002). Hafit period tombs facilitate the inclusion of all members of third millennium BC society in a number of ways. First, the low technology and skill levels necessary for tomb construction – visible through variation in

construction styles – allows for, at least in theory, the participation of all members in monument building. Second, each member of the society could expect to participate in this culture-wide ritual through his or her own eventual death and interment. Even with a relatively low population the occasion of tomb building would have been a regular – perhaps annual – occurrence, providing numerous opportunities across an individual's life and death to participate. These integrative funerary events would have been relatively frequent, and simultaneously universal and personal. Finally, even when not actively participating in the construction of a tomb, Hafit period people created stunning reminders of their universal culture. Although individual Hafit tombs vary in construction technique, the form of the monument is consistent and the number of mortuary monuments is extraordinary. In addition to their development of a distinctive and ubiquitous mortuary form, Hafit people deliberately placed their tombs on highly visible parts of the landscape. Hafit tombs, which are primarily impressive from a distance, seem intended to be seen from afar, thereby signaling social identity to a wide audience. Silhouetted against the sky, these stark monuments would have been potent reminders of the life flourishing below, life made possible through a complex set of relationships.

Hafit tombs signaled a broad, culture-wide access to both group identity and group resources, and these resources were as varied as the strategies undertaken by members of the group. If territory and tribal identity can be deeply entwined, and the purpose of the territory is to mark resources or subsistence practices, it is possible that, where there is no territory to speak of, it is the resource and its exploitation that is the identity-marker. In such a scenario, by choosing a specific way of interacting with the environment, an individual (or group of individuals) links their identity to their subsistence practices, and vice-versa: their subsistence strategies are employed in order to facilitate the maintenance of a specific cultural identity.

In an environmental context such as that provided by ancient Oman, and with a subsistence strategy which seeks to maintain access to shifting and/or unreliable resources over time and space, life is made possible through systems of social access negotiated via monument building and rights to burial. It is crucial that group members know – “know” in the ideological sense – how they will be received as they travel, and for those who remain in a single location that resources will regularly come to them in return.

This is in keeping with Frangipane’s (2007) description of the Halaf culture in northern Mesopotamia. Specifically, Frangipane argues that entire communities were “devoted, at least partially, to certain subsistence activities ... within one and the same socioeconomic and cultural system” (161). It would therefore have been necessary to integrate each group into a regular, stable, cooperative system in order to guarantee exchange and redistribution of both basic and luxury commodities. As in third millennium BC Oman, those cooperative exchange networks form the basis of the entire system. The corollary to this is that there is no need for consistent and defined territories. Howey argues that tribal social organization “predictably organizes dispersed groups, not linked by any hegemony, within defined territories. A defined territory ties groups to a localized, bounded set of resources” (Howey 2006:1). This does not appear to be the case in ancient Oman; it is not necessary that a tribe maintain a territory per se, so long as access to resources is regularized by other means – such as by reciprocity, by seasonal use patterns, or by other means.

In this light, it makes a great deal of sense that later Umm an-Nar tombs should be found “in the shadow of the ancestors,” as Cleuziou and Tosi (2007) describe it. There are numerous elements of Hafit mortuary practices that are retained during this later period and in close proximity to the early practices. The very fact that Hafit tombs were rarely (if ever) disassembled

in the following period for reuse elsewhere suggests that something signaled in the Hafit tombs was still of significance to Umm an-Nar people. Yet, while Umm an-Nar period tombs referenced Hafit mortuary practices, they exhibit some clear breaks from the earlier patterns. Umm an-Nar period tombs do not cluster exclusively, but rather are interspersed with other structures within contemporary settlement. The Umm an-Nar mortuary realm shifts focus from the **creation** of monuments to the monuments *qua* monuments, and thus subsumes the individual participant to the local group. These groups would have been corporate and probably related through kinship. Collective burial, while common enough in the Hafit period, was nevertheless limited in number. During the Umm an-Nar period hundreds of individuals – male and female, and of all ages – were interred in the same tomb and over lengthy periods of time, in some cases several hundred years. Individuals were placed first as primary interments in the tomb, then over time skeletal elements and associated funerary materials were disarticulated and re-aggregated in a variety of ways. As is made clear by the secondary and tertiary manipulation of comingled human remains, the identity of the group in the Umm an-Nar period not only continues to be important, but gains prominence. Small entrances, which were also characteristic of Hafit tombs (when such entrances existed at all), obscured views of the interior of the tomb and again focused attention on the monument and the whole. Individuals are associated with a larger cultural body in death as they were in life.

Nevertheless, the latter half of the third millennium BC shows a shift in mortuary practices, mortuary architecture, and tomb location. Tombs are now, in a word, beautiful: finely crafted facades made from stone at least 3–5 km distant, individually shaped and fitted to the exact specifications of a particular part of a particular tomb. While the number of individuals has increased dramatically, it is probable that the structural and stylistic intensification was equal per

individual to what it had been in the Hafit period. However, while the construction of a Hafit tomb provided opportunities for remembering the greater social whole of which each person was a part, fewer tombs were built during the Umm an-Nar period. On the other hand, these tombs were interspersed within the settlement, where daily life was ongoing; at Bat it is common for an Umm an-Nar tomb to be situated a few meters from a domestic structure. This is in keeping with the finer stylistic developments of the latter half of the third millennium BC; while Hafit tombs were impressive from a distance, Umm an-Nar tombs, as monuments, needed to impress under close scrutiny.

Even as the mortuary **realm** became, literally, closer to home – one wonders about the smell – the mortuary **monument** becomes itself grander and more important. That is, while the ideology is still one of equal access and solidarity in heterogeneity, it is now an ideology that has subtly re-focused on the **ritual structure** – e.g., monument and the rituals surrounding it – rather than on the relationships that underwrote and were underwritten by them.

From this perspective, there is intensification in the mortuary realm that focuses on the façade rather than on the vaguely accessible interior, with the potential for an increasing divide between ideology and daily life.

Why Tower Monuments?

This dissertation argued in Chapter 7 that the Umm an-Nar tower was originally dually a monument and a means of accessing – specifically, a means of limiting access to – *ghayl* (subsurface water). In conjunction with excavations at *Matariya*, recent excavations of tower 1156, also under the American Expedition at Bat (Possehl et al. 2011; Thornton and Mortimer 2012), confirm that all of the towers known to have their beginnings in the Hafit period are associated with regular access to water. In addition, those towers that continued in use through to

the Umm an-Nar period maintain access to *ghayl*, which is the only water source which is consistent year-round rather than seasonally. That is, early tower “success”, measured by its existence **as** a tower, is based on its association with unvarying access to water.

According to Casimir (1992), where a resource such as *ghayl* is spatially limited (i.e., to wells) and relatively predictable, access is more likely to resemble a defense of the space itself. It is possible to see the Umm an-Nar tower as a compromise between two competing strategies of access: on the one hand, the horizontal access signaled by the mortuary realm, and upon which the entire structure of the social system relies; on the other hand, a space as limited and inaccessible as technology and group effort can make it. Instead of guarding the territories in which wells exist – as discussed in Chapter 2, a nearly impossible, endless, and fruitless (not to mention counterproductive) task – the towers have the “convenience” of requiring only infrequent exertions of great, collective effort and limiting access both through their location – within the heart of the contemporary settlement, which itself is surrounded by ancestral monuments – and their very structure.

Chapter 7 also addressed one of the puzzles of third millennium towers: that they seem to have very little in common beyond **being** monuments. In the height of the Hafit period a tower tradition began; first made of mud brick, then later of stone. Over time they increased in monumentality, as measured by the effort needed to build the structure. The tower tradition began around control of wells as access to *ghayl* (i.e., limited and crucial resources). But the monumentality of these features exceeded simple access. These monuments were employed to make statements about those at the top – literally and figuratively. And those on top had access to and control of a limited resource. That is, limited physical (and thereby social) access to monumental structures that were already associated with a crucial resource would make it

possible for the monument itself to be leveraged by sub-groups within the society to gain ascendance. These individuals or groups need not have been directly involved in agriculture, although there is little doubt that the well water would have served that purpose – just as Ibn Khaldûn saw oases as belonging to the *bedw* even though the elite and much of the population were settled.

Why Tomb and Tower Monuments?

A delicate balancing act is a necessary complement to strategies of personal gain in systems of equality: as evidence to the contrary mounts, more and more effort must go into maintaining an ideology of flexibility, independence, and resource predictability. This may act to limit overt or even covert vertical differentiation, but it may also act to “exhaust” the ideological realm: the society (1) continues existing rituals enacting ideologies of social leveling, and also (2) creates new ones that (Kuijt 2001).

And so the balance between tombs and towers continued. Why, then, monuments, and why different types of monuments? Both mark access to resources; in the case of the tomb, participation in the mortuary ritual provides access to the living via resources marked by that dead; in the alternative case, the tower limits access to water through social and physical exclusion. These two different types of monuments simultaneously signal two different types of social ideologies: one in which group members may seek to access and leverage specific resources nodes; and another type of monument in which group members seek to leverage access to specific resources as access to an entire network of resources.

Future Directions

Site Conservation and Management

Documenting feature preservation – creating a system which helps to assess archaeological

feature distributions, significance, and relative state of preservation – is a crucial next step in this work. Not only may it be possible to predict endangered features, it may also be possible to develop a model for archaeological resources of which little is left in situ. It is of highest importance that this be integrated with research agendas. By developing an overarching research plan which includes endangered archaeological resources, research questions and data collection can be directed towards salvage excavations.

Hafit Tomb Construction

Monuments can serve a multitude of purposes and agendas. They can be a “system-maintaining mechanism” (Kaplan 1963:404); they can be employed to solve the “two opposing problems” of the tribal system, that of large-scale integration and local differentiation (O’Shea and Milner 2002:201). Groups of mortuary monuments can mark access to resources (Goldstein 1981), and group burials can mark social solidarity and group identity (Chesson 1999). In environments such as that of third millennium BC Oman, where we would expect to see large-scale integration in order to maintain access to disparate and patchily distributed resources, we can also expect local variation. Specifically, **local** traditions of tomb construction should vary across space. While the broadest level of tomb signaling is one of universality, we can expect that more intimate studies of the tomb clusters should provide different construction styles and local perspectives of identity and landscape.

Tomb Typologies and Spatial Relationships

The question of whether there is any significance to the relationship between towers and the “transitional” tomb type needs further study – as does the development of either a finer tomb seriation or finer spatial differences between contemporary tombs. I propose that more research on Umm an-Nar tomb layout, particularly in relation to isotopic and genetic studies, will go far to helping us to understand variation within cemeteries and between tombs. If the heuristic

divide between Hafit and Umm an-Nar is removed, what would be the result?

Hafit Period and Umm an-Nar Period Tomb Membership

The relationship between tomb membership and group membership is an important one. I have proposed that Hafit tomb membership is based solely on group membership. Others (e.g., Cleuziou and Tosi 2007) have proposed that Hafit tombs were distinct corporate units, and that the change in mortuary monuments in the Umm an-Nar period demonstrates a shift towards a larger corporate identity. The two hypotheses are not exclusive, but a study of relatedness between and within a cluster of tombs from the Hafit period, and another from the Umm an-Nar period, would be useful in a number of ways. First, it would provide comparability in space if not in time. At the moment tomb excavations have been extensive and opportunistic; while there are good reasons for this, a new, intensive study – particularly one that takes advantage of previous and ongoing research – is necessary in order to gain an understanding of the communities that made up specific third millennium BC settlements. Second, and more generally, it will allow us to capture what are probably very subtle differences between individuals by providing a baseline for comparability.

Integration of the Mortuary Realm

Interactions between the maritime, pastoral, and agricultural communities probably varied across a number of axes, from temporal (seasonally) to spatial (scalar). While most individuals living in a particular location at a particular time are likely to have been “local” – in the sense that their primary resources were nearby – a few individuals should be utilizing non-local resources. Gregorička (2011) found this pattern in the diets of Umm an-Nar individuals interred on the northern Oman Peninsula. A similar study of interments at a major interior third millennium BC oasis such as Bat would provide an important complement.

Tower Contemporaneity

While this research has teased apart the change in towers over time, the question of tower contemporaneity is crucial to understanding local interactions. The water table at ad-Dariz south is relatively high and accessible across much of the area (Bowen-Jones 1978); why is it, then, that the only two (extant) towers in that area are a mere 300 m apart? Is this an indication of two different groups providing exclusive access to the same resource, or is it a matter of one tower waxing as the other waned?

Tower Function

It is difficult to support the idea that some towers provide access to *ghayl*, and other towers provide access to... nothing. Were these other towers used for surplus storage? Or were they, as has been suggested to me by numerous Omani acquaintances, the houses of elites much like modern sheikhs?

Communities of Comparison

There are clear differences between the distribution of third millennium features at ad-Dariz South and at Bat. One hypothesis, supported here, is that much of the Umm an-Nar archaeological signature is either buried under alluvium or removed (by natural or human means). A second hypothesis is that ad-Dariz South is a very different distribution. A third hypothesis is that there is scalar and/or edge distortion: ad-Dariz South may be a corner of a different or simply larger distribution of third millennium features that is confusing because it is fragmentary. Geophysical survey and hydrogeological studies, already planned for the next upcoming seasons, may help to understand this part of the study area better.

Resource Identification and Regional Study

As culturally important resources shift over time between the Hafit and Umm an-Nar periods, what distinctions can be made between critical resources and culturally significant resources? Comparing the development of oasis and non-oasis sites and social signatures may help to

confirm or problematize this argument, that differential access to *ghayl* through the towers provided opportunities for advancement of a sub-sector of the group (whether or not at the expense of others). Oasis sites with similar numbers of towers are few and far between, but ongoing work in the Bahla and Bisya-Salut areas will go far to refining our understanding of third millennium BC monuments on the Oman Peninsula. Since scale is so critical to understanding the relationships posited here, it is important to aggregate comparable survey data across quite a large portion of Oman if we expect to best understand the relationships between different people doing different things within the same long-distance integrated system. Understanding local geomorphological and hydrogeological constraints is an important aspect of this, which should be equally emphasized if we intend to understand the ways in which ancient people used their environment, and the cultural actions resulting in the feature distributions evident in the Hijr Valley.

Maximizing Negative Data

Maximum entropy (Maxent) modeling is a general-purpose model for making inferences from incomplete information (Phillips et al. 2006). This is assessed based on the difference between a feature's "fundamental niche" – the set of all conditions that act as parameters for **potential** locations for that feature type – and the subset of the fundamental niche that an archaeological feature type actually occupies. If the realized niche and the fundamental niche do not fully coincide, then the modeling algorithm is missing specific characteristics that help to fully describe the feature type's fundamental niche ("locational suitability" may be substituted here). In addition, Maximum Entropy (Maxent) models make possible the differentiation between suitability in terms of data variables – what Phillips et al. (2006) call ecological space – and suitability in terms of geographic space. This may be particularly useful in a highly fragmented and mosaicked landscape such as that of the piedmontane region of the Oman

Peninsula.

Advancing Archaeological Survey Potential in Northern Oman

More and more high-resolution satellite imagery is becoming available for public use the world over. The use of this imagery as a tool for identifying archaeological features is ongoing (e.g., Beck et al. 2007; Deadman 2012), but each geographic region has its own unique characteristics and therefore challenges and advantages. This research is part of a larger attempt to explore new ways of evaluating features on the landscape remotely. Ongoing research with Yasuhisa Kondo (Tokyo Institute of Technology) in this and neighboring regions will provide a baseline for understanding the relationship between pedestrian and satellite-aided archaeological prospection.

What Lies Ahead

Perhaps most key to our understanding of the Hafit and Umm an-Nar periods is an increased understanding of the fourth and second millennium cultures that bookend them. In order to understand the **tensions** present between Umm an-Nar tombs and towers it is necessary that we explore its **resolution**. This is to be found first and foremost in studies of the Wadi Suq period. The first step in this direction is a systematic look at Wadi Suq settlement in north-central Oman.

What Lies Before and After

If it is true that certain groups are benefiting from access to *ghayl* more than other groups, would this be marked in other parts of the archaeological record. As restrictions on access, or control of exchange of goods, increases it is likely that social stratification will increase (Lancaster and Lancaster 2002). This restriction, if it occurs, should be visible in trade and exchange networks. Though useful, this is made difficult by the dearth of excavated third millennium settlement sites. Plans to locate and excavate settlement related to Kasr al-Khafaji will greatly increase the little that is known about third millennium BC settlements.

Social stratification is also an outcome of redistributive (as opposed to reciprocal) resources. If such redistribution was occurring we should be able to identify it archaeologically at Bat. For groups in which stability, alliances, and exchange are maintained through heterogeneity in production according to social units, specialization and differentiation may act as catalysts for structural change (Johansen et al. 2004:52). These may be located in the prestige structure or even in gender differences (Crown and Fish 1996).

Monuments and Identity

Since the concept of identity and the idea of a territorial social group are closely linked, it is possible to reflect on the cultural homogeneity and heterogeneity of the Hafit and Umm an-Nar periods in Oman. Specifically, if “the ideas of ruling and access to resources were not about exclusive control and power ... but rather about the provision of ‘peace’ through the expression of individual autonomy, and the defense of these moral attributes as tribes” (Lancaster and Lancaster 1992a:164), then monuments have an important role to play in our understanding of past social relations.

Summary

This research sought to understand the ways in which a culture employs different types of monuments. As a major part of the landscape the monument can be used to link people to places, people to resources, and people to people – and the employment of different types of monuments allows for people to highlight different kinds of relationships. In the case of third millennium BC Oman I argue that mortuary monuments had an important role to play as mnemonics of social integration, whether at the local or the regional scale. On the other hand, the tower monuments were employed to leverage certain groups over others. Both types of monuments triangulate between people and resources, balancing tensions between environments, individuals, kin and

corporate groups. While it is certain that further research will refine these relationships, the significance of third millennium BC monuments in the Wadi al-Hijr lies in their employment as bold, broad, social statements. These statements are repeated and patterned. Following Goldstein, I argue that “the most profitable way to begin a landscape analysis is to take note of basic visual patterns” (1981:67). For the third millennium BC monuments of the Wadi al-Hijr, this research contributes to that beginning.

APPENDICES

APPENDIX A

Gazetteer of Archaeological Resources

Table 14. Gazetteer of Archaeological Resources.

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100001	472362	2573169	Tomb	-	None	Poorly preserved.
100002	472348	2573170	Tomb	-	None	Roof collapsed.
100003	472340	2573199	-	-	None	Abuts rock outcrop.
100004	472376	2573159	Tomb	Iron Age	None	Honeycomb series of chambers.
100005	472391	2573156	Tomb	-	None	Robbed out and/or reuse make this difficult to study.
100006	472403	2573157	Tomb	-	None	Probably 100006 and 100007 have a chamber tombs b/w them.
100007	472406	2573153	Tomb	-	None	Probably 100006 and 100007 have a chamber tombs b/w them.
100008	472419	2573150	Tomb	-	None	Little preserved.
100009	472452	2573144	Tomb	-	None	-
100010	472464	2573138	Tomb	-	None	-
100011	472468	2573130	Tomb	3rd Mill. BC	Bone; Beads	Destroyed and stones robbed out.
100012	472460	2573134	-	-	None	Destroyed and stones robbed out.
100013	472482	2573136	-	-	Lithic	-
100014	472477	2573130	-	-	None	Possible reuse for Wadi Suq-Iron Age tombs. Mostly intact.
100015	472481	2573121	-	-	Lithic	Stones removed.
100016	472377	2572717	-	-	None	-
100017	472267	2572387	-	-	None	-
100018	472254	2572373	Tomb	-	Lithic	Lithics scattered across the entire ridge associated with this feature.
100019	472272	2572363	-	-	Lithic	Lithics scattered across the entire ridge associated with this feature. Lots of stone removal

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100020	472277	2572358	-	-	Lithic	Lithics scattered across the entire ridge associated with this feature.
100021	472287	2572353	-	-	None	Roofing stones present but tomb not intact. Lithics scattered across the entire ridge associated with this feature.
100022	472298	2572359	-	-	None	Lithics scattered across the entire ridge associated with this feature.
100023	472312	2572349	-	-	None	Probably intact interior.
100024	472316	2572350	Tomb	Hafit	None	Roofing stones still present. Lithics scattered across the entire ridge associated with this feature.
100025	472361	2572311	-	-	None	Construction made use of vertical bedrock. Lithics scattered across the entire ridge associated with this feature.
100026	472370	2572309	-	-	None	Lithics scattered across the entire ridge associated with this feature.
100027	472379	2572303	Tomb	Hafit	None	Intact tomb; in relatively good condition.
100028	472388	2572297	-	-	None	Probably collapsed in on itself. Lithics scattered across the entire ridge associated with this feature.
100029	472385	2572291	Tomb	Hafit	None	One side of this tomb is missing (only ~0.4m tall and mostly soil). Corbelled roofing on intact side.
100030	472406	2572288	Tomb	Hafit	None	Lithics scattered across the entire ridge associated with this feature.
100031	472406	2572287	Tomb	Hafit	None	Lithics scattered across the entire ridge associated with this feature.
100032	472404	2572300	-	-	None	-
100033	472399	2572304	-	-	Lithic	Lithics scattered across the entire ridge associated with this feature.
100034	472420	2572305	Tomb	Hafit	None	A "double" tomb with feature 100035 (to NE)

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100035	472419	2572308	Tomb	Hafit	Ceramic	A "double" feature with 100034 (to SW). Mostly intact; Jemdet Nasr sherds found in wall rubble.
100036	472492	2573110	Tomb	-	None	-
100037	472490	2573104	-	-	None	-
100038	472504	2573098	Tomb	3rd Mill. BC	None	Mostly intact. Walls are visible.
100039	472512	2573092	Tomb	-	None	-
100040	472517	2573089	-	-	None	Stone removal makes renders the outline indistinguishable but interior is probably intact.
100041	472520	2573090	-	-	None	-
100042	472530	2573086	Tomb	Hafit	None	-
100043	472545	2573075	Tomb	Umm an-Nar	None	Third millennium tomb with central dividing wall.
100044	472585	2573025	Tomb	Hafit	None	In good condition.
100045	472592	2573024	Tomb	Hafit	Lithic; Bone	This feature is completely gone; it is only visible because of the artifact cluster, a very small rise, and a stone circle flush with the ground.
100046	472598	2573021	Tomb	Hafit	None	-
100047	472607	2573019	Tomb	Hafit	None	A partially collapsed doorway is visible.
100048	472622	2573021	Building(s)	Hafit	Lithic; Bone	This feature resembles a miniature circular tower base: only 1 stone course tall; the South and West sides are relatively intact. This has a thick wall with large blocks and a central circular void ca. 1 m in diameter.
100049	472577	2572974	-	-	None	There is little distinctive about this feature of stones with fewer in center; a possible tomb.
100050	472571	2573015	Tomb	Hafit	None	Feature exterior walling was reused as a windbreak.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100051	472555	2573026	-	-	None	-
100052	472469	2573025	Tomb	3rd Mill. BC	None	Feature has a possible central wall.
100053	472457	2573026	-	-	None	-
100054	472449	2573029	-	-	None	More recent building on top of and abutting (on E side) tomb.
100055	472439	2573035	-	-	None	Possible tomb.
100056	472419	2573047	-	-	None	Feature is collapsed.
100057	472413	2573053	Tomb	3rd Mill. BC	None	Considerable stone robbing.
100058	472496	2572968	-	-	None	-
100059	472499	2572963	-	-	None	-
100060	472506	2572964	-	-	None	-
100061	472518	2572966	Tomb	Hafit	None	Tomb, fairly intact.
100062	472479	2572994	-	-	None	-
100063	472520	2572890	Tomb	3rd Mill. BC	Lithic	-
100064	472481	2572833	Tomb	Hafit	None	Modern digging in feature center.
100065	472537	2572792	Tomb	Hafit	Lithic	This tomb has several nice exterior walls visible (at least 2).
100066	472592	2572819	-	-	Lithic	-
100067	472595	2572827	-	-	None	-
100068	472607	2572825	Tomb	3rd Mill. BC	None	Multi-chambered tomb, now in poor condition.
100069	472626	2572859	Building(s)	-	Lithic; Bone	Rectangular building, with other probable buildings nearby (n = 4).
100070	472679	2572972	-	-	Lithic	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100071	472667	2572997	Tomb	Hafit	None	This feature is in good condition, with its ringwall visible to the South and East.
100072	472678	2572995	Tomb	-	None	-
100073	472722	2572993	Tomb	Hafit	None	Feature in good condition.
100074	472731	2572987	Building(s)	3rd Mill. BC	Ceramic	This is a possible tomb, now completely gone: the circular wall foundation is visible on South and West sides only.
100075	472737	2572983	Tomb	Hafit	None	Feature possibly undisturbed.
100076	472777	2572975	Tomb	Umm an-Nar	None	-
100077	472776	2572969	-	3rd Mill. BC	None	This feature is made of unusually large stone blocks.
100078	472782	2572966	Tomb	Hafit	None	-
100079	472865	2572918	Tomb	Hafit	None	-
100080	472886	2572913	Tomb	Hafit	None	-
100081	472923	2572883	-	-	None	This feature is a "pavement" -- flat stones set into earth -- in a ridge saddle.
100082	472671	2572829	-	-	None	Stone robbing make this feature difficult to intepret.
100083	472689	2572822	-	-	None	Stone robbing make this feature difficult to intepret.
100084	472690	2572814	-	-	None	Stone robbing make this feature difficult to intepret.
100085	472699	2572811	-	Historic	Ceramic	Stone robbing make this feature difficult to intepret.
100086	472716	2572804	-	-	None	Stone robbing make this feature difficult to intepret.
100087	472722	2572804	-	-	None	Stone robbing make this feature difficult to intepret.
100088	472737	2572799	-	-	None	Stone robbing make this feature difficult to intepret.
100089	472744	2572796	-	-	None	Stone robbing make this feature difficult to intepret.
100090	472741	2572802	-	-	None	Stone robbing make this feature difficult to intepret.
100091	472766	2572809	-	-	Bone	Stone robbing make this feature difficult to intepret.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100092	472782	2572804	-	-	None	Tomb is partially destroyed and stones removed.
100093	472813	2572785	-	-	None	Tomb is partially destroyed and stones removed.
100094	472824	2572782	Tomb	Hafit	None	Feature is collapsed in on itself but its interior is possibly intact.
100095	472801	2572752	-	-	None	-
100096	472813	2572737	Tomb	Hafit	None	-
100097	472802	2572711	-	Modern	None	Stone robbing and reuse makes this feature difficult to interpret.
100098	472796	2572684	Tomb	Hafit	None	-
100099	472792	2572676	-	-	None	-
100100	472798	2572674	-	-	None	-
100101	472537	2572605	Building(s)	Hafit-Umm an-Nar	Lithic	This feature is flat (no stone-on-stone); this is possibly a circular pavement with a ca. 2 m-void in its center. It is made up of large flat stones, possibly making up one circular or semi-circular wall.
100102	472727	2572422	Tomb	Umm an-Nar	None	-
100103	472880	2572758	-	-	None	-
100104	472878	2572734	Tomb	3rd Mill. BC	None	-
100105	472927	2572717	Tomb	Wadi Suq-Iron Age	Ceramic; Metal; Shell	This tomb is partially disturbed but probably intact.
100106	472954	2572729	-	-	None	-
100107	472967	2572722	-	-	None	There is a possible rectilinear structure near this feature.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100108	472980	2572714	Tomb	Umm an-Nar	Ceramic; Bone	-
100109	472988	2572710	Tomb	-	None	-
100110	473002	2572705	-	-	None	-
100111	473029	2572693	Tomb	Wadi Suq	None	This feature consists of a mound of pebbles and stone fragments with some blocks.
100112	473037	2572670	-	-	None	-
100113	473071	2572682	-	-	None	-
100114	472878	2572535	Building(s)	-	None	This feature is a large rectangular building and platform on a low rise on the West end of a ridge. It is possibly Iron Age.
100115	472931	2572480	Tomb	Iron Age	Ceramic; Shell	-
100116	472948	2572456	Tomb	3rd Mill. BC	Ceramic; Lithic	Feature in good condition.
100117	472966	2572469	Tomb	Iron Age	Ceramic	-
100118	473004	2572477	-	-	Bone	-
100119	473016	2572479	-	-	None	This feature is potentially a tomb but very disturbed.
100120	472994	2572455	-	Wadi Suq	None	This tomb is probably Wadi Suq.
100121	472983	2572436	Tomb	Iron Age	Ceramic	-
100122	472997	2572436	Tomb	Iron Age	Ceramic	This feature is a tomb but with a possibly later addition (or two chambers).
100123	473025	2572412	Tomb	Iron Age	Ceramic; Bone; Stone vessel	-
100124	473056	2572387	-	-	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100125	473073	2572379	Tomb	Wadi Suq	None	-
100126	473082	2572368	-	-	None	Feature has been disturbed.
100127	473088	2572360	-	-	None	Poorly preserved.
100128	473042	2572342	-	-	None	-
100129	473028	2572349	-	-	None	Feature is probably intact beneath the reuse.
100130	473013	2572354	Tomb	Wadi Suq	None	-
100131	472998	2572378	Tomb	Wadi Suq	None	-
100132	473001	2572385	Tomb	Wadi Suq	None	-
100133	473002	2572389	Tomb	Wadi Suq	None	-
100134	473000	2572393	Tomb	Wadi Suq	None	-
100135	473016	2572389	Tomb	Wadi Suq	None	-
100136	472960	2572386	Tomb	Wadi Suq	None	This feature is made up of small stones or pebbles over larger (unaligned) stones.
100137	472988	2572351	Tomb	Iron Age	None	-
100138	472940	2572178	Tomb	-	None	-
100139	472933	2572182	-	-	None	-
100140	472914	2572181	-	-	None	-
100141	472903	2572181	Tomb	-	None	-
100142	472220	2572389	Tomb	Hafit	None	-
100143	472206	2572404	-	-	None	-
100144	472162	2572426	-	-	None	Poorly preserved.
100145	472131	2572447	-	-	None	-
100146	472121	2572452	Tomb	Hafit	None	-
100147	472115	2572461	Tomb	-	None	Feature is mostly intact.
100148	472160	2572485	-	-	None	-
100149	472074	2572485	-	-	None	Feature is probably intact.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100150	472030	2572517	-	-	None	-
100151	471983	2572528	Tomb	-	None	-
100152	471962	2572524	Tomb	Hafit	None	-
100153	471939	2572544	Tomb	-	None	Feature is disturbed but probably intact. There is a possible rectangular platform or building foundation to the southwest.
100154	471940	2572570	Tomb	Hafit	None	-
100155	471919	2572597	Tomb	-	None	Feature is probably intact.
100156	471758	2572759	-	-	None	-
100157	471773	2572688	Tomb	Hafit	None	Considerable stone removal/robbing.
100158	471778	2572687	Tomb	Hafit	None	-
100159	471740	2572667	Tomb	Hafit	None	-
100160	471733	2572674	Tomb	Hafit	None	Feature is possibly intact.
100161	471728	2572713	-	-	None	-
100162	471708	2572755	-	-	None	Feature is probably intact but in poor condition.
100163	471692	2572780	Tomb	3rd Mill. BC	None	-
100164	471681	2572804	Tomb	Hafit	None	-
100165	471656	2572836	-	-	None	Poorly preserved.
100166	471639	2572851	Tomb	Hafit	None	-
100167	471664	2572855	-	-	None	-
100168	471583	2572909	-	-	None	-
100169	471552	2572926	Tomb	Hafit	None	-
100170	471570	2572956	-	-	None	Poorly preserved.
100171	471526	2572995	-	-	None	Poorly preserved.
100172	471499	2573027	-	-	None	-
100173	471628	2572595	-	-	None	Poorly preserved.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100174	471654	2572566	-	-	None	Very poorly preserved.
100175	471690	2572513	Tomb	-	None	Poorly preserved.
100176	471723	2572482	-	-	None	-
100177	471434	2572635	-	-	None	Poorly preserved.
100178	471356	2572642	Tomb	Hafit	None	-
100179	471295	2572596	Tomb	-	None	-
100180	471309	2572585	Tomb	Hafit	None	This feature is probably intact.
100181	471334	2572473	Tomb	3rd Mill. BC	None	-
100182	471351	2572457	-	-	None	Feature is probably intact but in poor condition.
100183	471416	2572469	-	-	None	-
100184	471522	2572452	Tomb	Hafit	None	-
100185	471604	2572407	-	Hafit	None	Feature has collapsed in on itself but is probably intact.
100186	471583	2572291	-	-	None	Feature has collapsed in on itself but is probably intact.
100187	471892	2572277	-	-	Lithic	Feature has collapsed in on itself but is probably intact.
100188	471972	2572207	-	-	None	-
100189	471949	2572229	-	-	None	-
100190	472498	2571954	Tomb	Hafit	None	-
100191	472409	2571932	-	-	None	-
100192	472392	2571956	-	-	None	-
100193	472378	2571974	-	-	None	-
100194	472301	2571997	-	-	None	-
100195	472157	2572089	-	-	None	-
100196	472045	2572151	-	-	None	Feature has collapsed in on itself but is probably intact.
100197	472011	2572137	-	-	None	-
100198	472102	2572056	-	-	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100199	472225	2571971	Tomb	Hafit	Bone	This feature has a large diameter and is intact except for some (animal) digging in center.
100200	472299	2571917	-	-	None	-
100201	472338	2571886	Tomb	Hafit	None	-
100202	472351	2571875	Tomb	Hafit	None	-
100203	472374	2571868	Tomb	Hafit	None	-
100204	472383	2571857	-	-	None	The feature has a potentially intact interior but some or most of the ringwall has been removed.
100205	472416	2571834	Tomb	-	None	-
100206	472463	2571804	Tomb	Hafit	None	This feature is in very good condition; ashlar blocks are visible at its base.
100207	472509	2571826	-	-	None	-
100208	472513	2571764	Tomb	Hafit	None	-
100209	472592	2571679	-	-	None	-
100210	472732	2571642	-	-	None	-
100211	472683	2571685	Tomb	-	None	-
100212	472649	2571753	-	-	Lithic	-
100213	472644	2571767	-	-	None	-
100214	472638	2571774	-	-	None	-
100215	472991	2572171	Tomb	-	None	Feature has seen lots of disturbance in its center.
100216	473003	2572084	-	-	None	-
100217	473067	2572187	Tomb	Hafit	Ceramic; Bone	This feature has been disturbed.
100218	473057	2572193	-	-	None	-
100219	473176	2572248	-	-	Ceramic	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100220	473157	2572156	Tomb	Umm an-Nar	Ceramic	This is a third millennium (Umm an-Nar) tomb with a Wadi Suq tomb built on top and its outer skins removed.
100221	473150	2572147	Tomb	Wadi Suq	None	-
100222	473164	2572151	Tomb	Wadi Suq	None	-
100223	473343	2571960	Tomb	Hafit	None	This feature is probably a Hafit tomb with Wadi Suq reuse.
100224	473369	2571943	Tomb	-	None	This feature is probably a Hafit tomb with Wadi Suq reuse.
100225	473389	2571961	Tomb	Iron Age	None	-
100226	473370	2571992	-	-	None	-
100227	473415	2571916	Tomb	3rd Mill. BC	None	-
100228	473591	2571775	-	Modern	None	This feature is poorly preserved. It is surrounded (to the North and East) by Wadi Suq tombs.
100229	473620	2571743	Tomb	Hafit	None	This feature is poorly preserved. It is surrounded (to the North and East) by Wadi Suq tombs.
100230	473638	2571722	-	-	None	This feature is poorly preserved. It is surrounded (to the North and East) by Wadi Suq tombs.
100231	473645	2571715	-	-	None	-
100232	473657	2571700	Tomb	Modern	None	-
100233	473740	2571620	Tomb	Hafit	None	-
100234	473959	2571453	-	-	None	-
100235	473904	2571076	Tomb	Hafit	None	-
100236	473767	2571186	Tomb	-	None	-
100237	473731	2571201	-	-	None	-
100238	473720	2571209	Tomb	Hafit-Umm an-Nar	None	Poorly preserved.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100239	473635	2571261	Tomb	Hafit	None	Feature is mostly intact, although there is evidence of exterior stone removal.
100240	473331	2571552	Tomb	Iron Age	Ceramic	Poorly preserved.
100241	473350	2571573	-	-	None	-
100242	473190	2571667	-	-	None	-
100243	473237	2571687	-	-	None	The northern half of this feature is completely destroyed; the south half resembles a tomb.
100244	473134	2571714	Tomb	Hafit	None	-
100245	473141	2571744	-	-	None	-
100246	473149	2571778	Tomb	Hafit	None	Small stones appear to have been "sprinkled" over a rebuilt top part of tomb and has therefore probably been reused in the Wadi Suq period.
100247	473079	2571835	Tomb	Hafit	None	Small stones appear to have been "sprinkled" over a rebuilt top part of tomb and has therefore probably been reused in the Wadi Suq period.
100248	473023	2571828	-	-	None	-
100249	472888	2571979	Tomb	Wadi Suq	None	Evidence of outer large stone removal from this feature, which has possibly been reused in the Wadi Suq period.
100250	472851	2571971	Tomb	Hafit	None	Stone removal has made this feature clear in plan.
100251	472845	2571971	Tomb	Hafit	None	Stone removal has made this feature clear in plan.
100252	472840	2571972	Tomb	Hafit	Ceramic	Stone removal has made this feature clear in plan.
100253	472826	2571984	Tomb	Hafit	None	Stone removal has made this feature clear in plan.
100254	472800	2572003	-	-	None	Stone removal has made this feature clear in plan.
100255	473033	2571259	-	Hafit	None	Poorly preserved.
100256	474492	2571232	Tomb	-	None	Poorly preserved; only stones set flush into soil in circle are evident.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100257	474498	2571228	Tomb	-	None	Poorly preserved; only stones set flush into soil in circle are evident.
100258	474507	2571221	-	Wadi Suq	Ceramic	Poorly preserved; only stones set flush into soil in circle are evident.
100259	474510	2571217	-	-	None	Poorly preserved; only stones set flush into soil in circle are evident.
100260	474542	2571185	-	-	None	Stone robbing and/or reuse make this difficult to study.
100261	474547	2571180	-	Iron Age	Ceramic	Stone robbing and/or reuse make this difficult to study.
100262	474614	2571117	-	-	None	Stone robbing and/or reuse make this difficult to study, but possibly Umm an-Nar.
100263	474621	2571110	-	-	None	Poorly preserved; modern cairn has been built atop.
100264	474627	2571107	Tomb	Hafit	None	Poorly preserved.
100265	474661	2571062	-	-	None	Stone robbing and/or reuse make this difficult to study.
100266	474728	2570981	-	-	None	Stone robbing and/or reuse make this difficult to study.
100267	474750	2570945	Tomb	Wadi Suq	Ceramic	Considerable stone removal is visible on the south side of this feature.
100268	474761	2570932	Tomb	Hafit	None	-
100269	474846	2570842	Tomb	Hafit	None	-
100270	474868	2570822	Tomb	Hafit	None	Feature is mostly intact, although there is evidence of exterior stone removal.
100271	474884	2570795	-	-	None	Feature is mostly intact, although there is evidence of exterior stone removal.
100272	474935	2570739	-	-	None	Poorly preserved.
100273	475094	2570566	Tomb	Umm an-Nar	None	This is a large tomb, in fairly good architectural condition. The interior has been partially disturbed.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100274	475192	2570435	-	-	None	Stones from the top have been cleared and built into modern cairn.
100275	473272	2573841	Tomb	Umm an-Nar	None	-
100276	473309	2573812	-	-	None	-
100277	473317	2573812	Tomb	-	Lithic	-
100278	473338	2573787	-	-	None	Stone robbing and/or reuse make this difficult to study.
100279	473343	2573786	Tomb	Umm an-Nar	None	Some white stones are intact in this feature.
100280	473387	2573760	-	3rd Mill. BC	None	-
100281	473401	2573751	-	-	None	-
100282	473420	2573733	Tomb	Umm an-Nar	None	Although the exterior is poorly defined (due to stone removal) it is definitely a tomb.
100283	471232	2573101	-	Hafit	None	Feature has been reused but its interior is possibly intact.
100284	471294	2573125	Tomb	Hafit	None	Feature has collapsed in on itself and is probably intact.
100285	471275	2573135	Tomb	Hafit	None	-
100286	471204	2573112	Tomb	Hafit	None	-
100287	471173	2573132	Tomb	Hafit	None	Feature has collapsed in on itself and is probably intact.
100288	471104	2573166	Tomb	Hafit	None	-
100289	471052	2573265	-	-	None	Stone robbing and/or reuse make this difficult to study.
100290	470984	2573318	-	-	None	-
100291	470963	2573338	-	-	None	-
100292	471186	2572700	-	-	None	-
100293	470539	2573633	Tomb	Hafit	None	Stone removal has left this tomb's "footprint" visible.
100294	469734	2574387	-	-	None	Poorly preserved.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100295	469792	2574356	-	Hafit	Ceramic	Poorly preserved.
100296	469695	2574354	Tomb	Umm an-Nar	None	This is a large, mostly intact tomb; the face of its outer skin is fully visible in plan.
100297	469617	2574399	Tomb	Umm an-Nar	None	-
100298	469585	2574418	-	-	None	This feature is potentially a building or part of a fortification. it is made up of huge blocks; a 1.2 m-wide stone wall ends at this feature and takes a 90 degree turn. There are lots of small stones on top if it, and its interior appears to have collapsed in on itself.
100299	471659	2574081	Tomb	Hafit	None	-
100300	471633	2574085	-	-	None	Poorly preserved.
100301	471620	2574086	Tomb	3rd Mill. BC	None	-
100302	471609	2574088	-	-	None	Poorly preserved.
100303	471594	2574094	Tomb	Hafit	None	Portions of this tomb's "skin" are visible to the north.
100304	471571	2574101	Tomb	Hafit	Lithic	-
100305	471549	2574104	Building(s)	Hafit-Umm an-Nar	Lithic	This feature consists of header-stretcher and double-faced rectilinear walling (with rubble fill between) and therefore is probably third millennium BC..
100306	471330	2574159	Tomb	Hafit	None	-
100307	471303	2574154	Tomb	Hafit	None	-
100308	471334	2574212	-	-	None	Stone robbing and/or reuse make this difficult to study.
100309	471304	2574237	-	-	None	-
100310	471245	2574271	-	-	None	-
100311	471234	2574276	-	-	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100312	471217	2574281	-	Iron Age	Ceramic	-
100313	471197	2574302	-	-	None	Stone robbing and/or reuse make this difficult to study.
100314	471193	2574304	-	-	None	Stone robbing and/or reuse make this difficult to study.
100315	471182	2574301	-	-	None	Stone robbing and/or reuse make this difficult to study.
100316	471122	2574668	Tomb	-	None	-
100317	471122	2574703	Tomb	Hafit	None	-
100318	471147	2574650	Tomb	Hafit-Umm an-Nar	Ceramic	This feature is in fairly good architectural condition.
100319	471159	2574634	-	-	None	-
100320	471178	2574624	Tomb	-	None	-
100321	471196	2574613	-	-	None	Stone robbing and/or reuse make this difficult to study.
100322	471236	2574585	-	-	None	Stone robbing and/or reuse make this difficult to study.
100323	471275	2574581	-	-	Bone	Stone robbing and/or reuse make this difficult to study.
100324	471338	2574598	-	-	None	Stone robbing and/or reuse make this difficult to study.
100325	471403	2574603	-	-	None	Stone robbing and/or reuse make this difficult to study.
100326	471404	2574500	Tomb	3rd Mill. BC	None	This feature has experienced a great deal of stone removal. However, digging straight through to the center from the south side has made three stone-on-stone courses.
100327	471427	2574469	-	-	None	Stone robbing and/or reuse make this difficult to study.
100328	471450	2574458	Tomb	Umm an-Nar	None	Stone robbing and/or reuse make this difficult to study.
100329	471560	2574379	-	-	None	Stone robbing and/or reuse make this difficult to study.
100330	471586	2574374	Tomb	Iron Age	Ceramic; Bone	Stone robbing and/or reuse make this difficult to study.
100331	471601	2574390	-	-	None	Stone robbing and/or reuse make this difficult to study.
100332	471612	2574380	-	-	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100333	471693	2574345	Tomb	3rd Mill. BC	None	Feature interior is possibly intact.
100334	471722	2574334	Tomb	-	None	This is a large tomb with disturbance of its center.
100335	471760	2574312	-	-	None	-
100336	471804	2574300	-	-	None	-
100337	471823	2574289	-	-	None	Stone robbing and/or reuse make this difficult to study.
100338	471842	2574285	Tomb	-	None	Stone robbing and/or reuse make this difficult to study.
100339	471847	2574285	-	-	None	-
100340	471918	2574304	Tomb	Hafit	None	Feature is partially intact to the south.
100341	471954	2574320	Tomb	Hafit	None	Interior is probably intact.
100342	471983	2574335	Tomb	Hafit	None	-
100343	472015	2574353	Tomb	Hafit	None	Only a few of the lowest courses are still intact, but this is probably a tomb.
100344	472020	2574369	Building(s)	-	None	Rectilinear building with interior walling.
100345	472028	2574358	-	3rd Mill. BC	None	This feature is almost completely gone except for large stones set into the soil in a circle.
100346	471972	2574447	-	-	None	-
100347	471964	2574479	-	-	None	Stone robbing and/or reuse make this difficult to study.
100348	472005	2574514	-	-	None	Only the bottom few courses of this feature are intact.
100349	472010	2574521	Tomb	Hafit	None	-
100350	472101	2574533	Tomb	Hafit	None	Only the bottom few courses of this feature are intact.
100351	472240	2574508	Tomb	-	None	Stone robbing and/or reuse make this difficult to study.
100352	472268	2574590	Tomb	Hafit	None	This feature's interior is probably intact; corbelling in place.
100353	472223	2574595	Tomb	Hafit	None	This very large tomb is fairly intact.
100354	472201	2574591	Tomb	Hafit	None	-
100355	472139	2574581	Tomb	Hafit	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100356	472029	2574600	Tomb	Hafit	None	-
100357	471514	2574870	Tomb	-	None	-
100358	471464	2574939	-	-	None	This feature has collapsed in on itself, and stones have been removed from its top.
100359	471421	2574978	-	Hafit	None	-
100360	471244	2574944	Tomb	-	None	-
100361	471328	2574885	-	-	None	Stone robbing and/or reuse make this difficult to study.
100362	471330	2574800	Tomb	Hafit	None	-
100363	471531	2574796	Tomb	Hafit	None	The top and outer stones of this feature have been "re-placed" in recent years.
100364	470953	2574863	-	-	None	Stone robbing and/or reuse make this difficult to study.
100365	470908	2574820	Tomb	3rd Mill.	None	Triangular stones are still visible, set in the bottom courses,
100366	470891	2574827	Tomb	-	None	-
100367	470869	2574834	Tomb	-	None	Stone robbing and/or reuse make this difficult to study.
100368	470833	2574845	Tomb	Hafit	None	This feature's outer skin to is intact ca. 2 m on the North side.
100369	470808	2574858	Tomb	3rd Mill. BC	None	This feature's outer skin to is intact ca. 2 m on the North side.
100370	470800	2574862	Tomb	Iron Age	None	The outer face of the inner ringwall is partially intact.
100371	470787	2574867	Tomb	Hafit	Bone	This tomb had been truncated by reuse (as the southern corner
100372	470783	2574873	Tomb	Hafit	None	This tomb has been truncated by reuse as the western corner of a rectilinear building.
100373	471027	2575063	-	-	None	Stone robbing and/or reuse make this difficult to study.
100374	471063	2575033	Tomb	-	None	-
100375	472357	2574807	Tomb	Hafit	None	-
100376	472412	2574534	Tomb	-	None	Only the bottom courses of this feature are original.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100377	472406	2574536	Tomb	-	None	Only the bottom courses of this feature are original.
100378	472366	2574541	Tomb	Hafit	None	Feature is mostly intact, although there is evidence of exterior stone removal.
100379	472626	2574583	-	Hafit	None	-
100380	472579	2574622	Tomb	Hafit	None	Feature is partially destroyed and robbed out.
100381	472520	2574603	Tomb	-	None	Destroyed and stones robbed out.
100382	472585	2574552	Tomb	Hafit	None	Poorly preserved.
100383	472570	2574507	-	-	None	Destroyed and stones robbed out.
100384	472581	2574495	Tomb	Hafit	None	Poorly preserved.
100385	472580	2574491	-	Hafit	None	-
100386	472528	2574357	-	-	None	-
100387	472550	2574342	Tomb	Hafit	None	-
100388	472554	2574337	Tomb	Hafit	None	-
100389	472430	2574406	Tomb	Umm an-Nar	None	-
100390	472329	2574496	Tomb	Hafit	None	-
100391	472785	2574262	-	Hafit	None	Poorly preserved.
100392	472774	2574265	Tomb	Hafit	None	Poorly preserved.
100393	472764	2574280	-	-	None	Poorly preserved.
100394	472755	2574305	-	-	None	-
100395	472800	2574313	-	-	None	-
100396	472796	2574327	-	-	None	-
100397	472787	2574334	Tomb	-	None	Tomb is partially destroyed and stones removed.
100398	472774	2574359	Tomb	Hafit	None	-
100399	472754	2574404	Tomb	-	None	Feature interior is probably intact and collapsed inward; all recent buliding is on top and exterior.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100400	472725	2574379	-	-	None	-
100401	472658	2574423	-	-	None	-
100402	472742	2574471	Tomb	-	None	Feature has an intact interior.
100403	472746	2574463	Tomb	-	None	-
100404	472772	2574491	Tomb	Hafit	None	Feature is partially removed.
100405	472902	2574370	Tomb	Hafit	None	Only this feature's bottom stones are visible and in situ.
100406	472835	2574422	-	-	None	Poorly preserved.
100407	472742	2574545	-	-	None	-
100408	472730	2574564	Tomb	Hafit	None	Despite modern disturbance this structure appears fairly intact beneath the rubble.
100409	472724	2574572	Tomb	Hafit	None	Despite modern disturbance this structure appears fairly intact beneath the rubble.
100410	472700	2574548	Tomb	Hafit	None	-
100411	472825	2574536	Tomb	-	None	Possibly 2 chambers to this feature.
100412	472863	2574522	Tomb	Hafit	None	The outer ringwall is visible ca. 3 m on the south side.
100413	472915	2574506	Tomb	-	None	Considerable stones removal and modern building over/in this feature.
100414	472921	2574503	Tomb	Hafit	None	-
100415	472925	2574494	Tomb	Umm an-Nar	None	Except for a small cairn built atop, this feature's original stones have been completely removed, and only the plinth remains.
100416	472945	2574455	-	Modern	Bone	Except for a small cairn built atop, this feature's original stones have been completely removed.
100417	472981	2574558	Tomb	Hafit	None	Feature is probably intact under its collapsed rubble.
100418	472978	2574593	-	-	None	-
100419	472970	2574593	Tomb	-	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100420	468982	2574612	-	-	None	-
100421	469018	2574587	-	-	None	-
100422	469048	2574656	Tomb	Hafit-Umm an-Nar	None	This feature appears to have been a tomb which was reused as a watchtower.
100423	469048	2574646	Tomb	3rd Mill. BC	None	-
100424	469061	2574616	Tomb	Hafit	None	-
100425	469071	2574607	-	-	None	-
100426	469078	2574598	Tomb	Hafit	None	-
100427	469082	2574591	-	-	None	Poorly preserved.
100428	469086	2574577	Tomb	-	Bone	-
100429	469129	2574441	Tomb	Hafit-Umm an-Nar	None	This large tomb is partially intact on its north and south sides.
100430	469175	2574232	-	Umm an-Nar	None	Stone robbing and/or reuse make this difficult to study.
100431	469223	2574181	-	-	Lithic	This feature was a large structure, probably a tomb with some internal rectilinear walling. It appears to have been disassembled by heavy equipment.
100432	469230	2574173	Tomb	-	Bone	This feature was bulldozed.
100433	469319	2574146	-	-	None	-
100434	469308	2574073	-	-	None	Poorly preserved.
100435	469343	2574042	-	-	None	Poorly preserved.
100436	469366	2574091	-	-	None	Poorly preserved.
100437	469410	2573934	-	-	None	This feature was bulldozed.
100438	469423	2573922	-	-	None	Poorly preserved.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100439	469479	2573883	Tomb	Umm an-Nar	Bone; Stone vessel	This feature was bulldozed.
100440	469469	2573839	-	-	None	This feature was bulldozed.
100441	469521	2573786	-	-	None	This feature was bulldozed.
100442	469521	2573852	-	-	None	Stone robbing and/or reuse make this difficult to study.
100443	469517	2573863	Tomb	Hafit	None	Feature is partially intact.
100444	469549	2573859	-	-	Bone	Poorly preserved.
100445	472866	2575002	Tomb	Hafit	None	-
100446	469650	2576639	Tomb	Hafit	None	-
100447	468932	2576992	Tomb	Umm an-Nar	None	-
100448	468950	2576971	-	-	None	Stone robbing and/or reuse make this difficult to study.
100449	469456	2576860	-	-	None	Stone robbing and/or reuse make this difficult to study.
100450	469583	2576834	-	-	None	-
100451	469070	2576845	Tomb	Umm an-Nar	Beads	Feature's interior is probably intact.
100452	469848	2573935	-	-	None	-
100453	469746	2573954	Tomb	3rd Mill. BC	None	-
100454	469665	2574010	-	-	None	-
100455	469609	2574043	Tomb	-	None	-
100456	469714	2573928	-	Hafit	Lithic	This feature was bulldozed.
100457	469781	2573896	Tomb	-	None	-
100458	469821	2573881	-	-	None	-
100459	470009	2573796	Tomb	-	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100460	470024	2573735	-	Wadi Suq	Ceramic	-
100461	470100	2573701	-	-	None	Completely destroyed feature.
100462	469731	2573510	-	-	None	
100463	468140	2574478	Tomb	3rd Mill. BC	Bone	
100464	467365	2577237	Tomb	Hafit-Umm an-Nar	None	Stone robbing and/or reuse make this difficult to study.
100465	467352	2577236	Tomb	-	None	-
100466	467247	2577262	-	Iron Age	None	Stone robbing and/or reuse make this difficult to study.
100467	466850	2577284	-	-	Lithic	Stone robbing and/or reuse make this difficult to study.
100468	466868	2577332	-	-	Bone	Stone robbing and/or reuse make this difficult to study.
100469	466899	2577305	Tomb	Hafit	None	-
100470	466923	2577286	Tomb	Hafit	Ceramic	Feature is partially intact.
100471	466950	2577260	Tomb	-	None	Feature is partially intact.
100472	466961	2577246	Tomb	3rd Mill. BC	None	Feature interior is probably intact.
100473	466982	2577224	-	-	None	Poorly preserved.
100474	467022	2577214	-	-	None	Poorly preserved.
100475	467046	2577181	Tomb	-	None	Feature's outer stones have been removed.
100476	467150	2577110	Tomb	Hafit	Ceramic; Lithic	Only the bottom course of ringwall remains in situ.
100477	467226	2577165	Tomb	Hafit-Umm an-Nar	None	There is a Ministry of Housing survey marker in the center of this tomb.
100478	467262	2577142	Tomb	Hafit-Umm an-Nar	None	-
100479	467391	2577130	Tomb	Hafit	None	Stone robbing and/or reuse make this difficult to study.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100480	467423	2577131	-	-	None	-
100481	467097	2576818	-	Iron Age	Ceramic; Shell	Associated ceramics were dated to the Early Iron Age and Islamic period (e.g., Schrieber 2007 55:2; 54:5; 20:7; 16:1,2)
100482	467088	2576801	Building(s)	-	None	This feature is probably a rectilinear building.
100483	467059	2576849	Tomb	Hafit	None	exterior stones removed; interior skins visible to E
100484	467045	2576864	Tomb	Hafit	Bone	-
100485	467006	2576864	Tomb	Hafit	Ceramic; Lithic; Bone	-
100486	467013	2576875	-	-	None	A fence runs through this feature, which is mostly destroyed.
100487	467016	2576891	-	-	None	This feature has experienced digging; stone removal; and general disturbance. No real diameter is possible but it appears to have been a large feature.
100488	466977	2576877	-	Iron Age	Ceramic	-
100489	466946	2576903	Tomb	3rd Mill. BC	None	-
100490	466902	2576965	Tomb	-	None	Interior is probably intact.
100491	466893	2576974	-	Historic	Ceramic	-
100492	466868	2576988	-	-	Ceramic	Stone robbing and/or reuse make this difficult to study.
100493	466827	2577006	Tomb	Umm an-Nar	Ceramic	There is rebar in the center of this very large tomb.
100494	467163	2577090	Building(s)	Umm an-Nar	Ceramic	This feature is made up of two nice walls (perpendicular but not abutting); others more difficult to see.
100495	466992	2575818	-	Historic	Ceramic	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100496	460164	2576226	Tomb	Hafit	None	This feature consists of a circle of flat stones in situ, so is probably the plinth of a tomb.
100497	460102	2576250	Tomb	Hafit	None	The lowest two courses of ringwall appear to be intact.
100498	460682	2575631	Tomb	Hafit	None	Poorly preserved.
100499	460743	2575577	-	-	Bone	Poorly preserved.
100500	460782	2575528	Tomb	Hafit	Bone	Feature is mostly intact, although there is evidence of exterior stone removal.
100501	460833	2575530	-	-	None	Feature is mostly intact, although there is evidence of exterior stone removal.
100502	460949	2575511	Tomb	Hafit	Bone	Parts of two ringwalls are visible to the north.
100503	460972	2575495	-	-	None	Stone robbing and/or reuse make this difficult to study.
100504	461016	2575470	Tomb	Umm an-Nar	None	Feature was probably reused as a Wadi Suq burial.
100505	461029	2575466	Tomb	-	Shell	Stones were removed from the feature's exterior.
100506	460953	2575451	Tomb	-	None	Stones were removed from the feature's exterior.
100507	461052	2575428	Tomb	Hafit	None	Although some stones still in situ, most have been removed from the feature's exterior and top.
100508	461064	2575410	Tomb	Hafit	None	Feature is mostly intact, although there is evidence of exterior stone removal.
100509	461082	2575387	Tomb	Hafit-Umm an-Nar	None	Stones were removed from the feature's exterior.
100510	461145	2575370	Tomb	Hafit	None	Stones were removed from the feature's exterior.
100511	461240	2575314	-	-	None	Stones were removed from the feature's exterior.
100512	461299	2575328	Tomb	Hafit	None	-
100513	461352	2575308	-	-	None	All complete stones were removed from this feature.
100514	461531	2575188	-	-	None	Stone robbing and/or reuse make this difficult to study.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100515	461613	2575120	-	-	None	Stone robbing and/or reuse make this difficult to study.
100516	461755	2575067	Tomb	Iron Age	Ceramic	Stone robbing and/or reuse make this difficult to study.
100517	461330	2575056	-	-	None	This feature consists of a giant stone cairn with no visible ringwall.
100518	461271	2575088	Tomb	Hafit	None	-
100519	461120	2575176	Tomb	3rd Mill. BC	None	-
100520	460999	2575240	Tomb	Hafit	None	Feature is mostly intact, although there is evidence of exterior stone removal.
100521	460949	2575269	Tomb	Hafit	None	This feature is probably intact on its interior; its exterior is preserved.
100522	460914	2575295	Tomb	Hafit	None	-
100523	460851	2575325	Tomb	-	None	-
100524	460743	2575399	Tomb	Hafit	None	-
100525	460729	2575412	Tomb	Hafit	None	-
100526	460718	2575421	Tomb	Hafit	None	Poorly preserved.
100527	460706	2575431	-	-	None	Poorly preserved.
100528	460696	2575435	-	-	None	There is evidence of some disturbance of the feature's interior.
100529	460650	2575453	Tomb	Hafit	None	-
100530	460633	2575462	Tomb	Hafit	None	-
100531	460626	2575467	Tomb	Hafit	None	-
100532	460592	2575491	Tomb	Hafit	None	-
100533	460581	2575502	Tomb	Hafit	None	-
100534	460529	2575521	Tomb	Hafit	None	-
100535	460519	2575523	Tomb	Hafit	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100536	460508	2575528	Tomb	3rd Mill. BC	None	-
100537	460495	2575536	-	-	None	This feature consists of a fairly disturbed ringwall visible in small sections.
100538	460480	2575548	Tomb	Hafit	None	Poorly preserved.
100539	460472	2575548	Tomb	Hafit	Bone	-
100540	460415	2575593	-	-	None	This feature is possibly not a tomb but rather a circular platform.
100541	460403	2575596	Tomb	Hafit	None	This feature's interior is probably intact.
100542	460320	2575629	-	Hafit	None	Feature is obscured by windblown sand.
100543	460287	2575641	Tomb	3rd Mill. BC	None	-
100544	460276	2575648	-	Hafit	None	This feature consists of an oval, flat stone space; this may have been a tomb or a platform.
100545	460264	2575656	-	Hafit	None	Feature is obscured by windblown sand.
100546	460238	2575673	-	Hafit	None	Poorly preserved.
100547	460001	2575813	Tomb	Hafit	None	-
100548	459988	2575824	-	-	None	Poorly preserved.
100549	459948	2575851	-	-	None	This feature's outer stones have been removed.
100550	459896	2575889	-	Hafit	None	-
100551	459891	2575888	-	Hafit	Ceramic	-
100552	459818	2575937	-	-	Bone	-
100553	459781	2575964	Tomb	Hafit	Bone	-
100554	459748	2575988	Tomb	Hafit	None	This feature has undergone extensive exterior stone removal.
100555	459708	2576011	-	Hafit	None	Stone robbing and/or reuse make this difficult to study.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100556	459698	2576019	Tomb	Hafit	None	This feature has undergone extensive exterior stone removal.
100557	459685	2576023	-	-	None	This feature has undergone extensive exterior stone removal.
100558	459667	2576037	-	-	None	This feature has undergone extensive exterior stone removal.
100559	459650	2576047	-	-	None	This feature has undergone extensive exterior stone removal.
100560	459619	2576065	-	-	None	This feature consists of a circle of stones.
100561	459921	2575760	-	-	None	Stone robbing and/or reuse make this difficult to study.
100562	459946	2575752	-	-	None	Destroyed and stones robbed out.
100563	459967	2575761	-	-	None	Destroyed and stones robbed out.
100564	460197	2575615	-	-	None	Destroyed and stones robbed out.
100565	460321	2575560	-	-	None	This feature includes a circular ditch where the ringwalls should be (i.e., evidence of stone removal).
100566	460325	2575556	-	-	None	This feature includes a circular ditch where the ringwalls should be (i.e., evidence of stone removal).
100567	472989	2573726	Tomb	Umm an-Nar	None	-
100568	472999	2573728	Tomb	Umm an-Nar	None	-
100569	473303	2573769	Tomb	-	None	-
100570	473343	2573756	Tomb	Hafit-Umm an-Nar	None	-
100571	473446	2573685	-	-	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100572	473453	2573678	Tomb	Hafit-Umm an-Nar	None	This feature has undergone extensive exterior stone removal.
100573	473441	2573675	Tomb	Hafit-Umm an-Nar	None	This feature has undergone extensive exterior stone removal.
100574	473458	2573661	Tomb	Hafit-Umm an-Nar	None	This feature has undergone extensive exterior stone removal.
100575	473475	2573639	Tomb	3rd Mill. BC	None	This feature has undergone extensive exterior stone removal.
100576	473494	2573625	Tomb	3rd Mill. BC	None	This feature has undergone extensive exterior stone removal.
100577	473530	2573597	Tomb	Umm an-Nar	None	This feature is probably a multi-chambered tomb.
100578	473559	2573567	-	Hafit-Umm an-Nar	None	This feature has undergone extensive exterior stone removal.
100579	473559	2573562	Tomb	3rd Mill. BC	None	This feature has undergone extensive exterior stone removal.
100580	473477	2573564	-	Hafit	None	This feature has undergone extensive exterior stone removal.
100581	473458	2573824	-	-	None	This feature has undergone extensive exterior stone removal.
100582	473523	2573738	-	-	None	-
100583	473532	2573741	Tomb	Hafit	None	-
100584	473541	2573749	Tomb	Hafit	None	-
100585	473546	2573754	Tomb	3rd Mill. BC	None	-
100586	473560	2573770	Tomb	-	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100587	473581	2573755	Tomb	Hafit	None	-
100588	473693	2573775	-	-	None	Stone robbing and/or reuse make this difficult to study.
100589	473757	2573732	-	-	None	-
100590	473717	2573754	Tomb	-	Bone	Stone robbing and/or reuse make this difficult to study.
100591	473771	2573721	-	-	None	A vehicle track runs over the top of this feature.
100592	473788	2573714	-	-	None	-
100593	473793	2573668	-	3rd Mill. BC	None	exterior stone removal; on flat, just inside an old fence; near road
100594				-		[ID number discarded]
100595	473916	2573834	Tomb	Hafit-Umm an-Nar	None	-
100596	473927	2573829	Tomb	Hafit	None	-
100597	473951	2573825	Tomb	Hafit-Umm an-Nar	Lithic	Corbelling stones are intact.
100598	473926	2573799	Tomb	Hafit	Ceramic; Bone	Feature is mostly intact.
100599	460455	2575502	-	-	Bone	Feature is obscured by windblown sand.
100600	460575	2575388	Tomb	-	None	Stone robbing and/or reuse make this difficult to study.
100601	460622	2575375	-	-	None	Corbelling stones are intact.
100602	460645	2575374	Tomb	3rd Mill. BC	None	Feature is mostly intact, although there is evidence of exterior stone removal.
100603	460658	2575387	-	3rd Mill. BC	None	-
100604	460745	2575317	-	3rd Mill. BC	None	Feature is mostly intact, although there is evidence of exterior stone removal.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100605	460858	2575250	-	3rd Mill. BC	None	Feature is mostly intact, although there is evidence of exterior stone removal.
100606	460963	2575197	Tomb	3rd Mill. BC	None	-
100607	461026	2575160	-	-	None	-
100608	461048	2575150	-	-	None	-
100609	461089	2575123	-	-	None	-
100610	461174	2575073	-	-	None	-
100611	461296	2575003	Tomb	Hafit	None	-
100612	461363	2574968	-	-	None	-
100613	461131	2574279	-	-	None	-
100614	460979	2574377	-	-	None	-
100615	460516	2574618	-	-	None	Feature is obscured by windblown sand.
100616	460342	2574727	Tomb	3rd Mill. BC	None	This feature is a well-preserved tomb.
100617	460257	2574775	-	-	None	-
100618	460221	2574805	Tomb	Hafit	None	-
100619	460195	2574815	Tomb	Hafit	None	Stone removal appears ancient.
100620	460185	2574823	-	-	None	-
100621	460139	2574862	Tomb	Hafit	None	-
100622	460078	2574906	Tomb	Hafit	None	-
100623	460044	2574924	Tomb	Hafit	None	This feature is a well-preserved tomb.
100624	460023	2574930	Tomb	Hafit	None	Feature is mostly intact, although there is evidence of exterior stone removal.
100625	459959	2574977	Tomb	Hafit	None	-
100626	459919	2575000	Tomb	-	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100627	459915	2575002	Tomb	Hafit	None	-
100628	459876	2575027	Tomb	3rd Mill. BC	None	-
100629	459867	2575034	Tomb	Hafit	None	-
100630	459847	2575052	-	Hafit	None	-
100631	459744	2575114	-	-	None	-
100632	459688	2575181	Tomb	Hafit	None	-
100633	459691	2575199	-	Hafit-Umm an-Nar	None	This feature is partially preserved.
100634	459692	2575209	Tomb	-	None	-
100635	459695	2575225	-	-	None	-
100636	459676	2575272	Tomb	Hafit	None	-
100637	459666	2575281	-	-	None	-
100638	459661	2575293	Tomb	Hafit	None	-
100639	459654	2575294	Tomb	Hafit	None	-
100640	459610	2575393	Tomb	-	None	Feature is mostly intact, although there is evidence of exterior stone removal.
100641	459583	2575424	Tomb	Hafit	None	-
100642	459587	2575430	-	-	None	Stone robbing and/or reuse make this difficult to study.
100643	459600	2575442	Tomb	Umm an-Nar	Ceramic; Bone	-
100644	459658	2575405	Tomb	-	None	Sand obscures some aspects of this feature.
100645	459664	2575407	-	-	Ceramic	-
100646	459851	2575254	Tomb	3rd Mill. BC	Bone	Stones are weathered and there has been some stone removal but lower stone wall courses are intact.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100647	459619	2575322	-	-	None	This feature consists of a round ringwall adjacent to a later rectilinear wall.
100648	459576	2575362	Tomb	3rd Mill. BC	None	-
100649	459518	2575415	-	Hafit	None	-
100650	459318	2575502	Tomb	Hafit	None	Sand obscures some of this feature.
100651	459313	2575506	Tomb	Hafit	None	This feature has three concentric skins, all visible now as "stepped" rings.
100652	459295	2575513	Tomb	-	None	Sand partially obscures this feature.
100653	459287	2575516	-	Hafit	None	Sand partially obscures this feature.
100654	459246	2575535	Tomb	Hafit	None	-
100655	459233	2575544	Tomb	Hafit	None	This feature's wall is faced on both the interior and exterior.
100656	459190	2575574	Tomb	Hafit	None	This feature's wall is faced on both the interior and exterior.
100657	459176	2575585	Tomb	-	None	-
100658	459152	2575604	-	Hafit	None	-
100659	459043	2575678	Tomb	-	None	This feature's wall is faced on both the interior and exterior.
100660	459021	2575687	-	-	Ceramic	-
100661	459007	2575692	Tomb	-	None	This feature's wall is faced on both the interior and exterior and built of large blocks.
100662	458997	2575695	Tomb	Hafit	None	Stone robbing and/or reuse make this difficult to study.
100663	458984	2575699	Tomb	Hafit	None	This feature's wall is faced on both the interior and exterior and built of large blocks.
100664	458976	2575706	Tomb	Hafit	None	This feature's wall is faced on both the interior and exterior and built of large blocks.
100665	458802	2575799	Other	-	N/A	This feature is a ground stone cone-shaped depression in bedrock, facing up.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100666	458695	2575851	Tomb	Umm an-Nar	Ceramic; Bone; Metal; Beads	This feature was once an Umm an-Nar tomb, but the circular ringwalls exist now only on the north side. This may have been due to the bedrock that may have formed the southern "wall" of the feature.
100667	459163	2575540	Tomb	Umm an-Nar	Ceramic	-
100668	459448	2575344	Tomb	Umm an-Nar	Ceramic; Bone	Poorly preserved.
100669	459459	2575339	-	-	None	Poorly preserved.
100670	459615	2575133	-	3rd Mill. BC	Bone	Poorly preserved.
100671	459592	2575118	Tomb	Hafit	None	This feature is partially sand-covered and obscured.
100672	459589	2575111	Tomb	Hafit	None	Poorly preserved.
100673	459672	2575112	Tomb	3rd Mill. BC	None	
100674	459720	2575024	-	-	None	This feature's ringwall is visible in sections.
100675	459735	2575019	Tomb	-	None	-
100676	460140	2574754	Tomb	Hafit	None	-
100677	460730	2574402	Tomb	Hafit	None	This feature is a large tomb, partially intact, although there is evidence of exterior stone removal.
100678	460794	2574370	Tomb	Umm an-Nar	None	Feature is mostly intact, although there is evidence of exterior stone removal.
100679	460830	2574353	Tomb	Umm an-Nar	None	Feature is mostly intact, although there is evidence of exterior stone removal.
100680	459652	2574625	Tomb	Hafit	None	-
100681	459494	2574689	Tomb	Hafit	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100682	459445	2574744	Tomb	Hafit	None	This was possibly reused as a Wadi Suq tomb.
100683	459411	2574725	-	-	None	This feature consists of a semi-circular multi-coursed stone structure; the semi-circle "ends" at (i.e., the circle is truncated by) bedrock.
100684	459373	2574757	Tomb	-	None	-
100685	459355	2574781	Tomb	Hafit	None	This features is partially obscured by wind-blown sand.
100686	459315	2574805	-	-	None	This features is partially obscured by wind-blown sand.
100687	459296	2574824	Tomb	3rd Mill. BC	None	-
100688	459289	2574829	Tomb	4th-6th Mill. BC	None	-
100689	459276	2574834	-	-	None	-
100690	459217	2574880	Tomb	Hafit	None	This feature is probably intact.
100691	459190	2574907	Tomb	3rd Mill. BC	None	-
100692	459187	2574909	-	-	None	-
100693	459164	2574917	Tomb	3rd Mill. BC	None	-
100694	459138	2574937	-	Hafit	None	Feature is mostly intact, although there is evidence of exterior stone removal.
100695	459082	2574966	Tomb	Hafit	None	Feature's ringwalls are clearly visible.
100696	459246	2574924	Tomb	Hafit	None	-
100697	459010	2575012	-	3rd Mill. BC	None	This feature consists of a "stone circle," like a tomb base with all superstructure removed.
100698	458967	2575037	-	-	None	-
100699	458914	2575067	-	-	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100700	458851	2575100	Tomb	-	Bone	-
100701	458803	2575125	-	-	None	-
100702	458714	2575157	-	-	None	-
100703	458671	2575181	Tomb	Umm an-Nar	Shell	This feature is partially obscured by wind-blown sand.
100704	458642	2575195	Tomb	Hafit	Ceramic; Metal	-
100705	458676	2575216	-	Umm an-Nar	None	This feature consists of a sand- and soil-covered mound but is probably Umm an-Nar.
100706	458843	2575164	-	Umm an-Nar	None	-
100707	458852	2575164	Tomb	Hafit	None	-
100708	458869	2575152	-	Umm an-Nar	None	-
100709	458432	2575302	-	3rd Mill. BC	None	Poorly preserved.
100710	458401	2575315	-	3rd Mill. BC	None	Poorly preserved.
100711	458380	2575331	Tomb	Hafit	None	-
100712	458428	2575328	Tomb	Umm an-Nar	None	Feaure is lightly sand-covered.
100713	458397	2575355	Tomb	-	None	Feaure is lightly sand-covered.
100714	458370	2575331	-	-	None	-
100715	458362	2575334	Tomb	Hafit	Bone	-
100716	458353	2575341	Tomb	3rd Mill. BC	Bone	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100717	458344	2575346	Tomb	Hafit	None	-
100718	458317	2575364	-	-	None	-
100719	458298	2575380	-	-	None	-
100720	458243	2575405	Tomb	Hafit	None	-
100721	458214	2575457	-	-	None	The interior of this feature is quare, made up of large blocks.
100722	458204	2575418	Tomb	Hafit-Umm an-Nar	None	Stone removal left the lower ringwall courses visible to the north.
100723	458197	2575421	Tomb	Hafit	None	-
100724	458175	2575434	Tomb	-	None	-
100725	458163	2575440	Tomb	Hafit	Bone; Metal	Feature interior is probably intact.
100726	458101	2575472	Tomb	Hafit	Ceramic; Bone; Beads	This feature is mostly destroyed.
100727	458087	2575481	Tomb	Hafit	None	Poorly preserved.
100728	458101	2575485	-	-	None	Poorly preserved.
100729	458094	2575490	-	-	None	Poorly preserved.
100730	458099	2575497	-	3rd Mill. BC	None	-
100731	458106	2575501	-	Iron Age	Ceramic	Feature is mostly intact, although there is evidence of exterior stone removal.
100732	458091	2575506	-	3rd Mill. BC	None	Feature is lightly sand-covered
100733	458095	2575512	-	Hafit-Umm an-Nar	None	Some feature stones appear in situ and are quite large.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100734	458084	2575484	Tomb	-	None	-
100735	458040	2575512	Tomb	Hafit	Ceramic	-
100736	458028	2575516	Tomb	Hafit	None	-
100737	457996	2575525	-	-	None	Stone robbing and/or reuse make this difficult to study.
100738	457985	2575528	Tomb	Hafit	None	-
100739	457959	2575542	Tomb	Hafit-Umm an-Nar	None	-
100740	457956	2575549	-	Hafit	None	-
100741	457941	2575550	-	Hafit	None	This feature is rubble-covered.
100742	457939	2575553	-	-	None	-
100743	457930	2575552	-	-	None	-
100744	457922	2575556	-	-	None	-
100745	457918	2575558	Tomb	Hafit	None	-
100746	457891	2575570	Tomb	-	None	This feature is mostly gone; probably reused in the construction of the rubble wall extending several meters to the southwest.
100747	457864	2575585	Tomb	-	None	This feature is mostly gone; probably reused in the construction of the rubble wall extending several meters to the southwest.
100748	457835	2575631	-	-	Ceramic	This semi-circle of stones abuts what appears to be two straight walls with a right angle between them.
100749	457809	2575631	-	4th-6th Mill. BC	Ceramic	Stone robbing and/or reuse make this difficult to study.
100750	457803	2575635	-	-	Stone	-
100751	457790	2575636	-	Hafit-Umm an-Nar	None	This feature consists of three "stepped" concentric ringwalls on the southwest side of the top of a ridge.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100752	457773	2575644	-	Hafit	None	This feature consists of two "stepped" concentric ringwalls on the southwest side of the top of a ridge.
100753	457738	2575664	Tomb	Hafit	None	-
100754	457694	2575687	-	-	Shell	This feature appears to have undergone considerable reuse.
100755	457665	2575699	-	-	None	-
100756	457618	2575734	Tomb	-	None	Poorly preserved.
100757	457605	2575742	-	-	None	Feature, possibly with heavy stone removal/destruction.
100758	457515	2575797	Tomb	-	None	-
100759	457510	2575800	Tomb	-	None	-
100760	457494	2575809	Tomb	Hafit	None	Feature has intact interior corbelling.
100761	457486	2575812	-	-	None	-
100762	457480	2575816	-	-	None	-
100763	456534	2576317	-	-	Shell	-
100764	456529	2575936	-	-	Ceramic	This feature consists of a mound of earth with calcrete (sample taken) from a nearby wadi bed and blocks forming and "edge".
100765	457535	2575673	-	-	Bone	This feature is a low mound of soil and stone.
100766	457612	2575631	-	-	Bone	Poorly preserved.
100767	457656	2575605	-	3rd Mill. BC	None	Poorly preserved.
100768	457682	2575593	-	-	Lithic	-
100769	457533	2575478	Tomb	Hafit-Umm an-Nar	None	Feature's interior is possibly intact.
100770	457403	2575531	Tomb	Hafit	None	This feature's exterior is relatively intact. There is evidence of a possible third ringwall, mostly removed.
100771	457393	2575526	-	-	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100772	457256	2575649	Tomb	Umm an-Nar	Bone; Beads	-
100773	457243	2575610	Tomb	-	None	-
100774	457116	2575699	Tomb	Hafit	None	-
100775	457081	2575709	-	-	None	-
100776	456858	2575773	Tomb	-	None	-
100777	456860	2575771	Tomb	-	None	-
100778	456901	2575755	Tomb	-	None	-
100779	456969	2575734	-	-	None	Features 100779, 100780, 100781 are all in a row.
100780	456972	2575734	Tomb	-	None	Features 100779, 100780, 100781 are all in a row.
100781	456977	2575733	-	-	None	Features 100779, 100780, 100781 are all in a row.
100782	456994	2575725	Tomb	-	None	-
100783	457013	2575715	-	-	None	This feature possibly has two chambers.
100784	457021	2575715	Tomb	Hafit	None	-
100785	457118	2575651	Tomb	Hafit	None	-
100786	457128	2575648	-	-	Bone	-
100787	457135	2575644	Tomb	-	None	-
100788	457235	2575579	Tomb	Hafit	None	-
100789	457269	2575559	Tomb	-	None	-
100790	457336	2575521	-	-	None	-
100791	457347	2575513	Tomb	Hafit	None	-
100792	457374	2575498	-	-	None	This feature's ringwall was not laid according to 3rd mill. architecture: stones have been placed with the grains facing up and triangular blocks facing inward.
100793	456916	2575665	-	-	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100794	456967	2575635	Tomb	Hafit	Lithic; Bone	-
100795	457023	2575613	-	-	None	-
100796	457026	2575607	-	-	None	-
100797	457063	2575612	-	Hafit	None	Feature is mostly intact, although there is evidence of exterior stone removal.
100798	457314	2575487	Tomb	-	Ceramic	This feature has intact corbelling.
100799	457337	2575426	Tomb	-	None	This feature consists of a mound of stones and soil with spaces where wall stones have been removed.
100800	457381	2575431	-	3rd Mill. BC	None	-
100801	457377	2575455	Tomb	Hafit	None	-
100802	457370	2575482	-	-	None	-
100803	457405	2575464	-	-	None	Feature's interior and corbelling are probably intact.
100804	457417	2575464	-	Hafit	None	-
100805	457452	2575453	-	-	None	-
100806	457493	2575438	Tomb	Wadi Suq	None	-
100807	457527	2575419	Tomb	Hafit	None	-
100808	457538	2575410	Tomb	Hafit	None	-
100809	457587	2575380	-	-	None	-
100810	457655	2575328	Tomb	Hafit	None	-
100811	457692	2575309	Tomb	Hafit	None	This feature sits on a circular stone-built platform (6 courses visible, ca. 1 m tall and 3 m wide) on the southwest side.
100812	457705	2575304	Tomb	Hafit	None	This feature is in good condition: six intact courses and corbelling are intact and visible.
100813	457721	2575288	Tomb	Hafit	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100814	457752	2575274	Tomb	Hafit	None	-
100815	457796	2575244	Tomb	Hafit	None	-
100816	457877	2575203	Tomb	Hafit	None	-
100817	457885	2575195	Tomb	Hafit	Lithic	Bulldozed rubbish abuts the feature.
100818	457804	2575144	Tomb	Hafit	None	This feature is "dusted" with rubbish.
100819	457787	2575153	Tomb	Hafit	Bone	Some of this feature's ringwall and a few large stones are intact.
100820	457674	2575204	Tomb	Hafit	None	There are spaces visible in the ringwall, where stones have been removed.
100821	457583	2575272	Tomb	Umm an-Nar	None	Some of the feature's ringwall and a few large stones are intact.
100822	457569	2575279	-	-	None	-
100823	457496	2575324	Tomb	3rd Mill. BC	None	-
100824	458016	2575101	-	-	None	-
100825	458082	2575078	Tomb	Hafit	None	-
100826	458122	2575062	Tomb	3rd Mill. BC	None	-
100827	458129	2575062	Tomb	3rd Mill. BC	None	-
100828	458155	2575056	Tomb	Hafit	None	Corbelling is intact.
100829	458179	2575045	Tomb	Hafit	None	The ringwall is preserved for six courses.
100830	458185	2575044	Tomb	Hafit	None	-
100831	458180	2575083	Tomb	Hafit	None	-
100832	458174	2575083	Tomb	3rd Mill. BC	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100833	458124	2575107	Tomb	Hafit	None	-
100834	458224	2575064	-	-	None	-
100835	458227	2575070	-	-	None	This feature consists of a low mound of soil and stone.
100836	458225	2575037	Tomb	Hafit	None	-
100837	458225	2575028	Tomb	Hafit	None	-
100838	458219	2575028	-	-	Ceramic	-
100839	458219	2575030	Tomb	Hafit	None	This feature's ringwall is visible in profile and is intact for three courses.
100840	458222	2575020	Tomb	Hafit	None	-
100841	458210	2575018	-	-	None	-
100842	458209	2575013	Tomb	Iron Age	Ceramic	-
100843	458211	2575012	-	-	None	-
100844	458199	2575017	Tomb	3rd Mill. BC	None	-
100845	458196	2575010	Tomb	3rd Mill. BC	None	This feature has been recently disturbed.
100846	458188	2575012	-	Iron Age	Ceramic	-
100847	458173	2575013	Tomb	3rd Mill. BC	None	-
100848	458108	2575047	-	-	None	This feature is a possible tomb: the strong slope (ca 45 degrees) possibly contributed to the feature's demise. It is only recognizable by the rough blocks (none in situ), and disturbance of a small soil mound.
100849	458042	2575077	Tomb	Hafit	None	The strong slope (ca. 40 degrees) probably facilitated this feature's destruction.
100850	458259	2574882	Tomb	Hafit	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100851	458388	2574831	Tomb	Hafit	None	-
100852	458250	2574990	Tomb	Hafit	None	This feature has intact corbelling.
100853	458285	2574971	Tomb	Hafit	None	This feature's interior ringwall is intact to a height of ca. 5 courses.
100854	458308	2574966	Tomb	Hafit	None	-
100855	458357	2574942	Tomb	Hafit	None	This feature has two walls, which may be one ringwall and one platform wall; the interior wall is higher up-slope.
100856	458368	2574933	Tomb	Hafit	None	This feature's ringwall is intact for at least five courses.
100857	458343	2574998	Tomb	Hafit	None	-
100858	458430	2574932	Tomb	Hafit	Shell (perforated disc)	-
100859	458401	2574927	Tomb	Hafit	None	This feature is 10 courses tall on its north side and has intact corbelling.
100860	458392	2574921	Tomb	Hafit	None	-
100861	458436	2574897	Tomb	Hafit	None	A platform built on this tomb's south (ca. .8 m tall and 3 m long) supports the exterior ringwall.
100862	458491	2574853	Tomb	Hafit	None	-
100863	458504	2574847	Tomb	Hafit	None	-
100864	458513	2574842	Tomb	Hafit	None	-
100865	458518	2574840	Tomb	Hafit	None	-
100866	458545	2574826	Tomb	Hafit	None	This feature has a square base or platform, with a circular ringwall.
100867	458554	2574824	Tomb	Hafit	None	-
100868	458560	2574819	Tomb	Hafit	None	-
100869	458585	2574805	-	-	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100870	458605	2574794	Tomb	Hafit	Lithic	-
100871	458603	2574790	Tomb	Hafit	None	-
100872	458631	2574770	-	-	None	The strong slope has displaced this feature's stone walling.
100873	458639	2574759	Tomb	Hafit	None	The strong slope has displaced this feature's stone walling, but the lowest courses are partially intact.
100874	459080	2574437	Tomb	Hafit-Umm an-Nar	None	This feature's lowest courses are visible in plan.
100875	458485	2574508	Tomb	3rd Mill. BC	Ceramic	-
100876	458669	2574767	Tomb	Hafit	None	-
100877	458688	2574749	Tomb	Hafit	None	-
100878	458733	2574727	Tomb	Hafit	Ceramic	-
100879	458727	2574724	Tomb	Hafit	None	-
100880	458729	2574722	Tomb	Hafit	None	-
100881	458747	2574715	-	-	None	-
100882	458760	2574716	Tomb	Hafit	None	-
100883	458789	2574698	Tomb	Hafit	None	-
100884	458819	2574685	Tomb	Hafit	None	A doorway is visible.
100885	458884	2574637	-	-	None	-
100886	458935	2574611	Tomb	Hafit	None	-
100887	458973	2574586	Tomb	-	None	-
100888	459030	2574556	Tomb	Hafit	None	-
100889	459113	2574536	-	-	None	-
100890	459271	2574447	Tomb	Hafit	Bone	-
100891	459420	2573973	Tomb	Hafit	None	-
100892	464534	2578864	Tomb	-	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100893	464541	2578862	-	-	None	Stone robbing and/or reuse make this difficult to study.
100894	464504	2578899	Tomb	-	None	-
100895	464386	2579056	-	3rd Mill. BC	Lithic	-
100896	464336	2579101	-	-	None	-
100897	464250	2579119	-	-	None	There is some digging in the southwest side of this feature but it probably has an intact interior.
100898	464266	2579164	-	-	Lithic	-
100899	464197	2579231	-	Iron Age	Ceramic; Lithic	-
100900	464115	2579286	Tomb	3rd Mill. BC	None	-
100901	464100	2579297	-	-	None	Stone robbing and/or reuse make this difficult to study.
100902	464075	2579273	-	-	None	-
100903	464111	2579292	-	-	Lithic	-
100904	464071	2579292	-	-	Lithic	-
100905	464056	2579341	Tomb	Hafit	None	-
100906	464015	2579323	Tomb	3rd Mill. BC	None	-
100907	464036	2579351	-	-	None	-
100908	463985	2579386	Tomb	3rd Mill. BC	Ceramic	This feature's interior is probably intact.
100909	463957	2579366	Tomb	Hafit	None	This feature's interior is probably intact.
100910	463936	2579326	Tomb	3rd Mill. BC	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100911	464064	2579257	Tomb	-	None	The feature is made of local brown limestone but built on red bedrock.
100912	463930	2579391	-	-	None	-
100913	463925	2579392	Tomb	Hafit	None	-
100914	463925	2579402	-	-	None	-
100915	464195	2579562	-	3rd Mill. BC	None	-
100916	464183	2579568	-	-	None	-
100917	464146	2579595	-	-	None	This feature has undergone extensive exterior stone removal.
100918	464121	2579611	-	-	None	This feature has undergone extensive exterior stone removal.
100919	464149	2579639	-	3rd Mill. BC	Bone	This feature has undergone extensive exterior stone removal.
100920	464108	2579646	-	-	None	-
100921	464074	2579646	-	-	Bone	This feature has undergone extensive exterior stone removal.
100922	464066	2579695	-	-	Metal	This feature has undergone extensive exterior stone removal.
100923	464057	2579710	-	-	None	ext. stone removal; digging in center
100924	464049	2579716	-	-	None	This feature has undergone extensive exterior stone removal.
100925	464017	2579664	Tomb	3rd Mill. BC	Ceramic	-
100926	463632	2579604	Tomb	-	Lithic	-
100927	463605	2579610	-	-	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100928	463595	2579606	-	-	None	-
100929	463644	2579661	Tomb	-	Bone	-
100930	463635	2579706	-	-	None	-
100931	463578	2579756	-	-	Ceramic; Bone	This feature has undergone extensive exterior stone removal.
100932	463570	2579768	-	-	None	This feature has undergone extensive exterior stone removal.
100933	463571	2579755	Tomb	-	Bone	-
100934	463348	2579928	Tomb	Umm an-Nar	Bone; Beads	-
100935	463895	2579859	Tomb	-	None	-
100936	463888	2579869	Tomb	-	None	-
100937	463883	2579875	Tomb	Hafit	None	This feature is two circular stone ringwalls visible in plan.
100938	463828	2579943	-	-	None	Stone robbing and/or reuse make this difficult to study.
100939	463782	2580010	Tomb	Umm an-Nar	Ceramic; Bone	-
100940	463739	2580027	Tomb	Hafit	None	-
100941	463675	2579973	Tomb	Hafit	None	-
100942	463663	2579951	Tomb	Hafit	None	-
100943	463637	2579938	Tomb	3rd Mill. BC	None	This feature has undergone extensive exterior stone removal.
100944	463577	2580031	Tomb	3rd Mill. BC	None	This feature has a possible doorway to the west.
100945	463408	2580201	Tomb	3rd Mill. BC	Ceramic; Lithic; Bone	This feature has undergone extensive exterior stone removal.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
100946	463428	2580267	Tomb	Umm an-Nar	None	-
100947	463508	2580384	-	Historic	Metal (coin)	This feature is built of large cobbles on the edge of a cobble terrace and overlooking the wadi to the south.
110948	463466	2580455	-	-	Lithic	-
110949	463705	2580450	-	-	None	-
110950	463754	2580412	Tomb	-	Lithic	-
110951	463734	2580357	Tomb	Umm an-Nar	Lithic	-
110952	463896	2580171	Tomb	Umm an-Nar	Lithic	-
110953	464069	2579972	Tomb	Umm an-Nar	Bone	-
110954	464267	2579724	-	-	None	-
110955	464120	2580114	Tomb	-	Bone	-
110956	463978	2580403	Tomb	Hafit	Lithic	-
110957	464090	2580455	Lithic scatter	-	Lithic	-
110958	463905	2581410	-	-	None	Stone robbing and/or reuse make this difficult to study.
110959	463549	2580785	Tomb	Hafit	Lithic; Bone	-
110960	474859	2572873	-	Hafit-Umm an-Nar	None	-
110961	474951	2572809	-	Hafit-Umm an-Nar	None	The lowest courses of this feature are intact.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
110962	474996	2572734	Tomb	Hafit	None	There is a significant height of wall still standing on this feature's west side.
110963	474998	2572708	-	-	Lithic	this could possibly be 2 features. One on the west side has a clear circular wall. On the east side there is another wall with less curvature, which may or may not link.
110964	475016	2572512	Tomb	-	None	-
110965	474956	2572519	-	-	Ceramic	Destroyed and stones robbed out.
110966	474827	2572495	-	Umm an-Nar	Ceramic	-
110967	474806	2572512	Tomb	Umm an-Nar	Ceramic; Bone; Shell; Copper; Stone vessel	Large tomb, mostly disturbed.
110968	474780	2572535	Tomb	Umm an-Nar	Ceramic; Bone; Beads	The southern corner is fenced in.
110969	474725	2572589	-	Umm an-Nar	Ceramic	-
110970	474857	2572876	Tomb	Hafit	None	The internal and external walls of this feature are visible.
110971	474997	2572747	Tomb	Hafit	None	This feature has a thick wall with rubble fill.
110972	475169	2572547	-	-	Lithic	-
110973	474839	2572485	Tomb	3rd Mill. BC	Ceramic; Bone	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
110974	474741	2572645	Tomb	Umm an-Nar	Ceramic; Bone	Two courses of stone are visible on tomb dividing wall (a central "post" style wall to support the roof), about 2m long.
110975	474773	2572540	Tomb	Umm an-Nar	Bone; Shell	-
110976	474731	2572632	Tomb	Hafit	Ceramic	Destroyed and stones robbed out.
110977	474892	2572450	Tomb	-	None	-
110978	474907	2572383	Tomb	Umm an-Nar	None	-
110979	474926	2572382	-	Historic	None	-
110980	474894	2572446	Tower	3rd Mill. BC	None	This tower feature has multiple "stepped" stone walls; the stone dimensions vary per wall. This may have been reported by Frifelt in her 1977-1978 unpublished end-of-season report to the Ministry of Heritage and Culture: "Prehistoric buildings on this South-facing slope can be found as far as and beyond the Easternmost tower (1147) in the fields at the foot of the slope ... The ridge here carries walls of large fashioned stone blocks near the top. Defensive?" (Frifelt 1978)
110981	474899	2572403	Tomb	Umm an-Nar	Ceramic; Bone; Stone vessel	Some ashlar blocks and brown stone courses remain intact.
110982	474904	2572390	Tomb	Umm an-Nar	Lithic; Stone vessel	Tomb interior is probably still intact, despite considerable exterior stone removal.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
110983	475027	2572271	Tomb	Umm an-Nar	None	Interior and exterior walling is visible on this feature's west side.
110984	475044	2572257	Tomb	Umm an-Nar	None	This feature's wall is visible all the way around. Interior consists of a E-W running wall and N-S running wall, giving the feature interior a cruciform shape. The plinth is also visible most of way around, and is made up of significantly larger stone blocks than tomb wall itself.
110985	475065	2572245	-	-	None	This is a feature of unknown type wedged between two Umm an-Nar tombs (and is therefore later).
110986	475076	2572235	-	Umm an-Nar	None	This feature sits mid-slope.
110987	475083	2572232	-	Umm an-Nar	Ceramic; Bone	This feature consists of scattered and fragmentary human remains to the south of and on a rough mound. The ringwall is visible to the south and east but no measurements were possible.
110988	475201	2572142	Tomb	Umm an-Nar	Ceramic; Bone	-
110989	475354	2572079	-	-	None	-
110990	475399	2572142	-	-	None	-
110991	475564	2572095	Tomb	3rd Mill. BC	Ceramic; Lithic; Bone	-
110992	475618	2572067	Tomb	-	None	-
110993	475190	2572025	Tomb	Umm an-Nar	Ceramic; Stone vessel	Poorly preserved.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
110994	475036	2572094	-	-	None	This is a raised mound of cobbles with some large blocks on and embedded in it.
110995	475108	2572061	Tomb	-	None	Possible camel grave: rectangular shape, outer walls now embedded in earth, three very large blocks covering the center of the feature laid flat atop, not sunk in. Stones were probably reused from Matariya tower. The feature is oriented N-S on a small rise.
110996	475335	2571832	Well	-	Ceramic	Oval stone lined well and adjacent deep hole to the northwest. Both have rectangular bases. There seems to be a drain in the stone lining, leading into the other hole. To the southeast are remains of a stone and mudbrick ramp for animals to pull the well retrieval mechanism.
110997	475425	2571897	-	-	Ceramic	Dam, wall or falaj. The feature is faced on both sides with stones of various dimensions and mudbrick on top (in places). It is possibly related to the well or bunds nearby.
110998	475238	2571768	Well	-	None	Well, now abandoned and partially filled in. Still visible is the ramp down from which the animal would have pulled the water.
110999	474759	2572105	Wall-dam	-	None	This is a stone wall, rather ephemeral, one stone course wide, and possibly part of a falaj.
111000	474684	2572213	Well	Modern	Ceramic	Tecent Modern or pre-Modern well, now abandoned. Two ramps aflaj extend off opposite sides (the north and south). It is built of reused Umm an-Nar stones.
111001	475059	2572249	Tomb	-	Ceramic; Lithic	This is a tomb with three cairns on top.
111002	475069	2572240	Tomb	Hafit	None	The tomb ringwall is clearly visible.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111003	475182	2572184	Tomb	Hafit	Ceramic	-
111004	475653	2572036	-	Wadi Suq	None	-
111005	475723	2571985	Tomb	Hafit	None	Tomb is mostly gone, with only the northern half present, where the ringwall is still visible in plan.
111006	475040	2572086	-	-	None	-
111007	475056	2572060	Wall	-	None	-
111008	475450	2571936	Wall-dam	-	None	Wall feature or possible falaj.
111009	475621	2571715	Well	-	None	Well with excavated downward slope (for draft animal); Umm an-Nar tomb stones have been reused in its modern holding tank. There is an associated stone-lined and concreted well plus remains of an attached falaj.
111010	475073	2571914	Well	-	None	This was probably a relatively recent well. The ox ramp and well are still visible, though filled in with modern rubbish.
111011	476275	2572420	-	-	None	-
111012	476303	2572531	-	-	None	-
111013	476163	2572651	-	-	None	-
111014	475878	2572957	-	-	None	-
111015	475580	2573248	Tomb	Hafit	None	-
111016	475413	2572440	Tomb	Hafit	None	Hafit tom, collapsed inward but probably intact.
111017	475343	2572521	Platform	-	None	This feature is some sort of rectilinear platform. It consists of a single course of stone laid over or in line with bedrock.
111018	475269	2572589	Tomb	Hafit	None	-
111019	475174	2572547	-	-	None	-
111020	474999	2572708	Tomb	Hafit	None	-
111021	474996	2572735	Tomb	Hafit	None	-
111022	474996	2572751	Tomb	Hafit	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111023	474950	2572811	-	-	None	Low circle of stones of unknown purpose or age.
111024	474854	2572878	Tomb	Hafit	None	-
111025	474857	2572874	-	Hafit	None	-
111026	474621	2572988	Tomb	-	Ceramic; Lithic; Bone; Chisel debitage	Tomb, very disturbed.
111027	474614	2572992	-	-	Bone	Feature is mostly intact, although there is evidence of exterior stone removal.
111028	474598	2572999	Tomb	-	None	-
111029	474696	2573184	-	-	Bone	-
111030	475354	2573376	-	Hafit	Ceramic	Ceramics indicate Iron Age reuse.
111031	475365	2573380	-	-	None	This is the remains of a possible Hafit tomb, collapsed and fallen downslope. Though no longer in place the stones are the correct size, shape etc.
111032	475398	2573348	Tomb	Hafit	None	-
111033	475428	2573332	-	Hafit	None	-
111034	475561	2573261	Tomb	Hafit	None	A possible door is partially visible.
111035	475471	2572174	Tomb	Hafit	None	This is a large (wide) cairn, possibly reused in the Wadi Suq period for honeycomb tombs.
111036	475431	2572201	Tomb	Hafit	None	-
111037	475383	2572308	-	-	None	-
111038	475463	2573305	-	Hafit	None	-
111039	475440	2573323	-	Hafit	None	-
111040	475317	2573410	-	-	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111041	475064	2573503	-	-	Ceramic	This feature is now just a large pile of stones without any visible order. It was once a very substantial structure. Given its location and extensive viewscape, possibly some kind of viewing area?
111042	474940	2573631	Tomb	Hafit	None	Tomb with 5-6 good courses visible and intact at its base.
111043	474996	2573432	-	Hafit	None	This feature does not appear to have been robbed of stones, so its interior is probably intact.
111044	474939	2573356	Tomb	Hafit	None	This feature is a tomb, collapsed. The interior wall and corbelling are partially visible.
111045	475013	2573269	-	-	None	Poorly preserved.
111046	474783	2573676	Tomb	Hafit	None	This feature provides a good example of uncoursed Hafit walling.
111047	474673	2573714	Tomb	Hafit	None	-
111048	474625	2573740	-	-	None	This is a possible partially subterranean feature. It seems circular, cut into the bedrock on the south side, and has collapsed in on itself.
111049	474567	2573762	Tomb	Hafit	None	This feature is largely surrounded by rubble but substantially intact, including corbelling of the interior, six courses of inner ringwall, and part of the exterior ringwall.
111050	474628	2573582	-	-	None	Feature is a low patch of rubble.
111051	474381	2573965	Tomb	-	None	There is evidence of lots of exterior stone removal from this feature but its interior is probably intact.
111052	474401	2573957	-	-	None	-
111053	474407	2573957	-	-	None	This is a small cairn with flat-laid stones under lots of stone fragments.
111054	474418	2573950	-	Hafit	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111055	474454	2573933	-	-	None	This feature has no discernible walls but is a substantial stone cairn.
111056	474483	2573915	-	-	None	-
111057	474503	2573907	-	Hafit	None	-
111058	474527	2573889	Tomb	3rd Mill. BC	None	The interior of this feature is probably intact under the substantial pile of stones.
111059	471724	2572203	Antiquity	4th-6th Mill. BC	N/A	Arabian biface. Found in two pieces (refits); no other archaeological material found nearby.
111060	474545	2573860	Tomb	Hafit	None	Stone cairn with corbelling visible but no wall.
111061	474603	2573846	-	-	None	-
111062	474713	2573813	-	-	None	-
111063	474837	2573827	Wall	-	None	This feature is a platform built into the hillside.
111064	476205	2573205	-	-	None	-
111065	475224	2573274	-	Umm an-Nar	Ceramic; Lithic	Poorly preserved.
111066	475274	2573230	-	-	Bone	Unidentified stone mound.
111067	462201	2579030	Wall	-	Ceramic	Perpendicular stone walling, two courses wide, running NW-SE, ca. .5 m wide. Stones are un-faced. The perpendicular wall extends to the southwest and is ca. .2 m wide. Possibly the foundation of a mudbrick wall.
111068	462192	2579113	-	Hafit-Umm an-Nar	Bone	This feature is the remains of a tomb, only in situ on its southeast side.
111069	462186	2579125	-	-	None	-
111070	462179	2579138	-	-	None	-
111071	462172	2579146	-	-	Bone	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111072	462162	2579148	Tomb	3rd Mill. BC	Lithic; Bone; Beads	This feature is a completely destroyed tomb: few stones are intact but tomb material found (e.g., human bone, beads).
111073	462151	2579156	-	-	Lithic; Bone	This is a low mound of stones and soil. If it was once a tomb it has been completely destroyed.
111074	462139	2579153	-	-	Bone	Possible tomb. The feature uses curving bedrock on 2.5 sides. A ring of stones are on its eastern side and may be the remains of a wall.
111075	462101	2579168	-	-	Lithic; Bone	Feature consists of a raised stone pile using folds of bedrock in its walling to the south. Bone fragments indicate it was possibly a tomb, but no walls are visible.
111076	462112	2579184	-	-	None	-
111077	462087	2579212	-	-	None	Feature is a possible tomb, but poorly preserved.
111078	462095	2579265	-	-	None	-
111079	462083	2579224	Tomb	-	Lithic; Bone	This feature consists of a mound of stones with bone fragments visible in its disturbed center.
111080	462040	2579258	-	3rd Mill. BC	Lithic	-
111081	462050	2579255	Tomb	-	Lithic; Bead	This feature incorporates lots of bedrock in its construction.
111082	462022	2579273	-	-	Lithic	-
111083	462102	2579286	-	Hafit	None	This feature is quite a tall mound of stone, with two small (modern) cairns on top.
111084	462124	2579362	-	-	None	-
111085	462103	2579313	-	Hafit	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111086	462019	2579422	-	Iron Age	Ceramic; Stone vessel; Beads	-
111087	462120	2579328	-	3rd Mill. BC	None	A sunken channel to the west in the rubble could mark a doorway location.
111088	462020	2579404	-	3rd Mill. BC	Lithic	-
111090	461583	2579800	-	Iron Age	Ceramic	This small low mound of rocks is distinctive: it is built of cobble conglomerate and sits on shist.
111091	462030	2579434	-	-	Bone	-
111092	461892	2579836	Tomb	Wadi Suq	Bone; Stone vessel	This feature consists of a small mound with a cairn built in its center.
111093	462010	2579459	-	-	Bone	-
111094	462215	2579678	-	-	None	This is quite a large cairn.
111095	462009	2579469	-	-	Lithic; Bone	This feature is the most southerly cairn on this ridge. Four blocks form the fragment of wall to the east.
111096	462275	2579645	Tomb	Wadi Suq	None	This cairn is situated on the edge of the wadi.
111097	461907	2579392	-	-	Lithic	This feature consists of a small mound of rocks roughly circular in form.
111098	462421	2579561	-	-	Bone	Poorly preserved.
111099	474473	2573410	Tomb	-	None	One ringwall, two courses wide, is visible for this feature. No stone-on-stone is left but the lowest course is visible nearly completely.
111100	474472	2573795	Tomb	Hafit	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111101	474463	2573799	-	Hafit	None	Little height of this feature is left but the lowest course of ringwall is visible most of the way around.
111102	474444	2573804	Tomb	-	None	This tomb had a doorway to the west.
111103	474428	2573826	Tomb	-	None	-
111104	474391	2573802	-	-	Bone	-
111105	474363	2573747	-	-	None	-
111106	474276	2573673	-	-	Bone	Feature consists of a low mound of stones.
111107	474263	2573738	-	3rd Mill. BC	None	This feature is a large mound of fragmented stone.
111108	474297	2573894	Tomb	Umm an-Nar	None	This is a large tomb with a W-E running wall on the west side of its interior.
111109	474386	2573869	-	-	None	-
111110	474325	2573914	-	-	None	This is a low mound of stones.
111111	474301	2573939	-	-	Lithic	This is a circle of weathered black and white stone rubble.
111112	474274	2573906	-	-	Lithic	A wall is visible on this feature's west side.
111113	461764	2579451	-	Hafit	Bone	Poorly preserved.
111114	461567	2580169	-	Modern	None	-
111115	461974	2579828	-	-	Lithic; Bone	Oval stone feature without visible structural elements.
111116	462270	2579674	-	Hafit	None	This feature has a grid peg on top.
111117	462320	2579578	-	-	None	-
111118	462476	2579397	Building(s)	-	Ceramic	This feature is one, possibly two buildings made of stones laid flat and upright in the walls.
111119	474458	2573705	-	-	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111120	474490	2573776	Tomb	Hafit	None	Well preserved tomb, with corbelling intact and visible from above, with a triangular shaped doorway and six courses of interior wall visible.
111121	474449	2573805	Tomb	3rd Mill. BC	None	Wall is visible all the way around and up to four courses high, with a probable doorway to the northwest.
111122	474435	2573818	Tomb	Hafit	None	This feature has an interior wall intact at least nine courses high and an exterior wall intact at least five courses.
111123	474377	2573875	Tomb	3rd Mill. BC	None	This feature is probably a largely collapsed tomb, but wall is visible to the north. Its central soil fill has no obvious signs of recent disturbance.
111124	474346	2573784	Tomb	3rd Mill. BC	None	-
111125	474284	2573697	-	3rd Mill. BC	None	-
111126	474367	2573882	Tomb	Hafit	None	Poorly preserved.
111127	474373	2573876	-	3rd Mill. BC	None	Part of this feature's outer ringwall is visible (one course only) with clear triangular (worked) stones and possible interior walls.
111128	474332	2573905	-	3rd Mill. BC	None	This feature has been subject to extensive robbing.
111129	474316	2573924	-	-	None	-
111130	474282	2573963	-	-	None	-
111131	474279	2573974	Tomb	Hafit	None	This feature is quite well preserved. The interior wall is probably 70% complete, and most rubble is derived from exterior wall collapse.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111132	474275	2573977	Tomb	-	None	This feature is very well preserved (90% of exterior ringwall is visible).
111133	474270	2573986	Tomb	Wadi Suq	None	
111134	474262	2573984	Tomb	-	Bone	-
111135	474270	2573972	-	-	None	This is a small robbed mound of stone.
111136	474196	2573954	Tomb	Hafit	None	This is a reconstructed tomb in the fenced enclosure within the UNESCO fence.
111137	474205	2573931	Tomb	Hafit	None	Tomb to the southeast of reconstructed tomb 111136 and east of reconstructed tomb 111138. This one is not reconstructed. Outer wall and core have collapsed and there is a small hole in the roof. Its inner wall is probably relatively complete.
111138	474187	2573915	Tomb	Hafit	None	Well preserved tomb to the east of reconstructed tomb 111145 and north of 111137. Wall has collapsed to the west and roof has collapsed into center.
111139	474222	2573745	Tomb	-	Bone; Shell; Beads	-
111140	474153	2573876	Tomb	Hafit-Umm an-Nar	Bone	-
111141	474163	2573879	Tomb	Hafit-Umm an-Nar	None	Tomb, probably dated to the Hafit-Umm an-Nar transition. Probably this was reused in a later (i.e., Wadi Suq) period.
111142	474151	2573888	Tomb	3rd Mill. BC	None	-
111143	474189	2573901	Tomb	3rd Mill. BC	Ceramic; Lithic	Exterior ringwall and corbelling intact, though there is evidence of reuse in the 2nd millennium BC.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111144	474168	2573921	Tomb	3rd Mill. BC	None	Remains of two outer skins are visible.
111145	474183	2573923	Tomb	3rd Mill. BC	None	This is a white-faced tomb, fully reconstructed, without a door.
111146	474194	2573939	Tomb	Hafit	None	This reconstructed tomb has paving slabs on the floor and its interior chamber is rectilinear in parts.
111147	474187	2573742	-	-	None	-
111148	474182	2573772	-	-	None	Feature is obscured by rockfall and rubble.
111149	474175	2573776	Tomb	3rd Mill. BC	None	-
111150	474126	2573803	Tomb	Hafit	None	-
111151	474135	2573794	Tomb	3rd Mill. BC	None	-
111152	474131	2573797	Tomb	3rd Mill. BC	None	This feature has been partially cleared of rubble but it looks like its interior has collapse inward and therefore may not have been disturbed in recent times.
111153	474183	2574112	Building(s)	-	None	-
111154	474172	2574127	Tomb	Umm an-Nar	None	-
111155	474030	2574138	Tomb	3rd Mill. BC	None	This tomb has collapsed but is likely to be reasonably undisturbed.
111156	474023	2574144	-	3rd Mill. BC	None	-
111157	474016	2574149	-	-	Lithic	-
111158	473871	2574127	Tomb	Hafit	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111159	473856	2574131	Tomb	Hafit	None	This feature consists of a small cairn with a central depression, and a ringwall visible on the west side.
111160	473821	2574142	Tomb	Hafit	None	This feature demonstrates beautifully "intact" collapse on its south side: eight courses have fallen in a curved line.
111161	473757	2574122	Tomb	Hafit	Ceramic	This feature is in an advanced state of collapse, but its internal ringwall is visible from above.
111162	474088	2574232	Tomb	Wadi Suq	None	This oblong feature is probably a Wadi Suq tomb.
111163	474124	2574075	Tomb	Hafit	None	-
111164	474130	2574081	Tomb	Hafit	None	-
111165	474114	2574078	-	-	None	-
111166	473886	2574122	-	Hafit	Lithic; Bone	This feature consists of a small cairn on a short ridge.
111167	473687	2574094	-	Hafit	None	-
111168	473672	2574095	-	-	Bone	-
111169	473675	2574092	-	-	None	-
111170	473624	2574081	-	-	Lithic	-
111171	473999	2574288	-	Hafit	None	This feature is highly disturbed, both from collapsed and stone robbing.
111172	474070	2574261	-	-	None	-
111173	474081	2574243	-	3rd Mill. BC	Lithic	-
111174	474197	2574195	Tomb	Wadi Suq	Beads	This is an intact Wadi Suq tomb that appears to have used stone from an Umm an-Nar tomb. Undisturbed. Covered in small, multicoloured (but predominantly dark) pebbles. Orientated northwest-southeast.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111175	474195	2574198	Tomb	Wadi Suq	Shell	This is an intact Wadi Suq tomb that appears to have used stone from an Umm an-Nar tomb. Undisturbed. Covered in small, multicoloured (but predominantly dark) pebbles. Orientated northwest-southeast.
111176	474190	2574202	Tomb	Wadi Suq	None	-
111177	473950	2574024	Cobble scatter	-	Lithic	This feature consists of scattered patches of grey, blue-grey, and light grey cobbles and white limestone chips, in stark contrast to the hillside bedrock. Lots of lithics are interspersed.
111178	473903	2573999	-	Wadi Suq	None	-
111179	474189	2574191	Tomb	Hafit	None	-
111180	474162	2574207	-	Hafit	Lithic	This feature consists of a slightly raised mound, with evidence of partial circular walls.
111181	474160	2574224	-	-	Worked stone	Stone robbing and/or reuse make this difficult to study.
111182	473896	2574066	-	-	Lithic	Feature consists of a rough pile of rubble with unclear edges and no visible walls.
111183	473908	2574055	-	Hafit	Ceramic; Lithic	-
111184	473848	2574039	-	-	Ground stone	-
111185	473775	2573356	Tomb	Umm an-Nar	None	-
111186	473761	2573993	-	3rd Mill. BC	None	-
111187	473740	2574006	Tomb	-	Bone	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111188	473740	2574001	-	-	Bone	Poorly preserved.
111189	473729	2574016	-	-	None	-
111190	473802	2573323	Tomb	Umm an-Nar	Ceramic; Lithic; Bone	This tomb has one central dividing wall.
111191	473786	2573329	-	Iron Age	Ceramic	This is a mound of soil, pebbles, and stones, including a clear reuse of Umm an-Nar pecked tomb-stones.
111192	473932	2573970	-	-	None	This is a low pile of stones. Stone-on-stone evident but alignments are dif to observe b/c stones are irregularly sized/shaped
111193	473973	2573949	Tomb	Hafit	Ground stone	This is a large, thick-walled tomb on the end of a ridge, part of a cluster of at least five large tombs.
111194	473982	2573939	Tomb	Hafit	None	This large tomb has an internal wall separating the two chambers.
111195	473979	2573954	Tomb	Wadi Suq	None	-
111196	473992	2573814	Tomb	Hafit	None	This large tomb has relatively intact corbelling and walls.
111197	473926	2573789	Grave(s)	Iron Age	Ceramic; Bone	This is a collection of features consisting of a possible Iron Age cemetery. Several have been excavated.
111198	473892	2573947	-	-	None	-
111199	473934	2573915	Tomb	Hafit-Umm an-Nar	Lithic	This prominent tomb appears to have seen very little robbing.
111200	473947	2573912	-	-	None	-
111201	473968	2573911	Tomb	Umm an-Nar	Lithic	The U-shaped chamber of this feature is visible.
111202	473979	2573910	Tomb	Umm an-Nar	None	Large tomb with well-preserved inner wall and second outer skin preserved to the East and North.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111203	473997	2573836	Tomb	Umm an-Nar	None	Well preserved tomb.
111204	473972	2573823	Tomb	Umm an-Nar	None	-
111205	473952	2573828	Tomb	Umm an-Nar	Ceramic; Lithic	-
111206	473916	2573833	Tomb	Hafit	None	-
111207	473684	2573782	-	-	None	This feature's wall is coarsely made and is therefore different from many others.
111208	473692	2573774	-	-	Lithic	-
111209	473718	2573754	-	-	None	This feature is a low accumulation of rocks.
111210	473459	2573825	-	-	None	-
111211	473928	2573799	Tomb	Umm an-Nar	Lithic; Bone	-
111212	473756	2573730	-	-	None	Poorly preserved.
111213	473775	2573717	-	-	Ceramic	Rubble scatter with fragments of white and black stones.
111214	473581	2573758	-	3rd Mill. BC	None	This is a low feature of triangular and rectangular stones set into a sub-circle (in plan).
111215	473578	2573765	-	Umm an-Nar	Bone	This is a low feature of triangular and rectangular stones set into a sub-circle (in plan).
111216	473572	2573766	-	3rd Mill. BC	Lithic	This is a low feature of triangular and rectangular stones set into a sub-circle (in plan).
111217	473560	2573773	-	-	Lithic	-
111218	473542	2573748	Tomb	Hafit-Umm an-Nar	Lithic	Feature, mostly gone, with the plinth and wall (to the north) visible in plan. The wall is faced to the interior and exterior.
111219	473548	2573753	-	-	Lithic	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111220	473442	2573714	-	-	None	Poorly preserved.
111221	473606	2573740	-	-	Bone	Poorly preserved.
111222	473595	2573750	-	-	Ceramic; Lithic	This is a small, non-descript mound of rocks which may be rectangular structure.
111223	473586	2573755	-	-	Lithic	-
111224	473523	2573738	-	Hafit-Umm an-Nar	None	This is poorly preserved feature.
111225	473532	2573740	-	-	None	-
111226	473456	2573666	-	Umm an-Nar	Lithic	Small mound with some (probably interior) wall visible. The thickness of the rubble may indicate an outer wall was present.
111227	473471	2573646	-	-	Ceramic; Lithic	-
111228	473529	2573596	-	-	Lithic	-
111229	473555	2573566	-	-	None	Cairn built with bedrock ridge, c. 1 m high to the west.
111230	473564	2573560	-	-	None	-
111231	473792	2573667	-	-	None	-
111232	474087	2573751	Tomb	Hafit-Umm an-Nar	None	This feature sits on a low ridge in the plain. Some robbing of outer wall seems to have occurred but the roofing seems to be intact.
111233	474084	2573741	Tomb	Hafit-Umm an-Nar	None	This feature has good wall preservation to the west.
111234	473440	2573690	-	Umm an-Nar	Lithic; Bone	-
111235	473451	2573681	-	Hafit-Umm an-Nar	Lithic	This feature is a mound of at least three concentric ringwalls.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111236	473437	2573676	Tomb	Iron Age	Lithic; Bone; Metal; Beads; Shell	-
111237	473492	2573626	-	3rd Mill. BC	Lithic	Poorly preserved.
111238	473479	2573561	-	3rd Mill. BC	Bone	This is a mound of soil and stone fragments.
111239	473577	2573548	-	-	None	-
111240	473765	2573662	-	Iron Age	Ceramic	Probable reuse of this feature in the Iron Age.
111241	474107	2573744	Tomb	Umm an-Nar	Lithic	-
111242	474095	2573750	Tomb	Hafit	None	-
111243	474095	2573703	Tomb	3rd Mill. BC	None	-
111244	474085	2573705	Tomb	Hafit	None	This is a reasonably tall standing tomb in a tomb cluster.
111245	474101	2573715	Tomb	Hafit	Ceramic	-
111246	474092	2573726	-	3rd Mill. BC	None	Poorly preserved.
111247	474081	2573723	Tomb	Hafit	None	Poorly preserved.
111248	474068	2573728	Tomb	Umm an-Nar	None	Two skins are visible for this feature, and the roof may be partially intact.
111249	474059	2573666	Tomb	Hafit	None	-
111250	474089	2573713	Tomb	3rd Mill. BC	None	This feature has ringwall just visible to the northwest under rubble.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111251	474064	2573712	Tomb	Umm an-Nar	None	This feature was probably reused in the Wadi Suq period.
111252	474081	2573668	Tomb	Hafit	None	-
111253	474062	2573673	Tomb	-	Bone	Poorly preserved.
111254	474074	2573635	Tomb	3rd Mill. BC	None	Feature is mostly intact, although there is evidence of exterior stone removal.
111255	474044	2573659	-	Umm an-Nar	Ceramic	This feature has good wall preservation.
111256	474033	2573627	Tomb	Hafit	None	Well preserved outer wall is visible to the south and west, and well preserved inner wall is visible to the north.
111257	474037	2573601	-	3rd Mill. BC	Ceramic; Lithic	-
111258	474069	2573613	Tomb	Hafit	Ceramic; Bone	Very large stones make up what remains of this feature's ringwall.
111259	474003	2573570	Wall-dam	-	None	This is a raised rectilinear mound running north-south, perpendicular to the wadi. It is 3.5 m wide, with traces of linear N-S walls on both sides.
111260	473986	2573564	-	-	None	-
111261	473980	2573544	Tomb	Hafit-Umm an-Nar	Bone; Beads	Remains consist of a very substantial tomb wall, including outer skin, space for a rubble core, then an inner wall faced on both sides.
111262	473961	2573530	Tomb	Hafit-Umm an-Nar	Bone	-
111263	473957	2573514	Tomb	Umm an-Nar	Bone	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111264	473945	2573503	-	Wadi Suq	Ceramic; Bone	This feature has quite a bit of fragmented bone (<10 cm pieces), including cranial and long bones.
111265	473935	2573509	Tomb	3rd Mill. BC	Ceramic	-
111266	473916	2573484	Tomb	Umm an-Nar	None	-
111267	473875	2573455	-	-	None	-
111268	473891	2573380	Tomb	Hafit	Ceramic; Bone	Significant amounts of stone robbing are visible but there is a large mound of soil.
111269	474008	2573537	-	Umm an-Nar	None	-
111270	473992	2573533	Tomb	Umm an-Nar	Bone	-
111271	473970	2573517	Tomb	Umm an-Nar	Bone	-
111272	473973	2573510	Tomb	-	Ceramic; Bone	-
111273	473980	2573497	Tomb	Umm an-Nar	Ceramic; Bone	-
111274	473949	2573485	-	-	Ceramic	This is a flattened mound of stones, slightly cleared in the middle, few a triangular stones suggesting former walls of a tomb.
111275	473934	2573467	Tomb	Umm an-Nar	None	This tomb has been reconstructed.
111276	473921	2573473	Tomb	3rd Mill. BC	Ceramic	The walls are mainly collapsed but two chambers are visible. The external wall survives to three courses.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111277	473888	2573469	Tomb	Umm an-Nar	Ceramic	-
111278	473858	2573422	Tomb	Umm an-Nar	Ceramic; Bone; Stone vessel	-
111279	473864	2573399	Tomb	3rd Mill. BC	None	Poorly preserved.
111280	473871	2573391	Tomb	3rd Mill. BC	Ceramic	Poorly preserved.
111281	473831	2573351	Tomb	Umm an-Nar	None	-
111282	473827	2573365	-	Hafit-Umm an-Nar	None	-
111283	473834	2573367	-	Iron Age	None	-
111284	473791	2573390	Wall-dam	-	None	-
111285	473868	2573361	Tomb	Umm an-Nar	Ceramic; Bone	-
111286	473862	2573366	Tomb	Umm an-Nar	Ceramic	This is a small pile of stones. It is possibly a more recent tomb reusing blocks from the 3rd Millennium cemetery.
111287	473856	2573342	Tomb	Umm an-Nar	Ceramic; Bone	This large tomb has one internal wall going half-way across.
111288	473854	2573331	-	-	Ceramic	-
111289	473844	2573324	-	-	None	-
111290	473827	2573348	Grave(s)	-	None	This is a cluster of graves, re-using stones from early periods (3rd millennium tombs mostly).

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111291	473813	2573250	Wall	Wadi Suq-Iron Age	None	The wall of this feature is double-faced with a rubble core.
111292	473850	2573298	-	-	None	This rectilinear structure is made up of four different types of linear constructions. To the north and south are stones on end.
111293	473869	2573278	-	Iron Age	None	This is a collection of unidentifiable features, possibly small walls or dams and graves. They re-use Third Millennium BC material.
111294	473875	2573298	-	-	None	-
111295	473865	2573318	Wall-dam	-	None	-
111296	473906	2573303	Tomb	Umm an-Nar	Ceramic; Bone	Feature made of large ashlar blocks, originally excavated by Frifelt (i.e., #1142).
111297	473869	2573320	-	-	None	-
111298	473889	2573351	Tomb	Umm an-Nar	Ceramic; Lithic	This tomb has a probable interior dividing wall between two chambers.
111299	473908	2573341	Tomb	Umm an-Nar	Ceramic	-
111300	473927	2573335	Tomb	Umm an-Nar	Ceramic; Lithic; Bone; Shell	-
111301	473932	2573326	Tomb	Umm an-Nar	None	There is a possible dividing wall running north-south.
111302	473939	2573325	Tomb	Umm an-Nar	Bone	This fairly flat mound is located on a gradual slope.
111303	473940	2573332	-	-	Ceramic	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111304	473958	2573333	Tomb	Umm an-Nar	Ceramic; Lithic; Bone	-
111305	473946	2573345	-	-	Lithic; Bone	This is a sub-circular (in plan) low mound - circular with smaller circle attached to S. It is probably a Wadi Suq tomb.
111306	474013	2573325	Tomb	Hafit	Ceramic; Lithic; Bone	-
111307	473917	2573315	Grave(s)	Iron Age	Ceramic	This Iron Age grave reuses Umm an-Nar tomb stones.
111308	473943	2573367	Tomb	Umm an-Nar	Ceramic; Bone	-
111309	473943	2573397	Tomb	Umm an-Nar	Bone	Umm an-Nar tomb with Iron Age reuse on top.
111310	473949	2573386	Tomb	Umm an-Nar	Bone	-
111311	473957	2573383	Tomb	Umm an-Nar	Ceramic; Bone	The corbelling on this tomb is intact to the northwest. Ceramics from the Iron Age (see Schreiber 2007:54 number 6) indicate later reuse.
111312	473971	2573373	Tomb	Umm an-Nar	Ceramic; Bone; Beads	This tomb was partially dismantled in antiquity, then graves were built on top.
111313	473985	2573367	Tomb	Umm an-Nar	Lithic	This tomb is visible primarily in plan. Its ringwall is faced to the interior and exterior and filled with rubble.
111314	473984	2573431	Tomb	Umm an-Nar	Lithic; Bone	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111315	473997	2573463	Tomb	Hafit	None	-
111316	474022	2573508	Tomb	Umm an-Nar	Ceramic	-
111317	474030	2573508	Tomb	Umm an-Nar	None	-
111318	474123	2573502	-	-	None	-
111319	474161	2573484	-	-	None	-
111320	473982	2573414	Tomb	Hafit	Bone	This is a small tomb, its ringwall visible in plan to the west, south, and east.
111321	473996	2573417	Tomb	Umm an-Nar	Bone	-
111322	473994	2573405	Tomb	Umm an-Nar	Ceramic; Bone	Tomb with an interior dividing wall running west-east. It has a brown and grey limestone pecked ringwall visible for three courses, suggesting that this did not have a white ashlar face.
111323	474003	2573407	Tomb	Hafit-Umm an-Nar	None	This tomb has been excavated.
111324	474011	2573401	Tomb	Umm an-Nar	None	White limestone chunks remain in situ, but this feature was prob levelled in antiquity.
111325	474032	2573378	Tomb	Hafit	None	-
111326	474038	2573375	Tomb	Umm an-Nar	None	-
111327	473926	2573254	Wall	-	None	This wall runs N-S, adjacent to a small tributary wadi. It is well coursed in places, and is probably a water management structure.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111328	473890	2573254	-	3rd Mill. BC	Ceramic; Lithic	-
111329	473884	2573263	-	-	Ceramic	-
111330	473886	2573250	Wall-dam	-	Ceramic	-
111331	473894	2573245	-	-	Ceramic; Lithic	-
111332	473911	2573243	-	-	None	This is an ovoid cairn with no visible wall.
111333	473918	2573231	-	Umm an-Nar	Ceramic; Lithic	This appears to be a continuation of a wall from the southwest.
111334	473973	2573118	-	-	Debitage	Poorly preserved.
111335	473982	2573105	Wall	-	Ceramic; Lithic	Poorly preserved.
111336	474032	2573146	Wall	-	Ceramic	This wall runs north-south and may form part of a field system with the E-W running wall to its south.
111337	474033	2573093	Wall	-	Ceramic; Lithic	-
111338	474046	2573085	-	Umm an-Nar	Ceramic	This cairn could be assoc with field clearance, or it could be the remains of a tomb with its walls robbed out.
111339	474063	2573506	-	-	None	-
111340	474103	2573504	-	Hafit	None	-
111341	474174	2573482	-	-	None	-
111342	474183	2573475	-	-	None	-
111343	474080	2573345	-	-	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111344	473946	2573203	Tomb	Wadi Suq	Ceramic; Lithic; Bone; Stone vessel	Wadi Suq tomb.
111345	473967	2573186	-	Wadi Suq	Ceramic	-
111346	473930	2573151	Grave(s)	-	None	This is probably a grave, oriented E-W.
111347						[number discarded.]
111348	473939	2573214	Grave(s)	Historic	Ceramic	This is a small rectilinear feature, probably a pre-Modern grave.
111349	473935	2573221	-	Historic	Ceramic; Metal	This is a N-S oriented feature of stone with a small mound of soil and pebbles in the center.
111350	473976	2573170	-	-	Ceramic	This is a small mound of soil and stones - including ashlar blocks - on top of an early wall extension.
111351	474205	2573435	-	-	None	-
111352	474034	2573113	Building(s)	-	Ceramic	-
111353	474040	2573102	Tomb	Umm an-Nar	Ceramic	-
111354	474041	2573095	Tomb	Wadi Suq	Ceramic; Bone	-
111355	474046	2573094	Tomb	Wadi Suq	Ceramic; Bone	-
111356	474059	2573107	Wall-dam	Wadi Suq	None	-
111357	474103	2573108	Wall	-	Ceramic	This is a linear wall made up of stones on end.
111358	474112	2573146	Wall	-	None	This is a small fragment of linear wall running roughly E-W.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111359	474149	2573152	Tomb	Hafit	None	This feature is the foundation for a tomb, on the hillside. It has been cleared to expose the full extent of the wall in plan.
111360	474154	2573152	-	-	None	This is a fragment of white limestone walling, appearing out of the hillside to the north of feature 111359.
111361	474144	2573161	-	-	None	-
111362	474085	2573089	Wall	-	Ceramic	-
111363	474116	2573103	-	-	Ceramic	This very eroded cairn sits mid-slope.
111364	474135	2573166	Wall	-	None	-
111365	474128	2573175	-	-	None	-
111366	474299	2573334	-	-	Lithic; Bone	-
111367	474284	2573449	-	Umm an-Nar	Ceramic	-
111368	474291	2573443	-	-	Ceramic; Lithic; Bone	Bone fragments were found in this mound of rubble without discernible wall.
111369	474317	2573427	-	-	None	-
111370	474343	2573412	-	-	None	-
111371	474350	2573406	-	-	Bone	This is a low mound of stone and soil with lots of bone fragments (from a medium-sized mammal).
111372	474365	2573397	-	-	None	This is a mound of stone rubble without visible shape.
111373	474431	2573376	Tomb	3rd Mill. BC	None	Remains of a ringwall is visible to the south.
111374	474441	2573365	-	-	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111375	474187	2573183	Tomb	Iron Age	Ceramic; Bone	This is an excavated Iron Age tomb beside a rebuilt Umm an-Nar tomb (feature 111376). The Iron Age tomb is rounded but the chambers inside are rectilinear (N-S orientation).
111376	474192	2573176	Tomb	Umm an-Nar	Ceramic; Bone; Grinding stone	-
111377	474198	2573171	Tomb	Iron Age	Ceramic	Iron Age tomb with four chambers.
111378	474241	2573154	-	-	None	Low mound of stone and soil.
111379	474233	2573160	-	-	Ground stone	ground stone ('mano').
111380	474224	2573164	-	-	Bone	This is a large semi-circle of stones and rubble.
111381	474187	2573165	Lithic scatter	-	Ceramic; Bone	This is a workshop area associated with feature 111376. Not known if this is recent or ancient. Made up of blocks, fragments, and chips of white limestone.
111382	474149	2573122	-	-	None	This is an unidentified rectilinear feature.
111383	474134	2573115	Grave(s)	-	Lithic	This consists of several graves with a general orientation E-W; the precise number etc. cannot be determined.
111384	474135	2573102	Building(s)	-	None	-
111385	474143	2573052	Tomb	Umm an-Nar	None	-
111386	474155	2573041	Tomb	Umm an-Nar	Bone	More than two courses are intact on the north side and visible.
111387	474128	2573041	Wall	-	Ceramic; Metal	This is a wall feature running N-S; its stone blocks are placed upright.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111388	474145	2573028	Tomb	3rd Mill. BC	Ceramic; Bone; Stone vessel	Poorly preserved tomb, but visible in plan on its western half.
111389	474130	2573011	Wall	-	Ceramic	This wall runs N-S for c. 12 m, then turns a corner at and runs E-W for c. 2 m. The stones are placed upright.
111390	474105	2573024	Wall	-	None	This wall, build of upright stones, runs E-W for c. 20 m.
111391	474092	2573049	Wall	-	None	This feature is a nearly completely buried wall.
111392	474097	2573028	Tomb	-	None	Wadi Suq tomb, situated at the base of the settlement slope, and oriented E-W.
111393	474093	2573023	Tomb	Wadi Suq	Ceramic	Wadi Suq tomb built on bedrock.
111394	474098	2573022	Tomb	Wadi Suq	Ceramic	Wadi Suq tomb built on bedrock.
111395	474100	2573017	Tomb	Wadi Suq	Ceramic	Wadi Suq tomb built on bedrock, and contains Umm an-Nar reused stones.
111396	474103	2573012	Tomb	Wadi Suq	Ceramic; Bone	Wadi Suq tomb built on bedrock.
111397	474111	2572996	Tomb	-	Ceramic	-
111398	474077	2573019	Tomb	Umm an-Nar	Ceramic	This Wadi Suq tomb is oriented NE-SW and is covered in Modern and pre-Modern finds.
111399	474248	2573049	-	-	None	-
111400	474258	2573049	-	-	None	-
111401	474395	2573342	Tomb	-	None	This cairn has traces of ringwall visible, especially on its west side where it sits directly on vertical bedrock.
111402	474468	2573226	Tomb	3rd Mill. BC	Lithic; Bone; Beads	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111403	474219	2572920	-	Wadi Suq	None	-
111404	474246	2572900	Tomb	Hafit	None	-
111405	474239	2572865	Antiquity	Umm an-Nar	None	This is a ground circular depression in a large piece of bedrock half-way down the slope.
111406	474232	2572859	Building(s)	Umm an-Nar	Ceramic	This is a series of rectilinear walls with a great deal of surface ceramics, all on the southwest face of the hill (on the "Settlement Slope"). Stones are large upright slabs, frequently at right angles or in line with each other, but not from the same bedrock source (i.e., not natural).
111407	474310	2572889	Tomb	Hafit	None	-
111408	474394	2572955	-	-	None	This is a large soil-filled cairn.
111409	474344	2572881	-	-	None	-
111410	474367	2572884	-	-	Ceramic; Lithic; Bone	-
111411	474169	2572968	Tomb	Wadi Suq	Ceramic; Bone	Wadi Suq tomb on top of Tower 1156. It incorporates 1156 stones into its ringwall.
111412	474176	2572965	Tomb	Wadi Suq- Iron Age	Ceramic; Bone	Wadi Suq tomb on top of Tower 1156. It incorporates 1156 stones into its ringwall.
111413	474163	2572961	Tomb	-	Ceramic; Bone	Wadi Suq tomb on top of Tower 1156. It incorporates 1156 stones into its ringwall.
111414	474164	2572965	Tomb	Wadi Suq	None	-
111415	474503	2573055	-	-	None	-
111416	474407	2572863	-	-	None	-
111417	474404	2572865	Tomb	-	Lithic; Bone	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111418	474359	2572748	Wall-dam	Wadi Suq-Iron Age	None	-
111419	474287	2572795	Wall-dam	-	None	-
111420	473114	2573821	Grave(s)	Modern	None	Islamic graveyard.
111421	474580	2572722	Wall	Historic	None	Wall built of blocks, one course wide, unfaced.
111422	474653	2572580	Wall-dam	-	None	Falaj, c. 1 m wide, made of subangular cobbles with mud fill between.
111423	474630	2572558	Well	Historic-Modern	None	Well feature, associated with falaj feature 111422. It has a Ministry of Water marker ("resources #320/873").
111424	474538	2572584	Building(s)	Historic-Modern	Ceramic; Lithic	-
111425	474559	2572595	Wall	Umm an-Nar	None	-
111426	474408	2572698	Wall	Umm an-Nar	None	This is a wall or dam, running NW-SE, over four courses high.
111427	474379	2572714	Wall	-	None	Poorly preserved wall.
111428	474214	2572795	Wall-dam	-	None	-
111429	474195	2572810	Wall	Historic-Modern	None	-
111430	474191	2572764	Wall	Umm an-Nar	None	-
111431	474153	2572858	Wall	Historic-Modern	None	One, possibly two rectilinear 3rd millennium-style walls.
111432	474084	2572887	Wall	Umm an-Nar	None	This wall is two courses wide, faced on both sides without fill, and two courses high.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111433	473985	2573067	Wall	Umm an-Nar	None	This feature is one long wall running NE-SW, with fragments of perpendicular walling at each end. Stones are upright and laid flat.
111434	474066	2572995	-	-	None	-
111435	473812	2573083	-	3rd Mill. BC	None	Operation 'A'
111436	473751	2573104	-	Umm an-Nar	None	Operation 'B'. Further excavations by Schmidt et al. (2012) suggest this may be either settlement or a tower structure.
111437	473599	2573191	-	-	Shell	-
111438	473538	2573179	Wall-dam	-	None	-
111439	473771	2573058	Wall	-	None	Linear wall, oriented NE-SW, one couse wide, built of stones upright and laid flat.
111440	473825	2572937	Wall	Modern	None	-
111441	473824	2573013	-	-	None	-
111442	473862	2572944	Grave(s)	-	None	Oval grave oriented N-S, with blocks laid around it.
111443	473966	2572872	Field systems	-	Ceramic; Lithic	Set of walls (NOT Umm an-Nar) stepped up. This is a poss field systems between two buildings.
111444	474049	2572835	Wall	-	None	Double-faced wall.
111445	466042	2574305	Grave(s)	Modern	None	-
111446	465519	2575227	Lithic scatter	-	Lithic	Collection of hammerstones and lithics: more than 30 gray and blue cobbles (ca. 10 cm in dia), with chunks of banded chert nodules.
111447	466089	2574590	Lithic scatter	-	Lithic	This "feature" consists of hundreds of lithics scattered about along a low line of hills, and made of the source material on which they sit.
111448	465501	2575696	Grave(s)	-	None	Three pre-Modern grave plots.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111449	465658	2575419	Grave(s)	-	None	-
111450	465695	2575614	-	-	None	-
111451	466266	2574807	-	-	None	This small cairn is not ancient and not a tomb; rather it is probably for navigation.
111452	468064	2577718	-	Modern	None	-
111453	468005	2577723	-	-	None	This is a mound of stones and soil with a bit of circular ringwall visible on its southwest side.
111454	467998	2577751	-	-	None	-
111455	467941	2577756	-	-	None	-
111456	467949	2577775	-	-	None	-
111457	467928	2577486	-	-	Bone	Mound of soil with a few sections of ringwall visible.
111458	467796	2577535	-	-	Bone	-
111459	467855	2577767	-	Modern	Bone	-
111460	467301	2577916	-	-	Bone	This is a low mound of soil and stones on a bedrock outcrop.
111461	468142	2577745	-	-	Bone	-
111462	461473	2587260	Tower	3rd Mill. BC	Ceramic	This tower has interior rectilinear stone walls built of large roughly hewn blocks. Outer "ringwall" (like at Matariya's) is visible in most directions.
111463	464827	2577546	-	-	Lithic	-
111464	464837	2577544	-	-	None	-
111465	464680	2577542	-	-	None	-
111466	464110	2576942	Well	-	None	Stone-lined well, probably an access hole to a falaj, which appears to run N-S.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111467	470292	2575607	Wall-dam	Modern	None	This is probably a rectangular semi-subterranean open water tank/trough. Unworked stone lined rectangular semi-subterranean structure with attached falaj.
111468	470187	2575695	Building(s)	Modern	Ceramic	Stone rectilinear two-part structure.
111469	470221	2575565	Building(s)	-	Ceramic	-
111470	470091	2575467	-	Historic-Modern	Ceramic; Lithic	This is a mound of pebbles and soil in an abandoned field; possibly just a field clearance cairn.
111471	470081	2575314	Tomb	3rd Mill. BC	Ceramic	-
111472	471063	2574312	Building(s)	Umm an-Nar	Ceramic	This is Umm an-Nar settlement associated with al-Khutm. Unlike the Settlement Slope this area is highly sedimented so it is possible that some of it is intact.
111473	470311	2574170	Mudbrick settlement	-	Ceramic; Metal	Mudbrick village south of Wahrah, with a line of open and silted stone-lined wells (afaj access points), mudbrick houses, etc.
111474	470196	2574019	Tower	Modern	Ceramic; Serouj	This is a pre-Modern mudbrick tower. Its stone foundation is visible, as well as two walls.
111475	470043	2573952	Wall-dam	Modern	Ceramic; Serouj	This feature is a stone wall, ca. 40 m long, running parallel to the active wadi.
111476	473512	2572299	Wall	Modern	Ceramic; Serouj	Stone retaining wall, two roughly faced courses wide and several high, made primarily of nearby bedrock and nearby cobbles (from conglomerate).
111477	473284	2572517	-	Wadi Suq	Ceramic; Lithic; Serouj	-
111478	473286	2572538	Tomb	Iron Age	None	-

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111479	473441	2572475	-	-	Ceramic; Shell	-
111480	473515	2572518	-	-	Ceramic	This is a circular mound with a "tail" to the west.
111481	473781	2572317	-	Umm an-Nar	Ceramic; Shell	-
111482	473870	2572321	-	-	Ceramic; Shell	Large mound of soil.
111483	468088	2575783	-	-	Bone; Shell	This is a semi-circular mound of light-colored soil and stone in center of a well-ploughed field.
111484	468082	2575797	Tomb	Umm an-Nar	Bone	-
111485	474057	2572925	Tower	Umm an-Nar	See reports	Tower 1145; "Karen's tower"; Kasr al-Rojoom.
111486	474219	2572581	Tower	Umm an-Nar	See reports	Tower 1146; Kasr al-Khafaji.
111487	474952	2572081	Tower	Umm an-Nar	See reports	Tower 1147; Matariya.
111488	474167	2572962	Tower	Hafit	See reports	Tower 1156.
111489	473741	2572180	Tower	Umm an-Nar	See reports	Tower 1148; Kasr al-Sleme.
111490	470807	2574527	Tower	Umm an-Nar	See reports	Tower al-Khutm.
111491	474120	2571728	Tower	Umm an-Nar	See reports	Tower Husn al-Wardi; Bat Qala.

Table 14 (cont'd)

ID	UTM Zone 40N		Material Culture Type	Period	Artifact(s)	Description and Notes
	Easting	Northing				
111492	469572	2574488	Tower	Umm an-Nar	See reports	Tower Wahrah Qala.
111493	458737	2576147	Tower	3rd Mill. BC	See reports	Tower ad-Dariz South 2
111494	459107	2576030	Tower	Umm an-Nar	See reports	Tower ad-Dariz South 1
111495	473927	2572464	-	Historic	Ceramic	-
111496	474029	2571890	Building(s)	-	Ceramic	This is a rectilinear stone building walls with mudbrick walls above. It has a Ministry of Heritage and Culture signpost.
111497	473910	2572487	-	Historic-Modern	Ceramic	-
111498	465454	2575067	Antiquity	-	N/A	-
111499	-	-	Antiquity	4th-6th Mill. BC	N/A	-
111500	466564	2574703	Antiquity	4th-6th Mill. BC	N/A	-
111501	467002	2574037	Antiquity	-	N/A	-
111089	462118	2579335	-	-	None	-

APPENDIX B

Artifact List and Descriptions

Introduction

Appendix B (**Tables 15 – 20**) lists all of the artifacts collected during the survey portion of data collection. All of these materials are held by the Ministry of Heritage and Culture in Muscat, Oman.

Table 15. Ceramic Descriptions.

Find #	Feature #	# sherds	Description	comments and comparanda
1	100666	1	black-on-buff	
20	110968	20	black-on-buff	
2	111296	2	black-on-brown	
2	111302	2	black-on-red	
1	100035	1	semi-coarse fabric	
1	100121	1	semi-coarse fabric	similar shape and fabric as 100122-3
1	100122	1	black-on-red	100122-3
1-2	100220	2	cloth-impressed	
1	100258	1	black-on-buff	
1-2	100261	2	black-slipped	black slip is fleeting (i.e., not Indus)
2-4	100267	3	black-on-red	
1	100280	1	semi-coarse fabric	
1	100485	1	glazed, turquoise	
1	100491	1	glazed, turquoise	
1-2	100495	2	glazed, turquoise	
2	100643	2	polychrome	
2	100666	2	black-on-buff	
1	100667	1	glazed, brown	
2-8	100875	7	unid.	
1	100908	1	glazed, green	
1	100925	1	glazed	
10	110965	10	fine fabric	
6	110967	6	unid.	
22	110968	22	black-on-buff	Hili 8 3rd millennium wares #8; in "ceramics of Oman Prehistory" pdf
11-12	110968	2	red-on-red	
14-19	110968	6	black-on-red	
2	110974	1	fine fabric	

Table 15 (cont'd)

Find #	Feature #	# sherds	Description	comments and comparanda
3	110974	1	incised gray ware	
4	110974	1	black-on-red	
1	110988	1	black-on-red	
16-17	110991	2	Bahla	
3	110993	1	glazed, brown	
1	110996	1	combed	
2	110996	1	Julfar	
3	110996	1	coarse fabric	
5	111000	1	combed	
6	111000	1	combed	
7-11	111026	5	black-on-red	
19	111065	1	fine fabric	
33	111065	1	black-on-red	
20-28	111065	9	black-on-red	
2	111067	1	semi-coarse fabric	
3	111113	1	black-on-red	
2	111190	1	black-on-red	
1	111257	1	glazed, brown	
2	111264	1	black-on-red	
1	111274	1	black-on-red	
1	111285	1	black-on-red	
2	111298	1	black-on-red	
3	111300	1	black-on-red	
1	111307	1	semi-fine fabric	
2	111307	1	fine fabric	
1	111316	1	Islamic green-glazed	
1	111337	1	vitreous fabric	
7	111344	1	black-slipped	

Table 15 (cont'd)

Find #	Feature #	# sherds	Description	comments and comparanda
8	111344	1	glazed, green	
1	111348	1	black-on-red	
1	111349	1	glazed, green	
4	111388	1	black-on-buff	
5	111388	1	black-on-brown	
6	111388	1	red-on-red	
1	111424	1	Bahla	
4	111472	1	black-slipped	
5	111472	1	black-on-red	
6	111472	1	black-on-buff	
3	111477	1	black-on-brown	
2	111480	1	glazed, turquoise	
3	111480	1	glazed, green	
2	111481	1	glazed, green	
2	111482	1	glazed, green	
6-7	100594	6	semi-coarse fabric	Refit with feature 111240
2-4	100035	3	unid.	
1	100101	1	unid.	
8	100105	1	coarse fabric	
1	100115	1	unid.	
2	100217	1	semi-coarse fabric	
1	100240	1	coarse fabric	
1	100267	1	coarse fabric	
2-3	100280	2	semi-coarse fabric	
1	100312	1	unid.	
2	100312	1	fine fabric	
6	100318	1	unid.	
2-5	100318	4	very fine fabric	

Table 15 (cont'd)

Find #	Feature #	# sherds	Description	comments and comparanda
1	100470	1	coarse fabric	
1	100488	1	coarse fabric	
1	100660	1	semi-coarse fabric	
3-4	100668	2	semi-coarse fabric	
1	100704	1	coarse fabric	
1	100726	1	semi-fine fabric	
2	100726	1	semi-fine fabric	
2-3	100731	2	semi-coarse fabric	
2-5	100735	4	semi-coarse fabric	
2	100764	1	semi-coarse fabric	
3	100764	1	non-diagnostic body sherd	
4	100764	1	semi-coarse fabric	
5	100764	1	semi-coarse fabric	
2	100798	1	non-diagnostic body sherd	
1	100838	1	semi-fine fabric; non-diagnostic	
3-5	100846	3	semi-coarse fabric; non-diagnostic	
1	100899	1	very coarse fabric; non-diagnostic	
1	100931	1	coarse fabric; non-diagnostic	
1	100939	1	coarse fabric; non-diagnostic	
1	100945	1	semi-fine fabric; non-diagnostic	
9	110965	1	unid.	
1-8	110965	8	unid.	
1	110967	1	unid.	
2	110967	1	unid.	

Table 15 (cont'd)

Find #	Feature #	# sherds	Description	comments and comparanda
3	110967	1	unid.	
4	110967	1	unid.	
5	110967	1	unid.	
10	110968	1	fine fabric; non-diagnostic	
1-9	110968	9	fine fabric; non-diagnostic	
1	110969	1	unid.	
1	110974	1	fine fabric; non-diagnostic	
4	110987	1	semi-coarse fabric; non-diagnostic	
2	110988	1	semi-fine fabric; non-diagnostic	
1-15	110991	15	coarse fabric; non-diagnostic	
7	110996	1	coarse fabric; non-diagnostic	
8	110996	1	coarse fabric; non-diagnostic	
1	110997	1	semi-coarse fabric; non-diagnostic	
1	111000	1	fine fabric; non-diagnostic	
2	111000	1	coarse fabric; non-diagnostic	
3	111000	1	coarse fabric; non-diagnostic	
4	111000	1	coarse fabric; non-diagnostic	
2	111001	1	fine fabric; non-diagnostic	
12-15	111026	3	very fine fabric; non-diagnostic	
1-18	111065	18	fine fabric; non-diagnostic	
4	111067	1	semi-coarse fabric; non-diagnostic	
5	111067	1	coarse fabric; non-diagnostic	

Table 15 (cont'd)

Find #	Feature #	# sherds	Description	comments and comparanda
6	111067	8	semi-coarse fabric; non-diagnostic	
7	111067	8	semi-coarse fabric; non-diagnostic	
3	111118	1	semi-coarse fabric; non-diagnostic	
6	111118	1	fine fabric; non-diagnostic	
7	111118	1	semi-fine fabric; non-diagnostic	
8	111118	1	semi-coarse fabric; non-diagnostic	
4-5	111118	2	semi-fine fabric; non-diagnostic	
9-10	111118	2	semi-fine fabric; non-diagnostic	
1	111143	1	coarse fabric; non-diagnostic	
1	111190	1	semi-coarse fabric; non-diagnostic	
1	111213	1	semi-fine fabric; non-diagnostic	
1	111222	1	semi-coarse fabric; non-diagnostic	
1-2	111227	2	semi-fine fabric; non-diagnostic	
1	111242	1	semi-coarse fabric; non-diagnostic	
1	111255	1	coarse fabric; non-diagnostic	
1	111264	1	unid.	

Table 15 (cont'd)

Find #	Feature #	# sherds	Description	comments and comparanda
1	111272	1	fine fabric; non-diagnostic	
2	111272	1	semi-fine fabric; non-diagnostic	
2	111273	1	fine fabric; non-diagnostic	
8	111278	1	very fine fabric; non-diagnostic	
9	111278	1	very fine fabric; non-diagnostic	
1	111280	1	semi-coarse fabric; non-diagnostic	
3	111298	1	fine fabric; non-diagnostic	
1	111300	1	fine fabric; non-diagnostic	
2	111300	1	semi-coarse fabric; non-diagnostic	
4-5	111300	2	fine fabric; non-diagnostic	
1	111328	2	unid.	
2	111328	2	unid.	
1	111329	1	unid.	
2	111329	1	unid.	
1	111330	1	semi-coarse fabric; non-diagnostic	
2	111330	1	unid.	
1	111335	1	fine fabric; non-diagnostic	
2	111336	1	unid.	
2	100108	1	unid.	
3	100108	1	unid.	
4	100108	1	unid.	

Table 15 (cont'd)

Find #	Feature #	# sherds	Description	comments and comparanda
5-15	110987	11	very fine fabric; non-diagnostic	
3-7	111278	5	black-on-red	
1	111303	1	semi-fine footed base	
1	111355	1	footed base	
1	111338	1	pierced base, black-on-red	
1	111003	1	pierced base	111338-1
1	111333	1	pierced base	111338-1
10	111278	1	raised base; gray fabric	
1	100318	1	raised base	similar to 110987-2; but no interior slip
2	111306	1	raised base	Bat 100802-2 (Matariya)
1	111462	1	raised base	
2	111469	1	Islamic brown-glazed	
2	100485	1	Islamic ring-base	
2	110981	1	Islamic ring-base	
1-5	100749	5	base; fine fabric	
4	111333	1	base; semi-fine fabric	111296-1
6	111344	1	base; semi-fine fabric	Similar to 100108-5 without the basal lip
18-21	110991	5	base; coarse fabric	111041-1
4	110996	1	base; coarse fabric	110996-6
29-32	111065	4	base; semi-fine fabric	111367-1
1-2	100598	2	base; coarse fabric	VERY coarse and thick version of 111001-1
7	100108	1	base; semi-fine fabric	Wadi Suq?
2	110987	1	base; very fine fabric	
1	111308	1	black-on-red base; very fine fabric	
7	100105	1	base; semi-fine fabric	100108-5
6	100108	1	base; semi-fine fabric	100108-5

Table 15 (cont'd)

Find #	Feature #	# sherds	Description	comments and comparanda
2	100115	1	base; coarse fabric	100108-5
1	100117	1	base; semi-fine fabric	coarser example of 110987-2
2	100122	1	base; semi-coarse fabric	coarser example of 100108-5
6	100764	1	base; coarse fabric	110996-6
1	100842	1	base; semi-fine fabric	110987-2
13	110968	1	base; fine fabric	111367-1
3	110987	1	base; fine fabric	110987-2
9	110996	1	base; coarse fabric	110996-6
1	111026	1	base; fine fabric	110987-2
1	111090	1	base; semi-coarse fabric	coarser version of 111367-1
1-2	111113	2	base; semi-fine fabric	
1-2	111118	2	base; semi-coarse fabric	
1	111258	1	base; semi-coarse fabric	coarser than 111367-1
1	111265	1	base; semi-fine fabric	110987-2
1	111268	1	base; fine fabric	111367-1
1	111278	1	base; very fine fabric	111367-1
2	111285	1	base; fine fabric	111367-1
1	111299	1	base; fine fabric	111367-1
3	111306	1	base; fine fabric	larger example of 110987-2
1	111331	1	base; semi-fine fabric	coarser version of 111308-1
3	111333	1	base; fine fabric	110987-2
1	111336	1	base; fine fabric	110987-2
2	111348	1	base; semi-fine fabric	
1	111353	1	base; fine fabric	100108-5
1	111354	1	base; fine fabric	111311-2
1	111363	1	base; fine fabric	111296-11
2	111363	1	base; fine fabric	
1	111388	1	base; semi-fine fabric	coarser version of 110987-2

Table 15 (cont'd)

Find #	Feature #	# sherds	Description	comments and comparanda
2	111388	1	base; fine fabric	110987-2
2	111424	1	base; fine fabric	100108-5
1	111472	1	base; fine fabric	100108-5
3	111363	1	base; fine fabric	111367-1
1	100123	1	base; semi-coarse fabric	100108-7
1	100217	1	base; semi-fine fabric	
1-3	100253	3	base; semi-fine fabric	
1	100643	1	base; semi-fine fabric	
5	110996	1	base; coarse fabric	
6	110996	1	base; semi-fine fabric	
3	111030	1	base; semi-fine fabric	
1	111041	1	base; semi-fine fabric	
1-2	111086	2	base; semi-fine fabric	
1	111161	1	base; fine fabric	
2	111311	1	base; fine fabric	
1	111469	1	base; coarse fabric	110996-6
1	100735	1	black-on-brown beaker	Schreiber 2007 (PhD) p415/549 - rims w/lines across lip
2	111312	1	beaker; semi-fine fabric	
1	100105	1	beaker; semi-fine fabric	
6	100115	1	beaker; semi-fine fabric	
3	100217	1	beaker	
5	100460	1	beaker	
6-7	100460	2	beaker	
1	100875	1	beaker	
1	110981	1	Wadi Suq beaker	Mery 1991:64fig.12B
6	111026	1	beaker	
2	111468	1	glazed green beaker	100108-1
1	111479	1	beaker	Bat 101413-1

Table 15 (cont'd)

Find #	Feature #	# sherds	Description	comments and comparanda
1-4	100460	4	beaker	
23	110968	1	pierced black-on-buff body sherd	
1	111276	1	pierced black-on-buff body sherd	111003-3; 111338-1
1	111481	1	green-glazed bottle	
4	100217	1	bowl	
3	100105	1	bowl, fine fabric	
4	100105	1	base; semi-fine fabric	
1	100108	4	bowl; fine fabric	
3	100115	1	bowl; semi-fine fabric	
4	100115	1	bowl; semi-coarse fabric	
1	100116	1	bowl; semi-fine fabric	
2	100116	1	bowl; semi-fine fabric	
3	100116	1	bowl; fine fabric	
4	100122	1	bowl; fine fabric	
2-3	100123	2	bowl; fine fabric	
1	100516	1	bowl; semi-fine fabric	
3	100598	1	bowl; semi-fine fabric	
21	110968	1	black-on-gray bowl	
2	111265	1	bowl; semi-fine fabric	
1	111296	1	bowl; fine fabric	
3	111344	1	bowl; very fine fabric	
1	111367	1	bowl; very fine fabric	
3	111388	1	bowl; fine fabric	
2	111473	1	bowl; semi-coarse fabric	
2	111477	1	bowl; semi-fine fabric	
1	111277	1	bowl; semi-fine fabric	Bat 102802

Table 15 (cont'd)

Find #	Feature #	# sherds	Description	comments and comparanda
3	111469	1	bowl; coarse fabric	
3	100122	1	Iron Age III; carinated bowl	Qarn Bint Sa'ud 10:1, 13, 19, 10, 11; also Rumeilah
5	100105	1	Iron Age III; carinated bowl	100122-3. Qarn Bint Sa'ud 10:1, 13, 19, 10, 11; also Rumeilah
5	100115	1	Iron Age III; carinated bowl	100122-3. Qarn Bint Sa'ud 10:1, 13, 19, 10, 11; also Rumeilah
1	100645	1	close-mouthed bowl; coarse fabric	
3	111067	1	close-mouthed bowl; semi-coarse fabric	
2	111333	1	close-mouthed bowl; fine fabric	
4-5	111344	2	close-mouthed bowl; fine fabric	
1-5	100594-111240	6	close-mouthed bowl; semi-coarse fabric	
1	100748	1	close-mouthed bowl; semi-fine fabric	
3	111424	1	green-glazed open-mouthed bowl	
1	111443	1	green-glazed open-mouthed bowl	
3	111473	1	green-glazed open-mouthed bowl	100115-3
2	100105	1	shouldered bowl	
6	100105	1	shouldered bowl	coarser version of 100105-2
1	111197	1	scored handle; semi-coarse fabric	
4	100598	1	twinned handle; semi-coarse fabric	

Table 15 (cont'd)

Find #	Feature #	# sherds	Description	comments and comparanda
26	110991	1	twinned handle; coarse fabric	
5	100108	1	unid.	
1-2	100846	2	unid.	
2	111355	1	unid.	
1	111480	1	unid.	
19	110966	1	unid.	111001-1
1-2	111205	2	modern	
1	111298	1	unid.	111367-1
1	111304	1	unid.	
1	100731	1	unid.	100115-3
7	110967	1	unid.	
2	100899	1	unid.	
2	111197	1	unid.	
17	110966	1	jar; fine fabric	
18	110966	1	jar; fine fabric	
34	111065	1	jar; fine fabric	
2	111303	1	jar; semi-fine fabric	
1	111306	1	jar; semi-fine fabric	
3	111353	3	jar; fine fabric	
1	111473	1	jar; semi-coarse fabric	
1	111482	1	modern; jar; semi-fine fabric	
1	111345	1	Julfar ware; close-mouthed jar	
2	100240	1	close-mouthed jar; semi-coarse fabric	
22-24	110991	3	collared jar; semi-coarse fabric	
1-2	111030	2	collared jar; semi-coarse fabric	

Table 15 (cont'd)

Find #	Feature #	# sherds	Description	comments and comparanda
1	100295	1	JN-EDI-II collared jar	
1	100481	1	collared jar; semi-fine fabric	
2	110993	1	collared jar; semi-coarse fabric	
3	111337	1	collared jar	
2	111344	1	collared jar; fine fabric	
2	111472	1	collared jar; fine fabric	
1	110987	1	miniature jar; very fine fabric	111322-1
1	111273	1	miniature jar; fine fabric	
1	111322	1	miniature jar; very fine fabric	
5	110974	1	miniature jar; very fine fabric	111322-1
5	111026	1	miniature jar; very fine fabric	111322-1
2-4	111026	3	black-on-red miniature jar; very fine fabric	111273-1
3	111472	1	open-mouthed jar; fine fabric	
1	100330	1	open-mouthed jar; coarse fabric	
1	110993	1	open-mouthed jar; fine fabric	
1	111067	1	open-mouthed jar; semi-fine fabric	
2	111337	1	open-mouthed jar; semi-coarse fabric	
1	111344	1	open-mouthed jar; fine fabric	
2	111353	1	open-mouthed jar; semi-fine fabric	
1	111474	1	open-mouthed jar; semi-coarse fabric	

Table 15 (cont'd)

Find #	Feature #	# sherds	Description	comments and comparanda
1-2	100668	2	open-mouthed jar; semi-coarse fabric	
1	100798	1	open-mouthed jar; fine fabric	111306-1
3	111197	1	open-mouthed jar; semi-fine fabric	
2	111268	1	open-mouthed jar; semi-coarse fabric	
1	111468	1	open-mouthed jar; coarse fabric	Bahla ware
2	111278	1	black-on-red miniature jar	111273-1
3	111481	1	green glazed plate	
5	111333	1	plate	
2	111276	1	cooking pot	
1	111311	1	cooking pot	refits with 111312-1
25	110991	1	open spout; course fabric	
9	100105	1	open spout; Wadi Suq	similar to Plate 31:11 in Cleuziou 1989 (Hili 8 4-5 seasons)
1	111477	1	black-on-brown; three-quarter spout	Plate 31:11 and 13, Cleuziou 1989 (Hili 8: seasons 4-7)
1	100551	1	unid.	Bat 090809
1	100219	1	unid.	
1	111001	1	unid.	
4	111197	1	unid.	
1	100764	1	combed, paddled body sherd	
16	110966	1	unid.	
1	111260	1	unid.	
1	111302	1	unid.	
3	111311	1	unid.	100330-1
3	111468	1	combed body sherd	

Table 15 (cont'd)

Find #	Feature #	# sherds	Description	comments and comparanda
4	111473	1	combed, paddled body sherd	
1	111312	1	unid.	111311-1
5-10	100598	6	unid.	
1-15	110966	15	unid.	
8-9	111240- 100594	2	unid.	Refits with 100594-1

Table 16. Bead Descriptions.

ID	Material type	Find #	# of pieces	Color(s)	Description
100011	stone	1	1	white, colorless	spherical white banded stone, poss. same type material as 111312. as w/111312 the color banding is perpendicular to the drill-hole direction. End 1 is the colorless translucent end
100217	stone	1	1	white	sub-spherical. Limestone. Material may be clay: the "drill" holes are not circular, and their edges are rounded (probably worn). End 1 is more worn than end 2 (ie grooves have been worn into the material).
100451	stone	1	1	transparent	rock(?) crystal, irregular rectangular. The stone appears v. hard. Drilling runs between the two shorter sides of the rectangle in plan. Bi-directional drilling is uneven but successfully meets. There are bits of green (copper residue?) in the pits and crags of this bead. all 6 sides are unevenly chipped but all edges are smooth (ie you wouldn't hurt yourself wearing it).
100666	stone	1	1	orange-red	carnelian; large and flat: diamond-shaped in plan (lxw=23x21); rectangular in section parallel to drill holes; diamond in section perpendicular to drill holes (width-wise that is). Sl. chip out of one corner.
100726	stone	1	1	white	steatite (?) cylinder. Bead 1 has been worn/chipped slightly at one end.
100726	stone	2	1	white	steatite (?) cylinder
100772	stone	1	1	orange	orange/redcarnelian. In section perpendicular to the drill hole this is square; in section parallel to drill hole this is oblong (convex rectangle, w/the long sides convex). Edges are smooth. Semi-translucent (can see the bi-direction drill holes through the side). TONS of work to make this, I'd think!
100939	stone	1	1	black	black, cylindrical, v small; slightly uneven thickness.
110967	stone	1	1	brownish red	red, cylindrical. Carnelian

Table 16 (cont'd)

ID	Material type	Find #	# of pieces	Color(s)	Description
110967	stone	1	1	green, black	irregularly made: uneven thickness ("length"), while the overall shape in plan is round but unevenly cut. dark green/black, round
111072	stone	1	1	white	white limestone cylindar
111072	stone	2	1	pink	pink limestone cylindar
111072	stone	3-7	5	chocolate brown	5 chocolate limestone cylindars: average measurements
111072	stone	8-10	3	green	3 green limestone: average measurements
111081	stone	1	1	white	pendant-style cylindrical bead, both ends broken. The top end shows evidence of bi-directional drilling; on one side it appears to angle down, and on the other side to angle up, thus making the v. delicate bead stronger at the hole but it would have hung at an angle when threaded. Stone is possibly limestone. Length here refers to the length of the pendant rather than along the length of the drill-hole.
111086	stone	1	1	red-brown	limestone cylinder "wheel" bead
111139	shell	1	1	white	worn dentalia shell bead.
111174	glass	1	1	white, blue, black	barrel-shaped, poss. Faience; attempting to be circular in perpendicular (according to hole) section, and oval in parallel section. Colors are swirled. Lightly patinated.
111236	stone	1	1	cream	white stone, cylindrical
111261	stone	1	1	pink-brown	"wheels".
111312	stone	1	1	white, translucent cream	Banded stone, lozenge shape. This one is slightly smaller
111312	stone	2	1	white, translucent cream	Banded stone, lozenge shape. This is the larger one

Table 16 (cont'd)

ID	Material type	Find #	# of pieces	Color(s)	Description
111402	glass	1	1	blue-green, white	long barrel-shaped highly patinated glass, lightly faceted in 5 facets on each half
111402	stone	2	1	gray	barrel-shaped, in 2 pieces, bi-drilled cylindar
111402	stone	3	1	gray	tiny (3mm) drilled cylindar, gray stone: "wheels"
111402	stone	4	1	green	6mm dia drilled cylindar of green stone "wheels"

Table 17. Lithic Descriptions.

ID #	# pieces	Description
100002	1	pale sandy brown flake, retouched on all edges except the platform of the bulb of percussion.
100013	1	brown, thick but small flake, retouched.
100015	4	3 flakes with retouch, 1 drill, dark brown.
100018	1	thick flake with retouch, dark to pale brown
100019	1	thick chunk with many signs of working/retouch, dark brown with orange vein
100020	1	dark brown thick flakes with retouch
100020	1	dark and pale brown thick flake with retouch
100020	1	black and orange thick flake with retouch
100033	1	orange-brown retouched flake. Cortical running at right angle to striking platform
100063	1	mid orange-brown narrow blade
100065	1	flake, toffee-brown
100066	1	black, projectile point, tip broken
100066	1	black to light brown, heavily retouched
100070	1	red-brown/pale brown worked flake
100187	1	mid red-brown blade
100187	1	Pale brown, possible blade
100212	1	black and orange core, with four flakes removed from one side. All other sides are untouched.
100277	1	mid orange/brown pointed blade, retouched on the longest 2 sides
100277	1	light grey drill/borer/awl
100768	1	flake, very pale grey/white, with very fine retouch on one edge
100794	1	possible projectile point, brown-gray
100794	1	flake, no retouch, brown-gray
100817	1	caramel brown pointed flake, signs of retouch
100824	1	mid brown blade. Retouched on convex edge only.
100870	1	caramel brown blade fragment
100895	1	red-brown flake.
100898	1	flake, very dark purple-brown. No retouch.

Table 17 (cont'd)

ID #	# pieces	Description
100899	1	thick flake, dark brown. Retouched on intact faces.
100903	1	pointed, retouched mid grey/brown flake
100903	1	Ovoid, mid-grey, heavily worked though small biface
100903	1	thick, small mid-brown chunk with many signs of retouch, unknown function/form
100904	1	flake with some retouch, reddish brown
100921	1	large red-brown flake
100926	1	light caramel brown blade, thickish
100945	1	blade, very dark brown, retouched along all edges
110948	1	blade frag (tip): light grey, ca. 1 cm long, retouched
110950	1	red-brown and pale brown scraper, 2 cm thick; biface
110951	1	speckled grey blade fragment, retouched on 3 sides
110951	1	dark red-brown scraper, finely retouched on all edges except striking platform.
110952	1	dark red/brown tool fragment: micro-retouch on 3 sides.
110956	1	tip of a large, t<1.5 cm-thick biface: dark brown, triangular, retouched on 2 sides.
110959	1	core, mid red-brown
110959	1	dark red-brown flake with retouch
110972	1	dark brown flake with blue streaks and retouch
110982	1	large, pale, tan flake; retouched
110991	1	worked rock crystal, transparent: rectangular in plan and triangular when bisected width-wise
110991	1	highly patinated dark brown flake; micro-retouch
111001	1	light greenish-brown retouched flake; partially retouched
111059	2	arabian biface: dark grey heavily retouched blade point, in 2 (refitting) pieces
111065	1	grey/brown stone, retouched edges
111072	1	reddish brown chip, possible retouch
111073	1	dark red core; scars from 11+ flakes evident
111073	1	notched flake tool, retouched
111073	1	fine brown drill, 3.5 mm thick

Table 17 (cont'd)

ID #	# pieces	Description
111073	1	purple blade, end missing
111073	1	translucent lithic; rectangular in plan, with a triangular cross-section
111075	1	grey, rectangular, retouched
111075	1	retouched flake
111075	1	red chunk with flakes removed
111076	1	sub-rectangular, brown, retouched fragment
111079	1	yellow-grey chip, retouched.
111079	1	retouched blade, dark brown; edges on both sides have been rounded and retouched.
111080	1	dark red retouched chip
111081	1	reddish brown core
111081	1	dark red flake/blade with lots of retouch
111081	1	multicolored retouched flake tool, squared off at both ends
111082	1	brown chert flake, worked on both sides
111088	1	projectile point.
111095	1	expedient tool; small flakes were removed along the long flat sides to emphasize edges
111095	1	expedient tool; retouched the edge
111097	1	brown concave scraper; retouched.
111111	1	retouched flake tool
111112	1	dark red micro-lith
111112	1	gray flake (no retouch visible)
111113	1	grey flake, no retouch visible
111115	1	biface; dark red, heavily worked, retouch
111117	1	reddish brown flake; possible drill
111143	1	dark red, retouched flake
111157	1	Caramel colour, retouched sub-rectangular scraper
111170	1	light brown, prismatic, retouched on all edges
111173	1	subrectangular tool, notched and retouched

Table 17 (cont'd)

ID #	# pieces	Description
111173	1	notched, retouched red flake tool
111177	1	heavily retouched pink-brown flake tool
111182	1	dark brown subrectangular flake tool, retouched on all edges
111182	1	dark brown, single-edged tool scraper
111182	1	highly patinated large gray flake
111190	1	retouched white flake
111191	1	dark red flake; finely retouched edge
111191	1	dark red and white rectilinear tool with notched edge
111193	1	dark brown core, highly patinated
111197	1	dark brown flake
111199	1	brownish red rectangular blade
111201	1	dark brown scraper, rounded and retouched
111206	1	grey-brown flake, notched and retouched
111208	1	brown worked flake with some retouch
111216	1	mottled cream-brown blade with extensive reworking on 3 edges and retouched.
111217	1	dark red flake, broken: triangular cross-section, rectangular in plan
111222	1	grey brown triangular retouched flake
111222	1	mottled brown flake, worked
111222	1	red brown chunk (not flake), worked on both sides; possible micro-core
111222	1	dark brown notched flake
111222	1	retouched, orange-brown heavily patinated flake
111223	1	pinkish red re-touched flake
111226	1	dark red, slightly retouched flake, worked to a point on the side
111226	1	retouched and highly worked medium brown lithic
111227	1	light brown lithic, triangular in plan, rectangular in long cross-section; retouched on the three edges
111227	1	pink-tan blade fragment, retouched
111234	1	tool flake, retouched on four edges

Table 17 (cont'd)

ID #	# pieces	Description
111235	1	dark red tool flake, retouched on four edges
111236	1	retouched microlith, bifacially worked, oval in short cross-section, rectangular in plan
111241	1	dark red blade, tip broken retouched on the long sides
111304	1	Light brown, rectangular bifacially worked flake, highly retouched
111305	1	Dark grey rectangular retouched flake
111305	1	caramel-brown flake tool, square, worked on all edges
111305	1	dark brown flake, scraper, retouched on most edges
111306	1	dark red retouched and worked flake tool/scraper
111306	1	purple/brown scraper, worked on one end
111317	1	dark brown expedient tool/scraper; one edge worked then retouched
111319	1	purple chip, squared, end has been blunted and retouched
111328	1	dark red, retouched drill
111328	1	light brown/grey flake, reworked edges
111331	1	purple/grey worked flake
111333	1	light brown retouched fragment
111335	1	yellow worked flake
111337	1	dark brown worked chunk
111344	1	light brown flake, retouched, broken
111344	1	purple chip with retouched point
111344	3	dark brown wide "halfed" biface
111424	1	large gray lithic
111443	1	tip of black retouched tool
111443	1	thick caramel-brown, possible expedient tool
111446	1	large notched tool, heavily patinated
111446	1	bifacially flaked rectangular worked tool, heavily patinated
111447	1	projectile point
111447	1	brown lithic, retouch

Table 17 (cont'd)

ID #	# pieces	Description
111498	1	large expedient rectangular scraper/blade, worked on two adjacent sides
111499	1	large tear-drop-shaped brown lithic, worked on all sides; highly patinated
111500	1	large multi-colored oval flake tool, highly retouched
111501	1	large, rectangular expedient scraper; worked on 3 sides

Table 18. Metal and Small Finds Descriptions.

ID #	material	# pieces	Description
100105	metal	1	copper alloy ring
100666	metal	1	copper alloy pin, perhaps awl
100704	metal	1	copper slag
100725	metal	1	metal ball (bullet)
100858	shell	1	shell disc: conus species with point cut off and ground smooth.
100922	metal	1	metal slag
100947	metal	1	Islamic coin
110963	stone	1	white and white-green limestone flake; example of construction debitage
110967	metal	1	copper fragment
110968	metal	1	fragment of small square nail
110975	metal	1	possible copper alloy fragment
111026	stone	1	white limestone fragment with possible chisel marks
111111	stone	1	white limestone chip
111236	metal	1	metal pin, curled end
111236	metal	1	iron pin or hook
111236	metal	1	copper alloy rivet
111250	ceramic	1	ceramic spindle whorl
111298	metal	1	copper alloy point
111349	metal	1	metal debris
111473	ceramic	1	disc (partial) of overfired ceramic with incisions near edge
111473	glass	1	glass stylus
111473	metal	1	coin (1 mm thick)
111473	metal	1	coin (2 mm thick)
111474	unkn	1	serouj sample
111474	ceramic	1	green-glazed base, reused, probably as a spindle whorl
111489	metal	1	pin or hook

Table 19. Marine Shell Descriptions.

ID #	# pieces	Description
100105	1	small oliva bulbosa
100105	2	shell fragments, bivalve species
100505	1	fragment of cardium pseudolina
100598	1	fragment of Anadara uropigimelana
100703	1	strombus (persicus) or conus species
100754	1	shell fragment, bivalve species
100763	1	shell fragment, bivalve species
110967	2	fragments of 2 different bivalve species
110975	1	shell fragment; possibly the hinge joint of a bivalve
110987	1	small, complete shell
111139	1	unid.
111175	1	unid.
111236	1	marine shell fragment
111300	1	unid.
111481	1	strombus (persicus) or conus species

Table 20. Groundstone Descriptions.

ID #	# pieces	Description
100123	1	stone lid with design on top
100439	1	small stone bowl/cup, almost complete, in 2 pieces, design on outside
100750	1	stone ball
110967	6	fragments of stone vessels, all with patterns
110968	1	fragment of stone vessel with design
110981	1	square cup or bowl fragment with design
110981	2	rim fragments
110981	3	stone vessel fragments with designs
110982	1	stone vessel fragment
110993	1	stone vessel fragment with part of handle
111086	3	stone vessel fragments
111092	1	pierced weight
111344	2	ground stone bowl
111388	2	refitted ground stone bowl

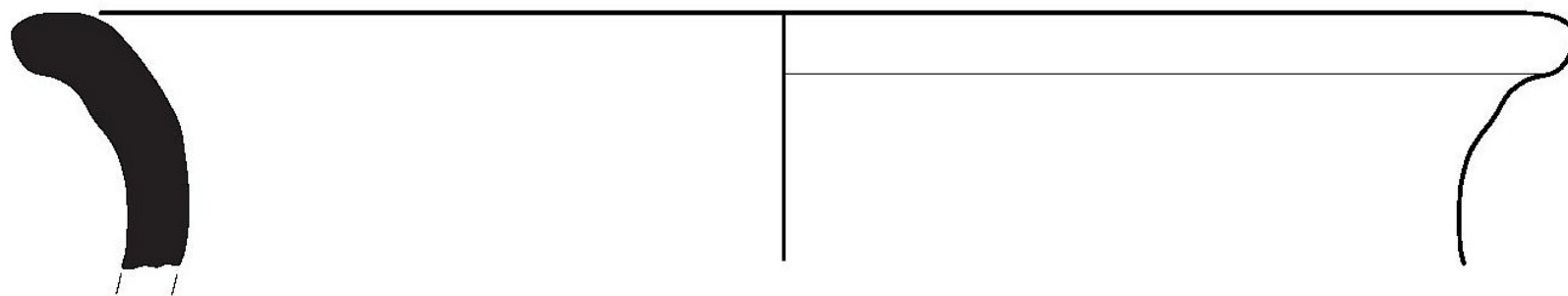


Figure 91. 111067-c1.

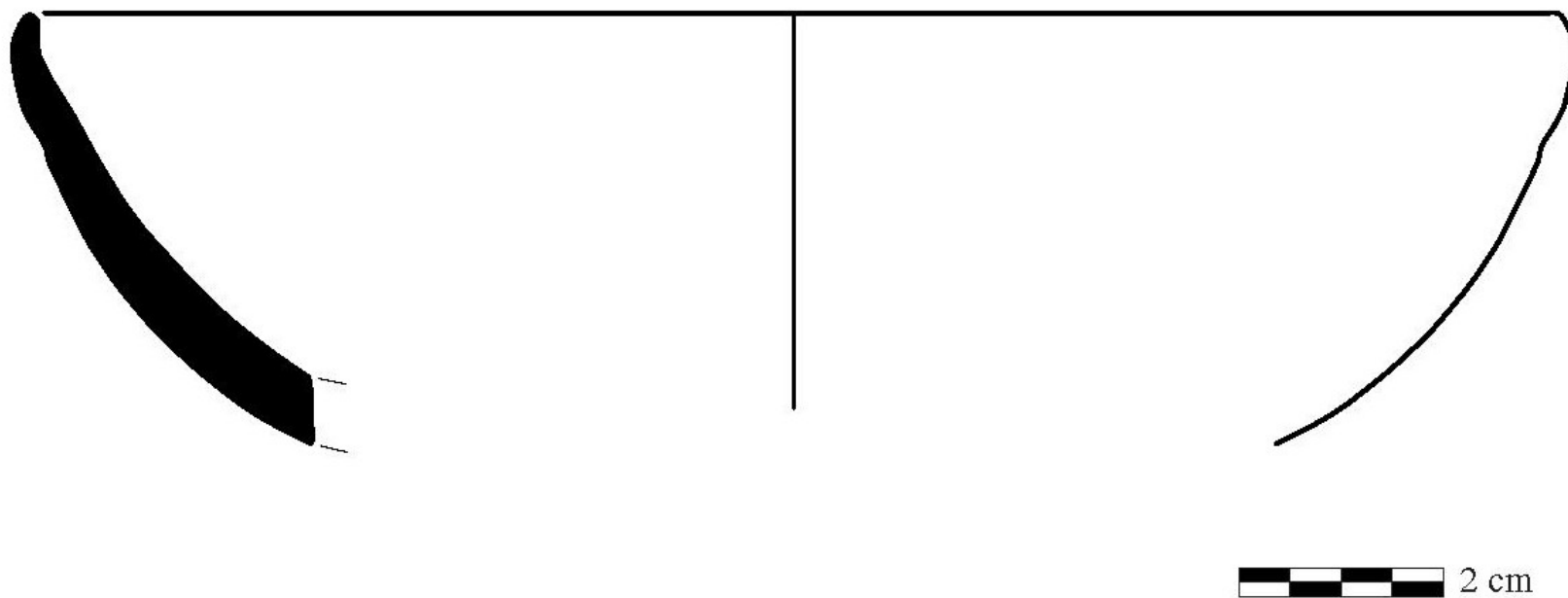


Figure 92. 100122-c4.

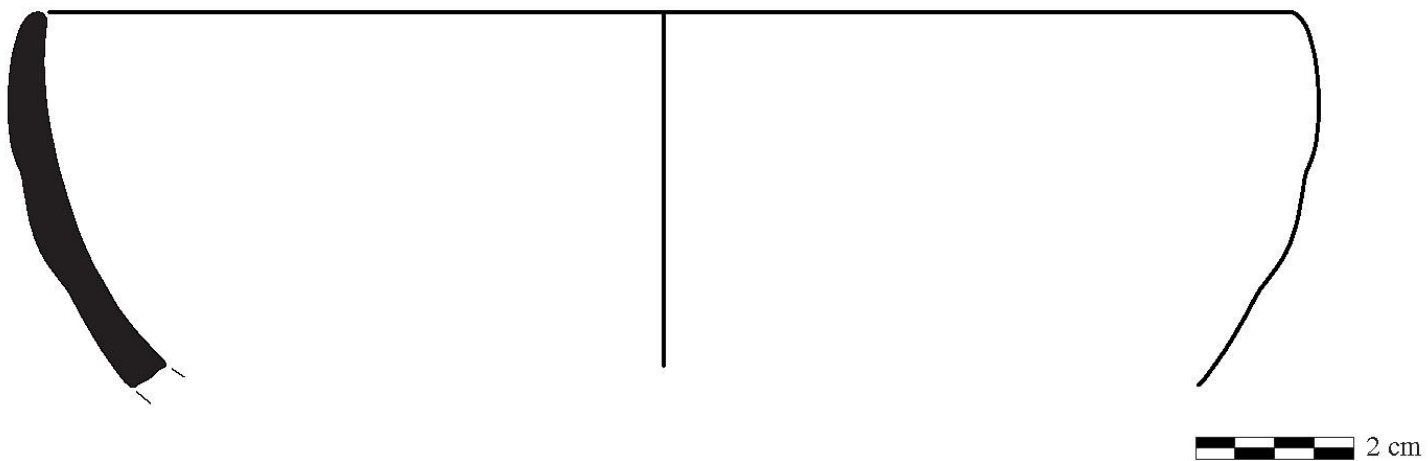


Figure 93. 100116-c1.

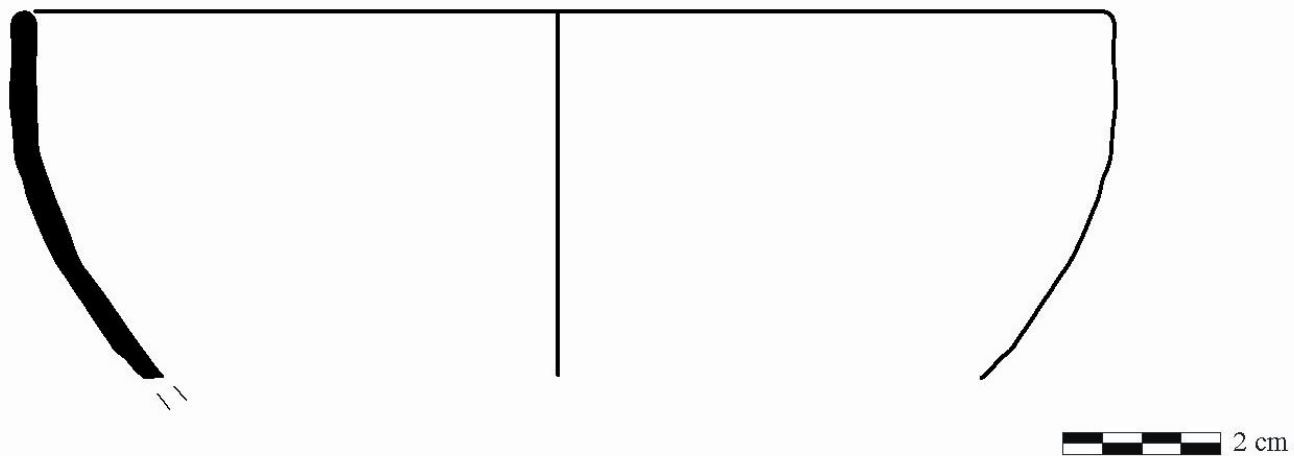


Figure 94. 100105-c1.

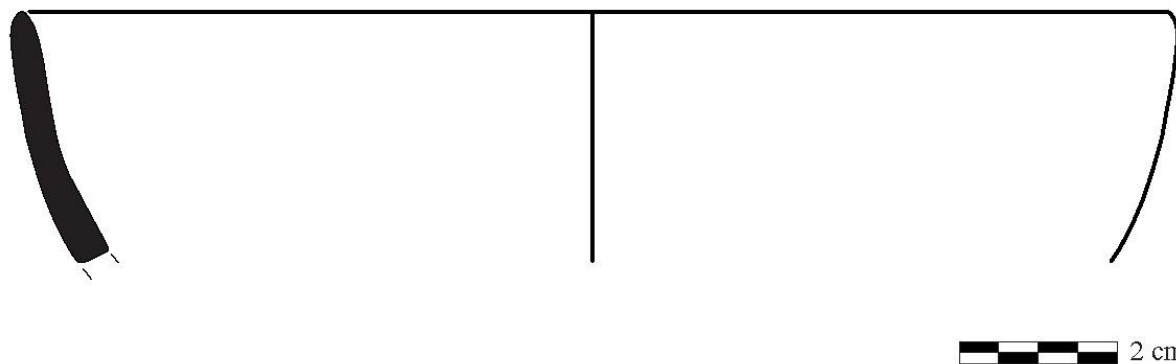


Figure 95. 100105-c4.

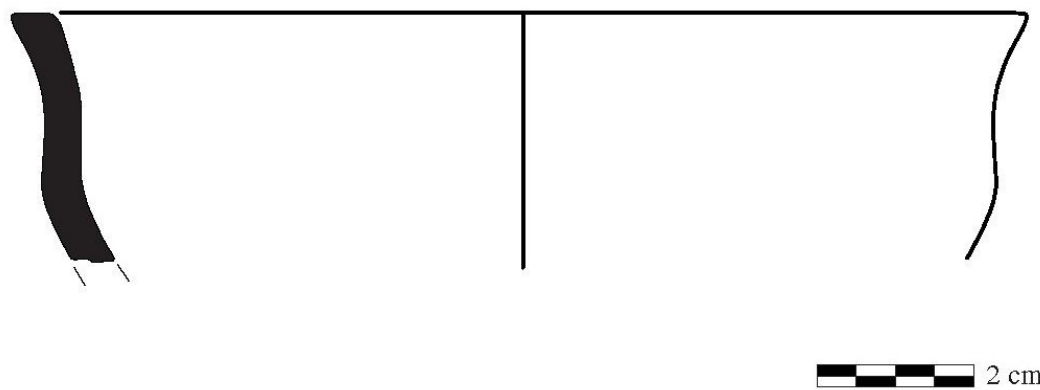


Figure 96. 100105-c1.

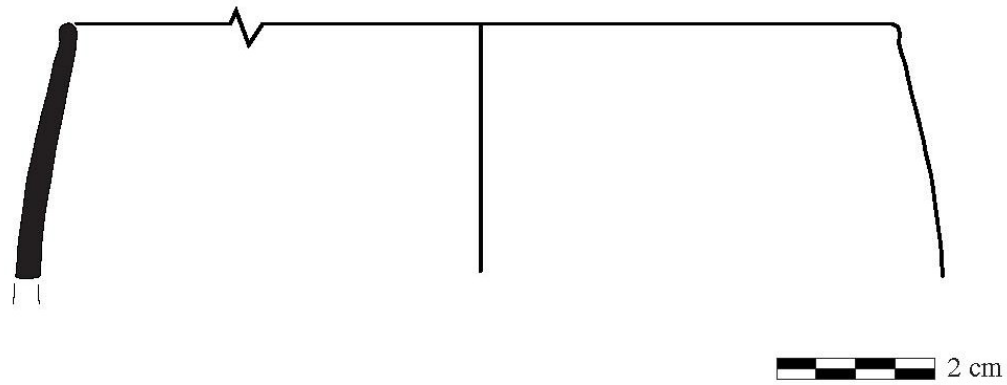


Figure 97. 100460-c6.



Figure 98. 111265-c2.

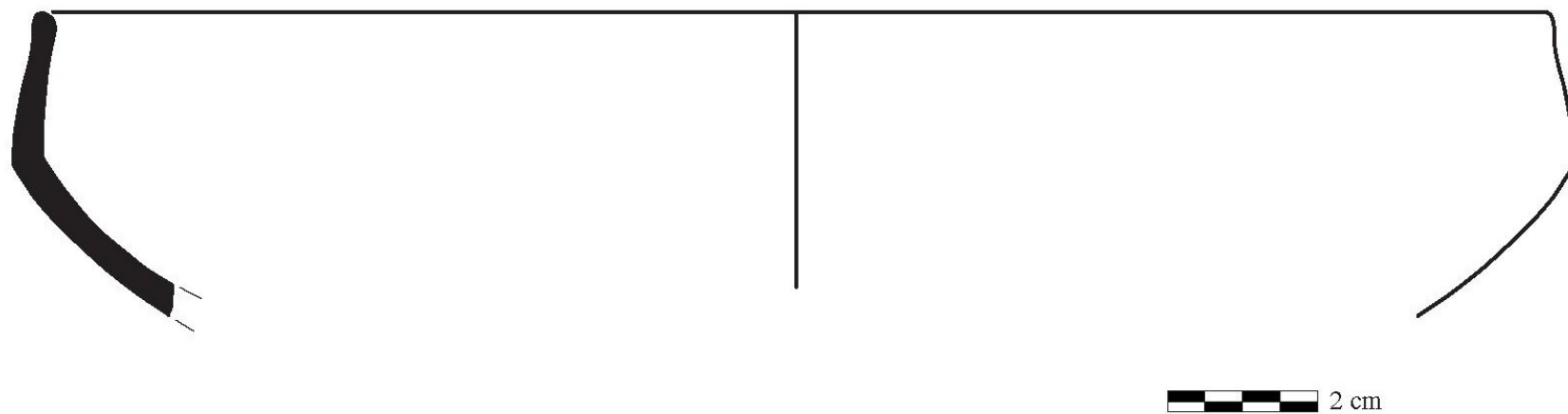


Figure 99. 100105-c2.

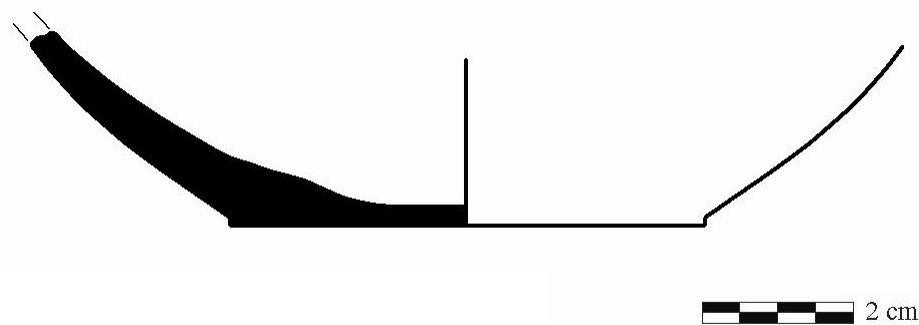


Figure 100. 100108-c5.

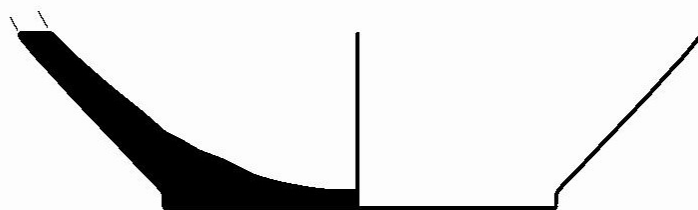


Figure 101. 110987-c2.

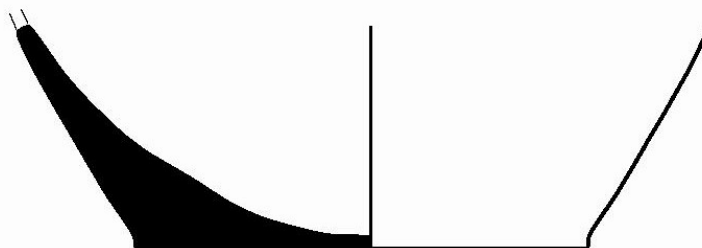


Figure 102. 111001-c1.

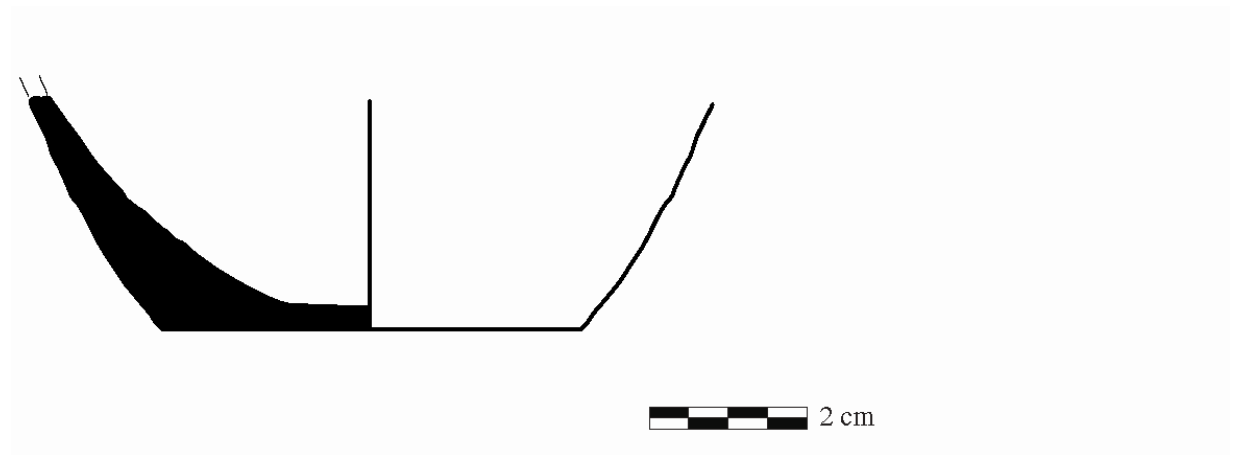


Figure 103. 111367-c1.

APPENDIX C

Maps and Visual Statistics

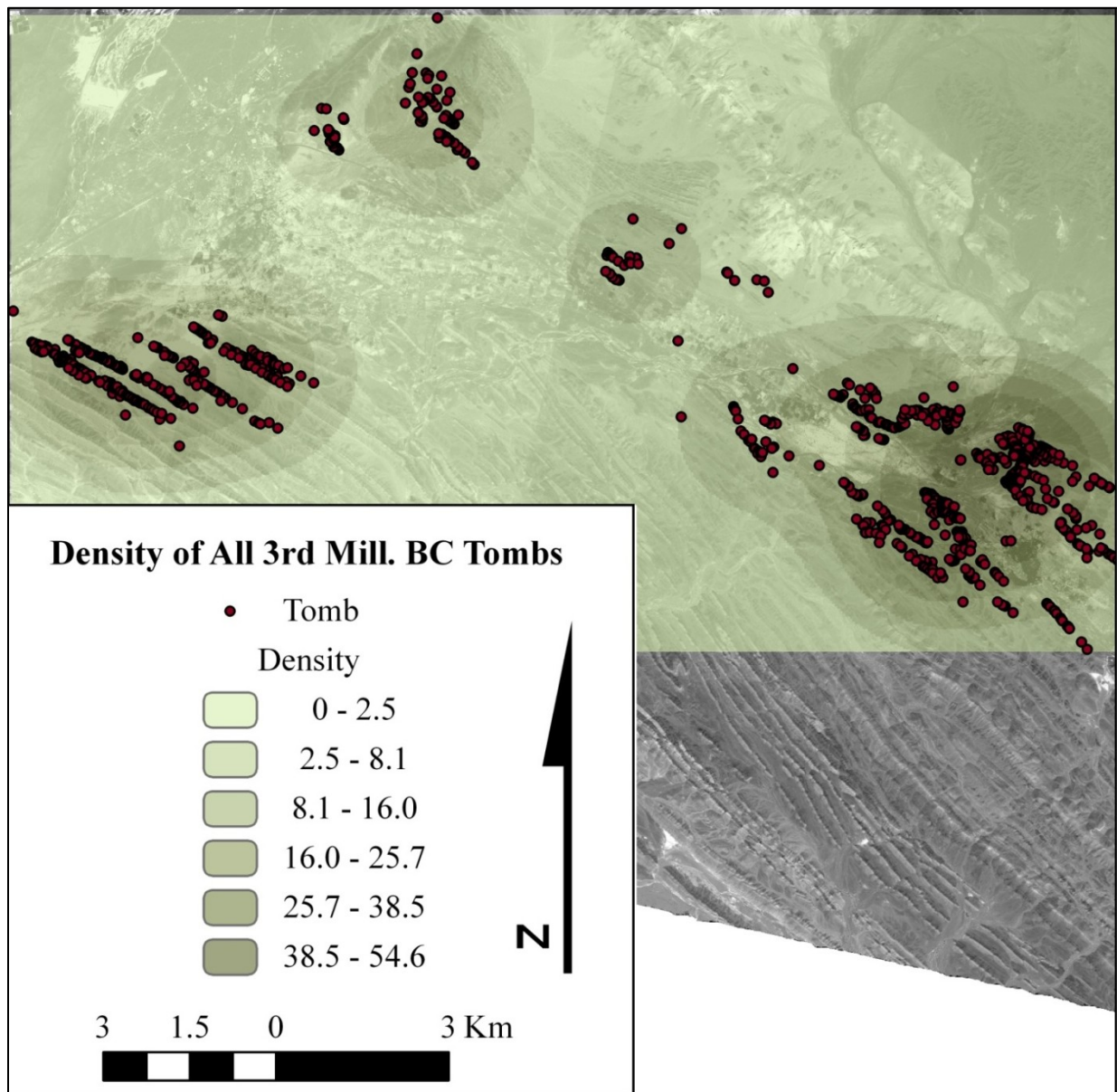


Figure 104. Kernel Density Map (2.6 km kernel). Natural Breaks classification.

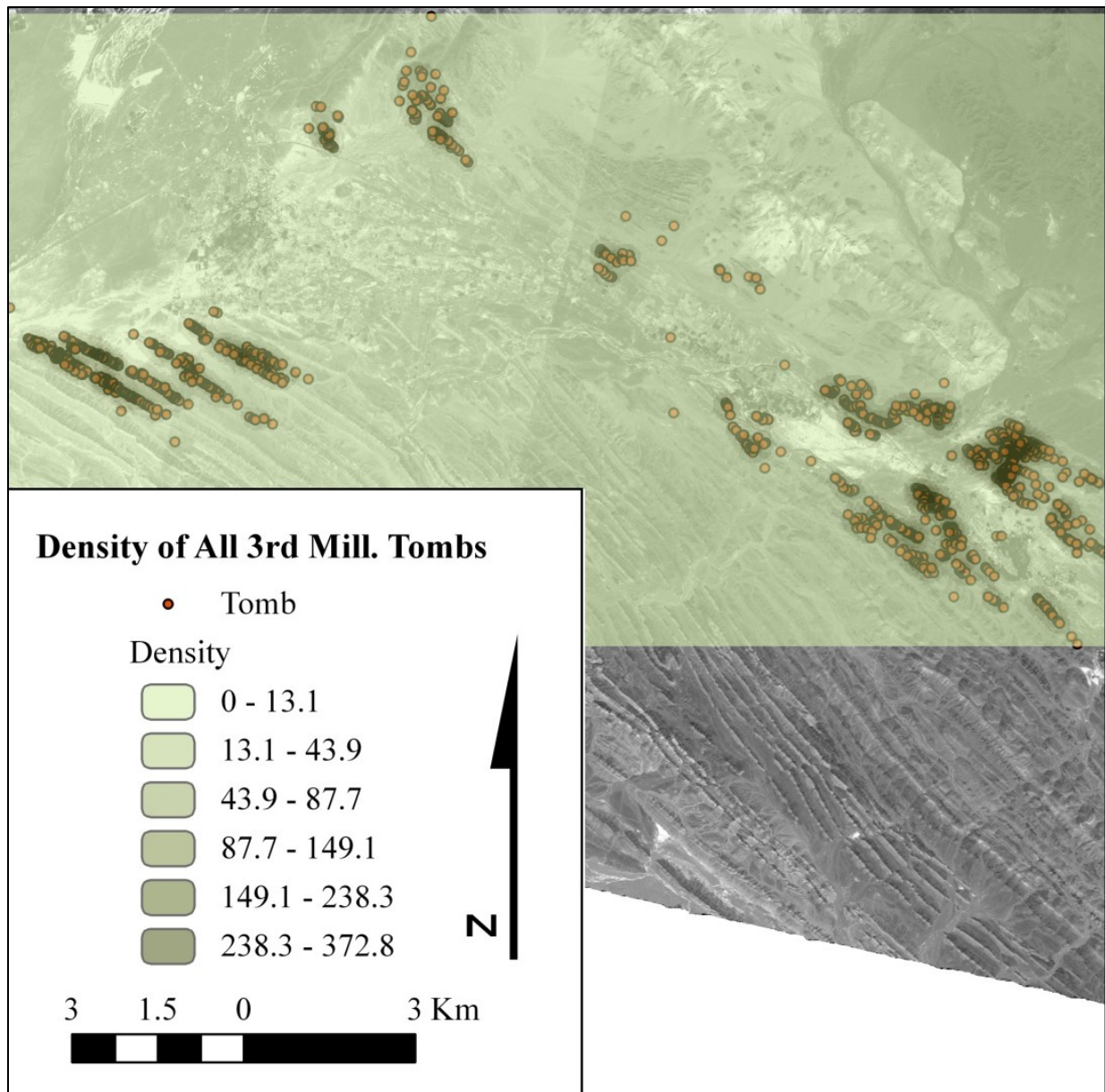


Figure 105. Kernel Density Map (350 m kernel). Natural Breaks classification.

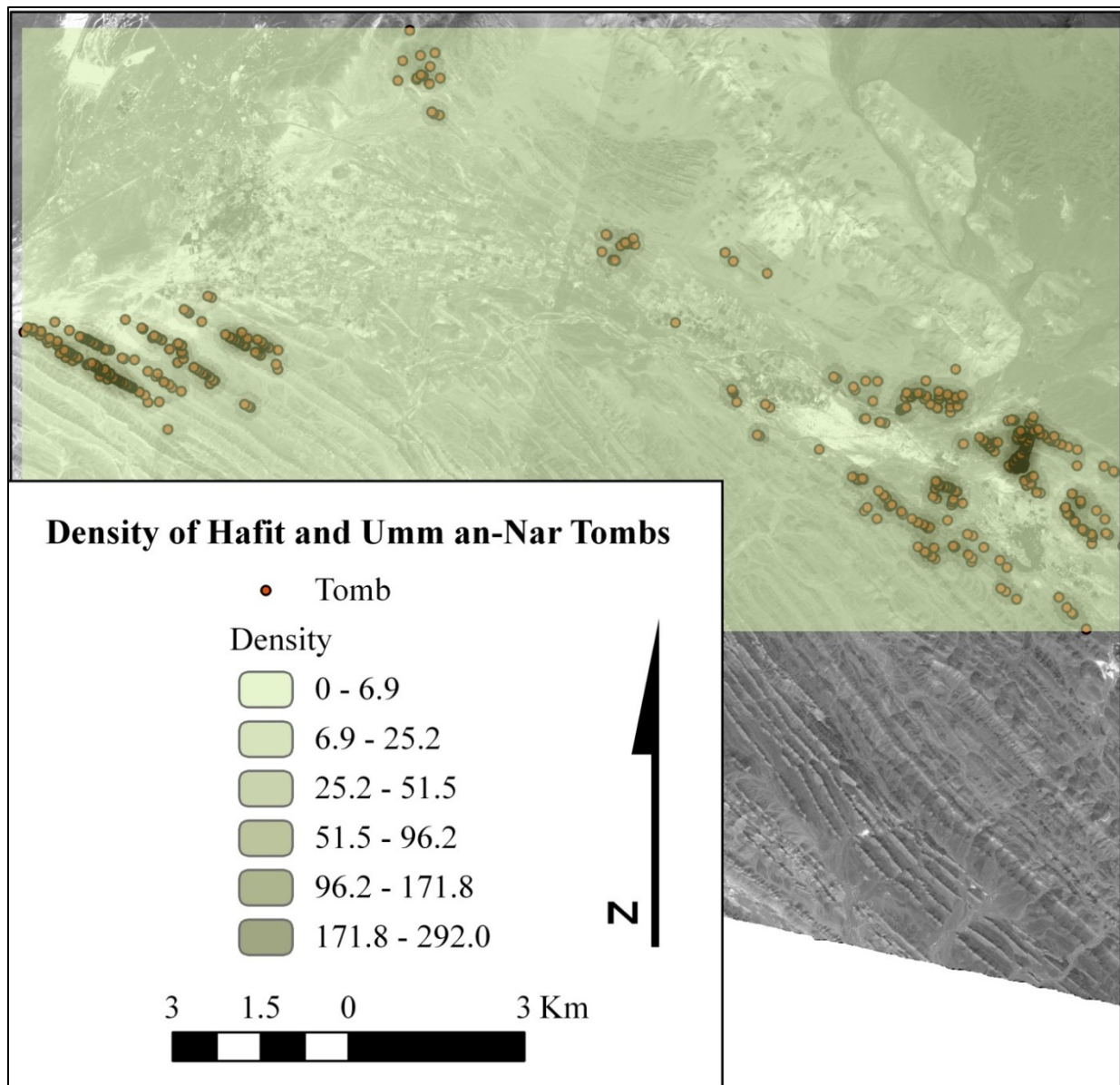


Figure 106. Kernel Density Map (350 m kernel) of Hafit period and Umm an-Nar period tombs. Natural Breaks classification.

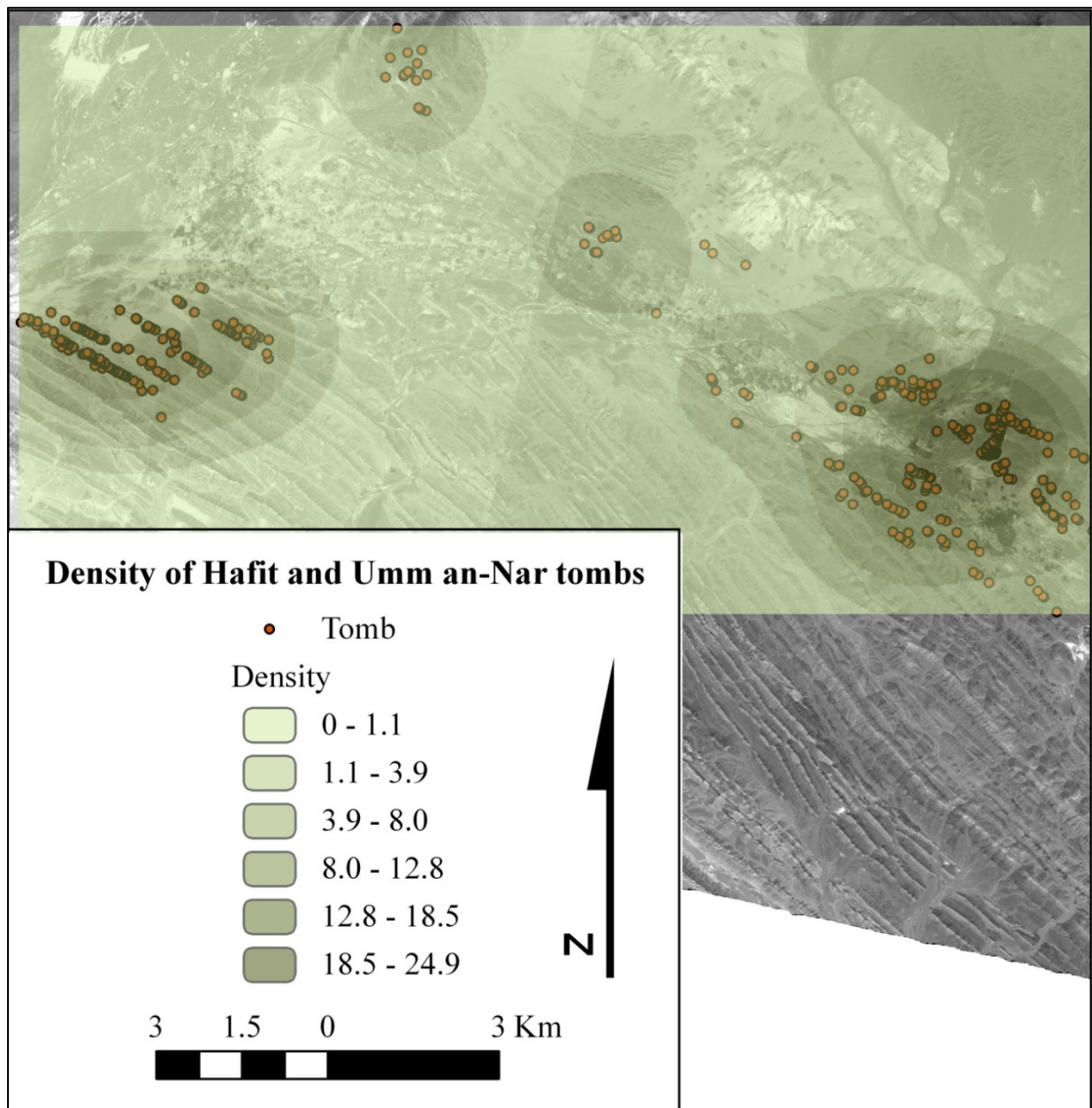


Figure 107. Kernel Density Map (2.3 km kernel) of Hafit period and Umm an-Nar period tombs. Natural Breaks classification.

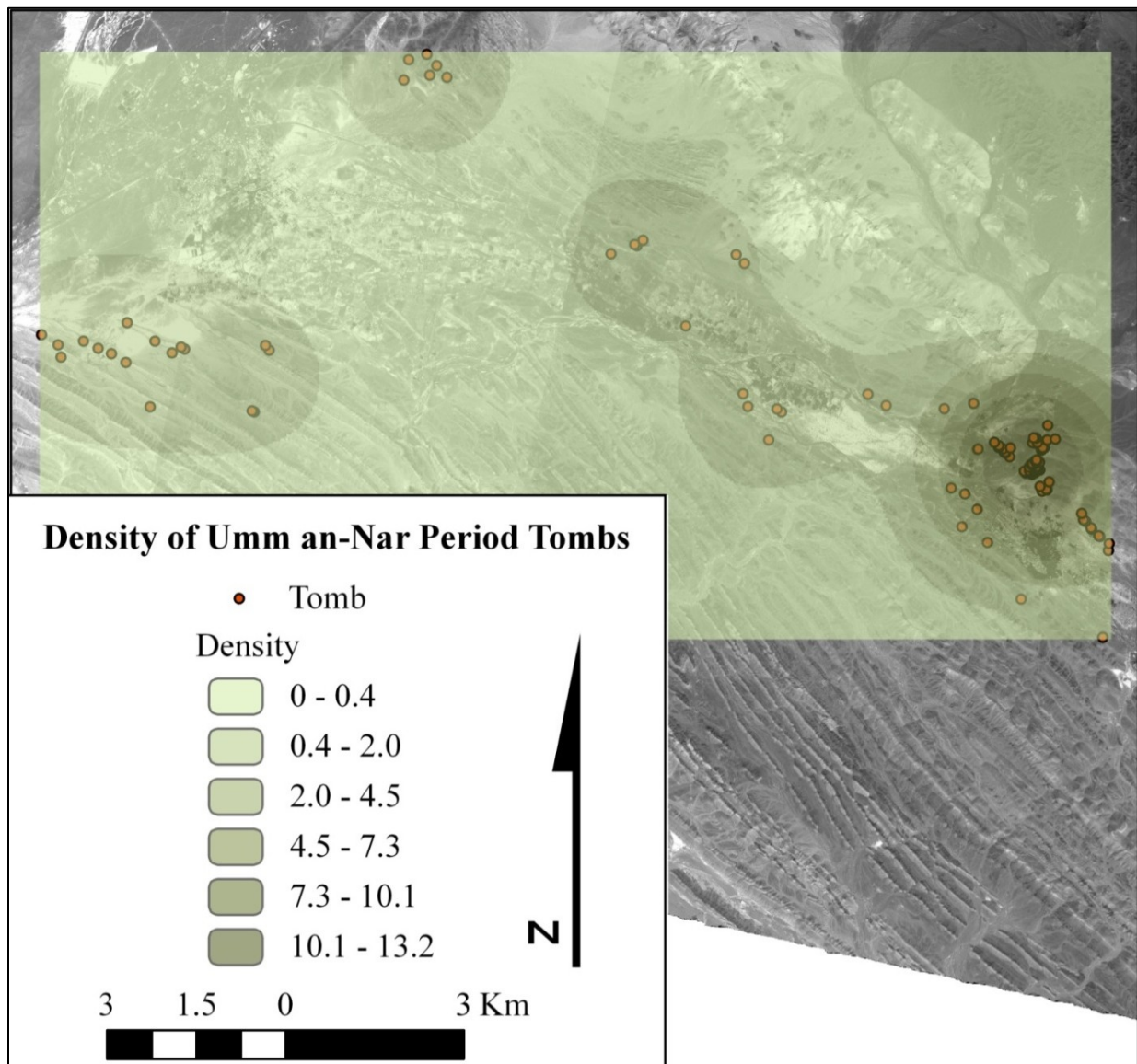


Figure 108. Kernel Density Map (2.3 km kernel) of Umm an-Nar period tombs. Natural Breaks classification.

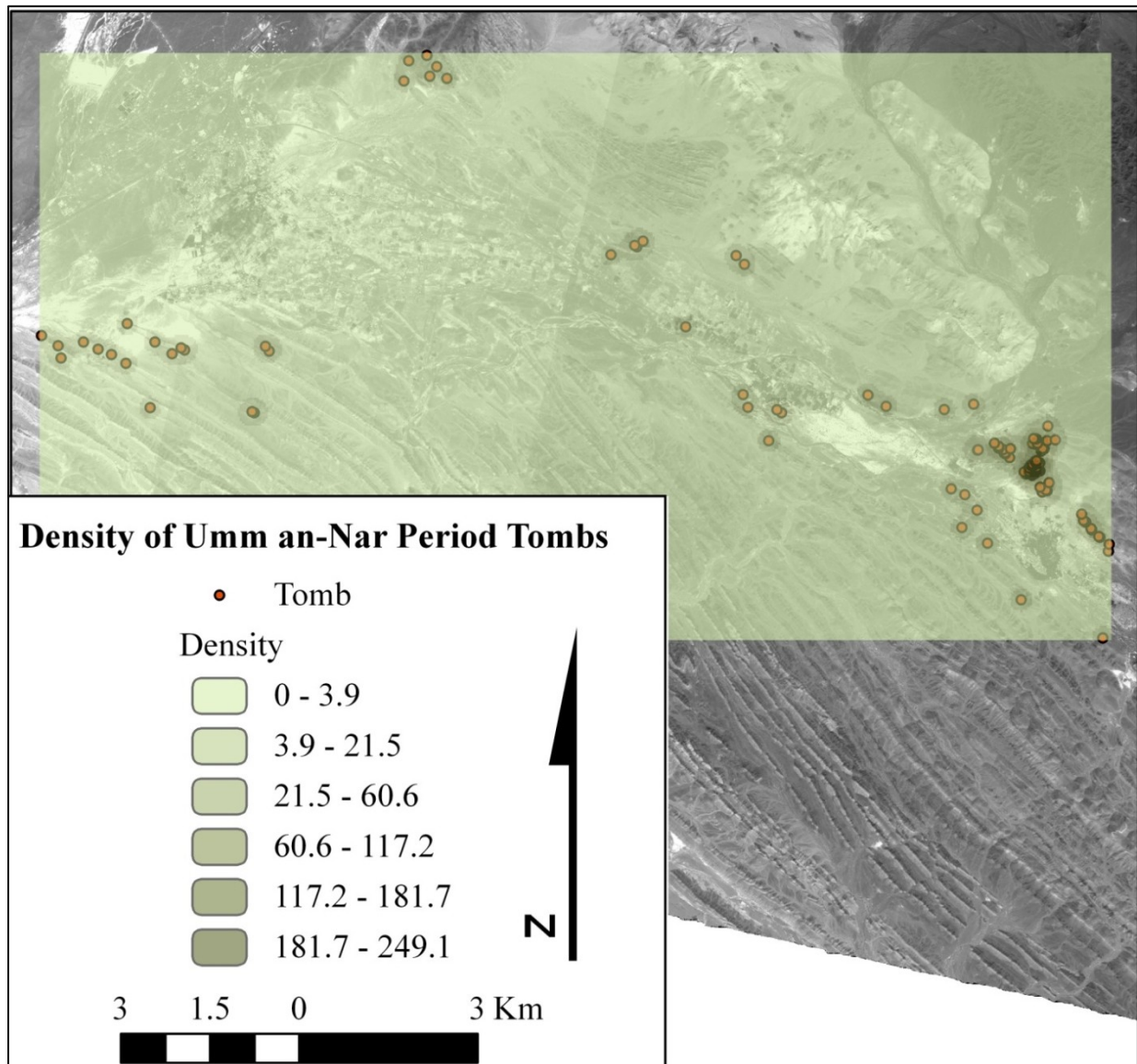


Figure 109. Kernel Density Map (350 m kernel) of Umm an-Nar period tombs. Natural Breaks classification.

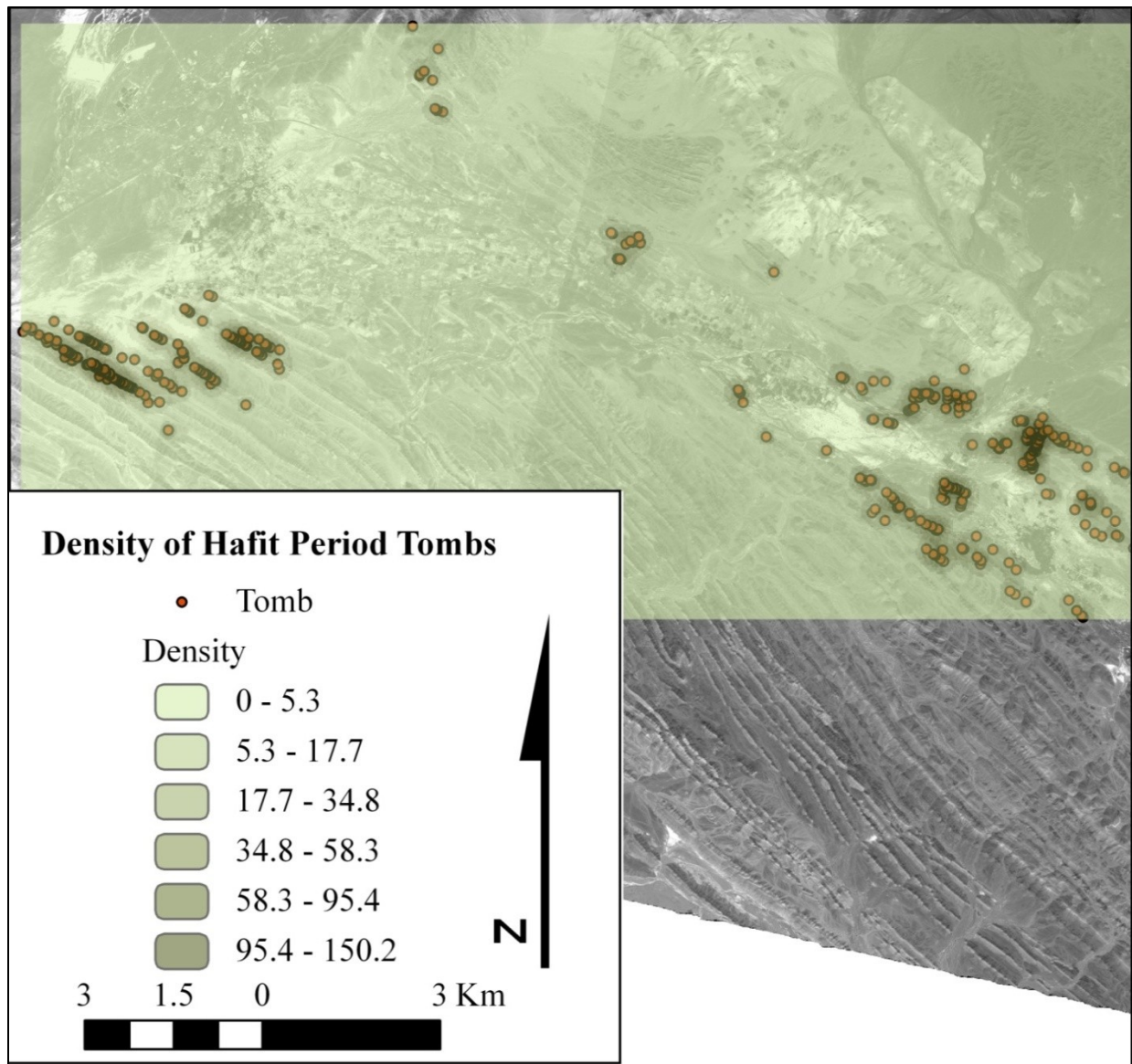


Figure 110. Kernel Density Map (350 m kernel) of Hafit period tombs. Natural Breaks classification.

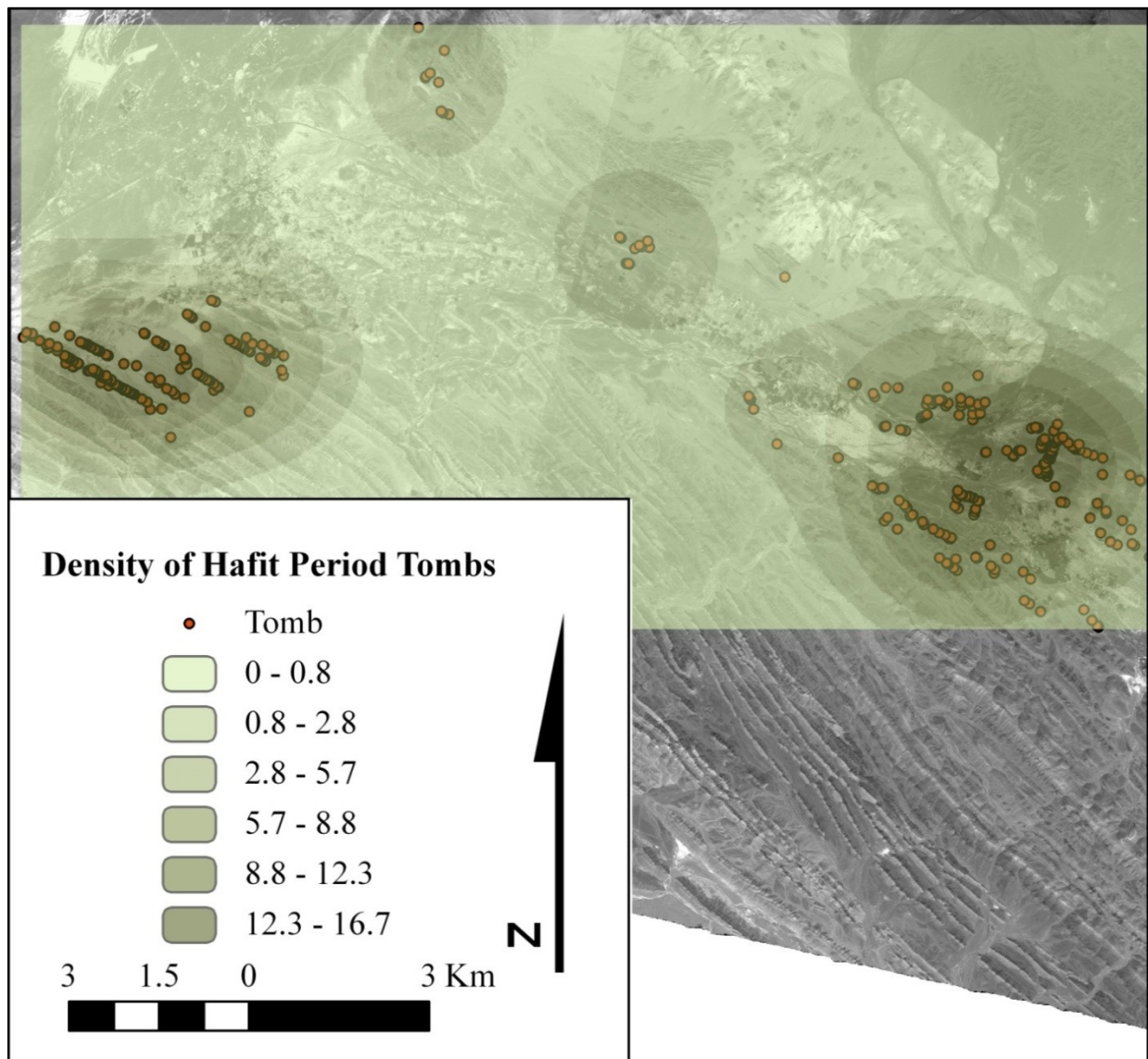


Figure 111. Kernel Density Map (2.3 km kernel) of Hafit period tombs. Natural Breaks classification.

Table 21. Ripley's K Function Results (100 Distance Bands).

Distance Band	Hafit Tombs (Likelihood 2-3)					Umm an-Nar Tombs (Likelihood 2-3)				
	Distance	Unweighted		Weighted		Distance	Unweighted		Weighted	
		L(d)	Difference	L(d)	Difference		L(d)	Difference	L(d)	Difference
1	46.89	399.43	352.54	417.18	370.29	44.86	755.33	710.47	766.71	721.84
2	93.78	568.3	474.52	588.61	494.83	89.73	1197.45	1107.73	1212.69	1122.96
3	140.67	719.5	578.83	740.98	600.31	134.59	1582.49	1447.9	1589.51	1454.93
4	187.56	849.75	662.19	870.94	683.38	179.45	1856.99	1677.54	1868.11	1688.66
5	234.45	983.72	749.27	1007.54	773.09	224.31	2038.65	1814.33	2051.14	1826.82
6	281.34	1090.65	809.31	1119.2	837.86	269.18	2132.99	1863.81	2141.89	1872.72
7	328.23	1201.67	873.44	1233.9	905.67	314.04	2231.54	1917.5	2239.88	1925.84
8	375.12	1332.2	957.08	1362.09	986.97	358.9	2358.2	1999.3	2361.68	2002.78
9	422.01	1462.04	1040.03	1492.78	1070.77	403.76	2511.16	2107.4	2516.73	2112.97
10	468.9	1577.34	1108.44	1608.28	1139.38	448.63	2659.37	2210.74	2659.93	2211.3
11	515.79	1698.45	1182.66	1728.03	1212.24	493.49	2823.05	2329.57	2828.37	2334.88
12	562.68	1807.27	1244.59	1839.22	1276.54	538.35	2974.22	2435.87	2987.32	2448.97
13	609.57	1901.92	1292.35	1934.49	1324.92	583.21	3097.38	2514.17	3112.2	2528.99
14	656.46	1990.89	1334.43	2025.65	1369.19	628.08	3199.24	2571.17	3217.61	2589.53
15	703.35	2071.07	1367.72	2108.92	1405.57	672.94	3269.64	2596.7	3287.71	2614.77
16	750.24	2155.43	1405.19	2194.29	1444.05	717.8	3320.9	2603.1	3342.02	2624.22
17	797.13	2247.35	1450.22	2289.18	1492.05	762.66	3379.26	2616.6	3397.14	2634.48
18	844.02	2328.01	1483.99	2369.91	1525.89	807.53	3419.32	2611.79	3439.42	2631.89
19	890.91	2395.34	1504.43	2436.33	1545.42	852.39	3470.44	2618.05	3491.9	2639.51
20	937.8	2464.75	1526.95	2508.11	1570.31	897.25	3500.48	2603.23	3526.43	2629.18
21	984.69	2554.15	1569.46	2594.79	1610.1	942.11	3525.73	2583.62	3552.58	2610.47
22	1031.58	2646.2	1614.62	2682.61	1651.03	986.98	3560.12	2573.14	3589.89	2602.91
23	1078.47	2722.48	1644.01	2758.72	1680.25	1031.84	3601.56	2569.72	3636.64	2604.81
24	1125.36	2795.95	1670.59	2832.86	1707.5	1076.7	3644.32	2567.62	3678.38	2601.68
25	1172.25	2866.56	1694.31	2900.29	1728.04	1121.56	3681.17	2559.61	3716.77	2595.21
26	1219.14	2937.47	1718.33	2971.79	1752.65	1166.43	3721.64	2555.21	3759.63	2593.21

Table 21 (cont'd)

Distance Band	Hafit Tombs (Likelihood 2-3)					Umm an-Nar Tombs (Likelihood 2-3)				
	Distance	Unweighted		Weighted		Distance	Unweighted		Weighted	
		L(d)	Difference	L(d)	Difference		L(d)	Difference	L(d)	Difference
27	1266.03	3007.61	1741.58	3041.42	1775.39	1211.29	3773.36	2562.08	3814.37	2603.08
28	1312.92	3073.4	1760.48	3108.44	1795.52	1256.15	3819.94	2563.79	3863.41	2607.26
29	1359.81	3144.72	1784.91	3177.82	1818.01	1301.01	3863.72	2562.71	3910.67	2609.66
30	1406.7	3215.3	1808.6	3247.38	1840.68	1345.88	3902.6	2556.73	3953.58	2607.7
31	1453.59	3290.71	1837.12	3324.73	1871.14	1390.74	3955.97	2565.23	4004.43	2613.69
32	1500.48	3369.9	1869.42	3403.69	1903.21	1435.6	4008.95	2573.35	4057.14	2621.54
33	1547.37	3445.92	1898.55	3482.51	1935.14	1480.46	4076.23	2595.77	4128.77	2648.3
34	1594.26	3526.85	1932.59	3568.54	1974.28	1525.33	4139.1	2613.78	4191.46	2666.13
35	1641.15	3607.33	1966.18	3653.14	2011.99	1570.19	4196.04	2625.85	4250.07	2679.88
36	1688.04	3682.48	1994.44	3731.53	2043.49	1615.05	4251.79	2636.74	4305.92	2690.87
37	1734.93	3753.34	2018.41	3804.38	2069.45	1659.91	4296.9	2636.99	4354.82	2694.91
38	1781.82	3820.49	2038.67	3872.89	2091.07	1704.78	4336.12	2631.34	4392.68	2687.9
39	1828.71	3891.6	2062.89	3946.25	2117.54	1749.64	4372.78	2623.14	4430.55	2680.91
40	1875.6	3953.93	2078.33	4011.03	2135.43	1794.5	4421.76	2627.26	4480.92	2686.42
41	1922.49	4012.51	2090.02	4071.44	2148.95	1839.36	4473.13	2633.77	4534.52	2695.16
42	1969.38	4073.48	2104.1	4133.07	2163.69	1884.23	4520.22	2636	4584.88	2700.66
43	2016.27	4136.91	2120.64	4196.67	2180.4	1929.09	4558.59	2629.5	4624.7	2695.61
44	2063.16	4200.01	2136.85	4260.24	2197.08	1973.95	4590.97	2617.02	4659.66	2685.71
45	2110.05	4266.22	2156.17	4326.56	2216.51	2018.81	4607.35	2588.54	4676.85	2658.03
46	2156.94	4333.04	2176.1	4394.56	2237.62	2063.68	4634.32	2570.65	4704.85	2641.18
47	2203.83	4395.29	2191.46	4459.67	2255.84	2108.54	4657.21	2548.68	4727.75	2619.21
48	2250.72	4465.96	2215.24	4530.43	2279.71	2153.4	4687.2	2533.8	4757.5	2604.1
49	2297.61	4531.53	2233.92	4598.16	2300.55	2198.26	4716.23	2517.97	4786.76	2588.49
50	2344.5	4583.59	2239.09	4651.75	2307.25	2243.13	4736.27	2493.15	4804.48	2561.36
51	2391.39	4636.52	2245.13	4702.12	2310.73	2287.99	4749.86	2461.87	4817.12	2529.14
52	2438.28	4688.37	2250.09	4755.04	2316.76	2332.85	4768.8	2435.95	4836.02	2503.17

Table 21 (cont'd)

Distance Band	Hafit Tombs (Likelihood 2-3)					Umm an-Nar Tombs (Likelihood 2-3)				
	Distance	Unweighted		Weighted		Distance	Unweighted		Weighted	
		L(d)	Difference	L(d)	Difference		L(d)	Difference	L(d)	Difference
53	2485.17	4741.85	2256.68	4808.13	2322.96	2377.71	4787.12	2409.41	4854.34	2476.63
54	2532.06	4802.23	2270.17	4866.97	2334.91	2422.58	4798.25	2375.68	4864.86	2442.29
55	2578.95	4856.33	2277.38	4919.54	2340.59	2467.44	4805.69	2338.25	4872.15	2404.71
56	2625.84	4908.36	2282.52	4968.98	2343.14	2512.3	4816.02	2303.72	4883.64	2371.34
57	2672.73	4953.6	2280.87	5012.72	2339.99	2557.16	4827.01	2269.85	4893.01	2335.85
58	2719.62	5003.7	2284.08	5062.43	2342.81	2602.03	4844.1	2242.07	4906.88	2304.86
59	2766.51	5053.41	2286.9	5111.26	2344.75	2646.89	4860.69	2213.8	4921.08	2274.19
60	2813.4	5097.11	2283.71	5155.14	2341.74	2691.75	4876.84	2185.09	4935.76	2244.01
61	2860.29	5139.09	2278.8	5196.52	2336.23	2736.61	4898.42	2161.81	4953.03	2216.42
62	2907.18	5183.83	2276.65	5240.48	2333.3	2781.48	4913.33	2131.85	4964.74	2183.27
63	2954.07	5220.67	2266.6	5275.75	2321.68	2826.34	4919.06	2092.72	4970.84	2144.51
64	3000.96	5257.12	2256.16	5312.63	2311.67	2871.2	4922.18	2050.98	4973.76	2102.56
65	3047.85	5292.75	2244.9	5347.13	2299.28	2916.06	4928.79	2012.73	4979.37	2063.3
66	3094.74	5321.95	2227.21	5374.9	2280.16	2960.93	4934.72	1973.79	4985.48	2024.56
67	3141.63	5350.73	2209.1	5403.02	2261.39	3005.79	4953.05	1947.27	5006.12	2000.34
68	3188.52	5375.34	2186.82	5426.94	2238.42	3050.65	4983.55	1932.9	5040.03	1989.38
69	3235.41	5401.09	2165.68	5451.15	2215.74	3095.51	5014.19	1918.68	5070.7	1975.19
70	3282.3	5420.83	2138.53	5469.98	2187.68	3140.38	5035.45	1895.07	5091.12	1950.75
71	3329.19	5442.23	2113.04	5491.43	2162.24	3185.24	5047.7	1862.46	5105.45	1920.21
72	3376.08	5461.64	2085.56	5510	2133.92	3230.1	5051.85	1821.75	5109.77	1879.67
73	3422.97	5479.96	2056.99	5527.29	2104.32	3274.96	5055.4	1780.43	5113.36	1838.4
74	3469.86	5499.19	2029.33	5546.79	2076.93	3319.83	5060.38	1740.55	5116.96	1797.14
75	3516.75	5522.41	2005.66	5568.36	2051.61	3364.69	5074.39	1709.7	5131.24	1766.56
76	3563.64	5539	1975.36	5583.44	2019.8	3409.55	5081.62	1672.07	5137.99	1728.44
77	3610.53	5552.16	1941.63	5595.64	1985.11	3454.41	5099.6	1645.18	5156.82	1702.41
78	3657.42	5563.37	1905.95	5606.09	1948.67	3499.28	5105.94	1606.66	5162.7	1663.43

Table 21 (cont'd)

Distance Band	Hafit Tombs (Likelihood 2-3)					Umm an-Nar Tombs (Likelihood 2-3)				
	Distance	Unweighted		Weighted		Distance	Unweighted		Weighted	
		L(d)	Difference	L(d)	Difference		L(d)	Difference	L(d)	Difference
79	3704.31	5576.39	1872.08	5619.18	1914.87	3544.14	5118.5	1574.36	5175.96	1631.83
80	3751.2	5588.76	1837.56	5631.73	1880.53	3589	5126.87	1537.87	5184.1	1595.1
81	3798.09	5599.24	1801.15	5641.49	1843.4	3633.86	5130.63	1496.76	5187.77	1553.91
82	3844.98	5610.88	1765.9	5652.89	1807.91	3678.73	5137.78	1459.05	5195.71	1516.98
83	3891.87	5621.01	1729.14	5663.53	1771.66	3723.59	5144.29	1420.71	5202.27	1478.68
84	3938.76	5631.68	1692.92	5673.84	1735.08	3768.45	5151.01	1382.56	5209.36	1440.91
85	3985.65	5641.16	1655.51	5682.61	1696.96	3813.31	5160.33	1347.01	5219.08	1405.77
86	4032.54	5649.7	1617.16	5691.71	1659.17	3858.18	5166.87	1308.69	5225.56	1367.39
87	4079.43	5658.64	1579.21	5700.61	1621.18	3903.04	5172.96	1269.92	5231.43	1328.39
88	4126.32	5664.86	1538.54	5706.64	1580.32	3947.9	5180.41	1232.51	5238.66	1290.76
89	4173.21	5670.4	1497.19	5712	1538.79	3992.76	5186.55	1193.79	5244.59	1251.83
90	4220.1	5678.24	1458.14	5719.36	1499.26	4037.63	5190.77	1153.15	5247.65	1210.02
91	4266.99	5683.52	1416.53	5724.25	1457.26	4082.49	5196.07	1113.58	5253.25	1170.77
92	4313.88	5690.77	1376.89	5731.19	1417.31	4127.35	5200.68	1073.33	5258.38	1131.03
93	4360.77	5697.54	1336.77	5737.46	1376.69	4172.21	5201.49	1029.28	5259.34	1087.13
94	4407.66	5702.65	1294.99	5742.04	1334.38	4217.08	5208.83	991.76	5266.83	1049.76
95	4454.55	5707.21	1252.66	5746.4	1291.85	4261.94	5215.36	953.42	5273.89	1011.95
96	4501.44	5713.54	1212.1	5752.33	1250.89	4306.8	5230.96	924.16	5290.06	983.26
97	4548.33	5719.67	1171.34	5758.36	1210.03	4351.66	5247.28	895.62	5308.48	956.82
98	4595.22	5726.89	1131.67	5764.71	1169.49	4396.53	5280.42	883.9	5345.31	948.78
99	4642.11	5731.78	1089.67	5769.35	1127.24	4441.39	5307.07	865.68	5372.15	930.77
100	4689	5738	1049	5775.61	1086.61	4486.25	5337.89	851.64	5406.05	919.8

Table 21 (cont'd)

Distance Band	Hafit and Umm an-Nar Tombs (Likelihood 2-3)					Third Millennium BC Tombs (Likelihood 1-3)				
	Distance	Unweighted		Weighted		Distance	Unweighted		Weighted	
		L(d)	Difference	L(d)	Difference		L(d)	Difference	L(d)	Difference
1	46.89	410.65	363.76	426.08	379.19	47.97	356.09	308.12	382.31	334.34
2	93.78	624.39	530.61	647.15	553.37	95.95	537.21	441.27	576.41	480.47
3	140.67	803.44	662.77	827.76	687.09	143.92	696.86	552.94	742.93	599.01
4	187.56	943.33	755.77	971.75	784.19	191.89	835.21	643.32	887.63	695.74
5	234.45	1070.01	835.56	1101.34	866.89	239.86	953.68	713.82	1017.47	777.61
6	281.34	1169.64	888.3	1204.58	923.24	287.83	1059.11	771.28	1128.06	840.23
7	328.23	1276.21	947.98	1313.41	985.18	335.81	1179.51	843.7	1250.43	914.62
8	375.12	1396.04	1020.92	1432.9	1057.78	383.78	1299.02	915.24	1370.55	986.77
9	422.01	1509.62	1087.61	1546.96	1124.95	431.75	1410.54	978.79	1486.4	1054.65
10	468.9	1614.78	1145.88	1653.11	1184.21	479.72	1520.93	1041.21	1599.48	1119.75
11	515.79	1728.61	1212.82	1767.44	1251.65	527.7	1628.29	1100.59	1710.37	1182.67
12	562.68	1821.79	1259.11	1862.14	1299.46	575.67	1726.1	1150.43	1810.98	1235.31
13	609.57	1910.5	1300.93	1953.68	1344.11	623.64	1820.42	1196.77	1908.38	1284.74
14	656.46	1988.27	1331.81	2034.45	1377.99	671.61	1905.32	1233.71	1996.05	1324.43
15	703.35	2057.18	1353.83	2106.64	1403.29	719.59	1985.14	1265.55	2074.63	1355.04
16	750.24	2131.5	1381.26	2182.07	1431.83	767.56	2072.39	1304.83	2162.15	1394.59
17	797.13	2208.04	1410.91	2260.95	1463.82	815.53	2154.61	1339.08	2244.01	1428.48
18	844.02	2274.79	1430.77	2327.99	1483.97	863.5	2221.76	1358.25	2311.35	1447.85
19	890.91	2325.57	1434.66	2378.44	1487.53	911.48	2282.54	1371.06	2371.43	1459.96
20	937.8	2381.45	1443.65	2435.58	1497.78	959.45	2343.02	1383.57	2430.49	1471.04
21	984.69	2447.23	1462.54	2499.58	1514.89	1007.42	2405.84	1398.42	2494.38	1486.96
22	1031.58	2517.8	1486.22	2567.92	1536.34	1055.4	2470.49	1415.1	2559.37	1503.97
23	1078.47	2584.91	1506.44	2633.66	1555.19	1103.37	2533.87	1430.5	2622.47	1519.1
24	1125.36	2644.91	1519.55	2693.73	1568.37	1151.34	2596.17	1444.83	2682.7	1531.36
25	1172.25	2706.15	1533.9	2752.53	1580.28	1199.31	2660.81	1461.49	2746.08	1546.76
26	1219.14	2768.42	1549.28	2815	1595.86	1247.29	2729.62	1482.34	2813.96	1566.67

Table 21 (cont'd)

Distance Band	Hafit and Umm an-Nar Tombs (Likelihood 2-3)					Third Millennium BC Tombs (Likelihood 1-3)				
	Distance	Unweighted		Weighted		Distance	Unweighted		Weighted	
		L(d)	Difference	L(d)	Difference		L(d)	Difference	L(d)	Difference
27	1266.03	2832.72	1566.69	2879.61	1613.58	1295.26	2797.77	1502.51	2884	1588.74
28	1312.92	2894.64	1581.72	2943.41	1630.49	1343.23	2864.93	1521.7	2954.28	1611.05
29	1359.81	2958.24	1598.43	3006.66	1646.85	1391.2	2934.23	1543.03	3026.27	1635.07
30	1406.7	3023.07	1616.37	3071.38	1664.68	1439.18	3007.91	1568.74	3103.41	1664.24
31	1453.59	3092.41	1638.82	3141.84	1688.25	1487.15	3082.31	1595.16	3182.62	1695.48
32	1500.48	3167.13	1666.65	3216.65	1716.17	1535.12	3153.98	1618.86	3258.88	1723.76
33	1547.37	3236.85	1689.48	3287.67	1740.3	1583.09	3222.46	1639.36	3331.33	1748.23
34	1594.26	3306.17	1711.91	3360.02	1765.76	1631.07	3290.75	1659.68	3403.33	1772.26
35	1641.15	3376.69	1735.54	3432.67	1791.52	1679.04	3358.02	1678.98	3474.18	1795.14
36	1688.04	3442.79	1754.75	3500.52	1812.48	1727.01	3430.19	1703.18	3549.76	1822.75
37	1734.93	3509.9	1774.97	3567.78	1832.85	1774.98	3496.7	1721.71	3618.16	1843.17
38	1781.82	3572.65	1790.83	3631.62	1849.8	1822.96	3564.26	1741.31	3687.24	1864.29
39	1828.71	3637.89	1809.18	3697.99	1869.28	1870.93	3629.37	1758.44	3753.97	1883.04
40	1875.6	3699.87	1824.27	3762.14	1886.54	1918.9	3697.9	1779	3823.74	1904.84
41	1922.49	3758.79	1836.3	3822.05	1899.56	1966.87	3762.43	1795.55	3889.2	1922.33
42	1969.38	3817.69	1848.31	3880.77	1911.39	2014.85	3829.43	1814.59	3954.14	1939.3
43	2016.27	3874.82	1858.55	3936.72	1920.45	2062.82	3897.26	1834.45	4022.74	1959.92
44	2063.16	3932.15	1868.99	3993.76	1930.6	2110.79	3962.1	1851.31	4087.53	1976.74
45	2110.05	3993.05	1883	4053.83	1943.78	2158.76	4025.79	1867.03	4153.58	1994.82
46	2156.94	4056.71	1899.77	4117.42	1960.48	2206.73	4089.92	1883.18	4218.75	2012.02
47	2203.83	4118.33	1914.5	4180.41	1976.58	2254.71	4155.24	1900.53	4283.94	2029.24
48	2250.72	4183.41	1932.69	4244.19	1993.47	2302.68	4214.63	1911.95	4343.5	2040.82
49	2297.61	4243.66	1946.05	4304.48	2006.87	2350.65	4270.45	1919.79	4398.8	2048.15
50	2344.5	4293.31	1948.81	4353.9	2009.4	2398.62	4324.68	1926.06	4450.06	2051.44
51	2391.39	4342.1	1950.71	4400.12	2008.73	2446.6	4375.94	1929.34	4500.03	2053.43
52	2438.28	4388.53	1950.25	4445.86	2007.58	2494.57	4429.61	1935.04	4552.62	2058.05

Table 21 (cont'd)

Distance Band	Hafit and Umm an-Nar Tombs (Likelihood 2-3)					Third Millennium BC Tombs (Likelihood 1-3)				
	Distance	Unweighted		Weighted		Distance	Unweighted		Weighted	
		L(d)	Difference	L(d)	Difference		L(d)	Difference	L(d)	Difference
53	2485.17	4434.98	1949.81	4491.29	2006.12	2542.54	4484.24	1941.69	4605.3	2062.76
54	2532.06	4487.7	1955.64	4542.12	2010.06	2590.52	4538.48	1947.96	4654.96	2064.44
55	2578.95	4532.96	1954.01	4585.11	2006.16	2638.49	4588.99	1950.5	4702.82	2064.33
56	2625.84	4578.44	1952.6	4627.91	2002.07	2686.46	4636.53	1950.07	4747.83	2061.37
57	2672.73	4620.58	1947.85	4668.51	1995.78	2734.43	4686.57	1952.14	4796.36	2061.93
58	2719.62	4667.86	1948.24	4714.01	1994.39	2782.41	4734.78	1952.38	4841.84	2059.44
59	2766.51	4714.57	1948.06	4758.77	1992.26	2830.38	4780.24	1949.86	4884.76	2054.38
60	2813.4	4753.83	1940.43	4797.67	1984.27	2878.35	4825.78	1947.43	4926.41	2048.06
61	2860.29	4790.66	1930.37	4832.64	1972.35	2926.32	4866.67	1940.34	4963.72	2037.39
62	2907.18	4826.44	1919.26	4866.43	1959.25	2974.29	4904.46	1930.17	4998.23	2023.94
63	2954.07	4854.19	1900.12	4892.36	1938.29	3022.27	4938.76	1916.49	5030.28	2008.01
64	3000.96	4883.65	1882.69	4921.46	1920.5	3070.24	4970.86	1900.62	5060.94	1990.7
65	3047.85	4914.21	1866.36	4951.19	1903.34	3118.21	4999.28	1881.07	5087.83	1969.61
66	3094.74	4940.41	1845.67	4975.93	1881.19	3166.18	5026.93	1860.75	5114.35	1948.16
67	3141.63	4965.1	1823.47	4999.64	1858.01	3214.16	5053.32	1839.16	5138.64	1924.48
68	3188.52	4985.98	1797.46	5020.08	1831.56	3262.13	5077.73	1815.6	5161.27	1899.14
69	3235.41	5007.06	1771.65	5040.04	1804.63	3310.1	5102.92	1792.82	5185.17	1875.07
70	3282.3	5025.66	1743.36	5058.22	1775.92	3358.08	5127.53	1769.46	5209.2	1851.13
71	3329.19	5044.59	1715.4	5077.22	1748.03	3406.05	5149.73	1743.68	5231.24	1825.19
72	3376.08	5063.17	1687.09	5095.53	1719.45	3454.02	5170.47	1716.45	5252.2	1798.18
73	3422.97	5081.04	1658.07	5112.75	1689.78	3501.99	5191.57	1689.58	5273.81	1771.82
74	3469.86	5099.86	1630	5131.68	1661.82	3549.96	5210.43	1660.46	5292.65	1742.69
75	3516.75	5123.33	1606.58	5153.98	1637.23	3597.94	5226.55	1628.61	5307.52	1709.58
76	3563.64	5139.16	1575.52	5168.88	1605.24	3645.91	5243.12	1597.21	5322.51	1676.6
77	3610.53	5151.08	1540.55	5180.29	1569.76	3693.88	5258.93	1565.05	5337.33	1643.45
78	3657.42	5161.77	1504.35	5190.3	1532.88	3741.85	5274.37	1532.52	5351.81	1609.96

Table 21 (cont'd)

Distance Band	Hafit and Umm an-Nar Tombs (Likelihood 2-3)					Third Millennium BC Tombs (Likelihood 1-3)				
	Distance	Unweighted		Weighted		Distance	Unweighted		Weighted	
		L(d)	Difference	L(d)	Difference		L(d)	Difference	L(d)	Difference
79	3704.31	5173.83	1469.52	5202.37	1498.06	3789.83	5290.13	1500.3	5366.49	1576.66
80	3751.2	5184.92	1433.72	5213.57	1462.37	3837.8	5304.59	1466.79	5379.96	1542.16
81	3798.09	5195.31	1397.22	5223.41	1425.32	3885.77	5318.1	1432.33	5392.49	1506.71
82	3844.98	5205.42	1360.44	5233.18	1388.2	3933.74	5332.19	1398.44	5405.64	1471.89
83	3891.87	5214.75	1322.88	5242.69	1350.82	3981.72	5346.08	1364.36	5418.15	1436.43
84	3938.76	5225.01	1286.25	5252.68	1313.92	4029.69	5360.88	1331.19	5430.48	1400.79
85	3985.65	5234.17	1248.52	5261.54	1275.89	4077.66	5375.89	1298.23	5443.39	1365.73
86	4032.54	5241.82	1209.28	5269.23	1236.69	4125.64	5388.9	1263.26	5453.93	1328.3
87	4079.43	5250.23	1170.8	5277.4	1197.97	4173.61	5402.31	1228.7	5464.93	1291.32
88	4126.32	5256.03	1129.71	5283.04	1156.72	4221.58	5413.91	1192.33	5475.29	1253.71
89	4173.21	5261.9	1088.69	5288.93	1115.72	4269.55	5426.24	1156.69	5486.02	1216.47
90	4220.1	5268.78	1048.68	5295.44	1075.34	4317.52	5437.74	1120.21	5496.83	1179.31
91	4266.99	5274.45	1007.46	5300.87	1033.88	4365.5	5449.55	1084.05	5508.02	1142.52
92	4313.88	5282.79	968.91	5309.54	995.66	4413.47	5461.01	1047.54	5518.9	1105.43
93	4360.77	5290.32	929.55	5317.03	956.26	4461.44	5472.78	1011.34	5530.41	1068.97
94	4407.66	5298.25	890.59	5325.32	917.66	4509.42	5485.11	975.69	5542.44	1033.03
95	4454.55	5307.13	852.58	5334.49	879.94	4557.39	5498.14	940.76	5554.86	997.48
96	4501.44	5316.89	815.45	5344.34	842.9	4605.36	5510.27	904.91	5566.04	960.68
97	4548.33	5326.12	777.79	5353.85	805.52	4653.33	5522.1	868.77	5576.71	923.38
98	4595.22	5334.3	739.08	5361.56	766.34	4701.3	5534.11	832.81	5587.44	886.13
99	4642.11	5340.52	698.41	5367.63	725.52	4749.28	5544.48	795.2	5596.5	847.22
100	4689	5346.99	657.99	5374.23	685.23	4797.25	5554.89	757.64	5605.49	808.24

APPENDIX D

The Oman Archive: A digital repository for archaeological research on the Sultanate of Oman

A. Project Activities

Background to the Region and Survey Area

This final report documents my early efforts to create a digital repository documenting the prehistoric archaeological remains in the Wadi al-Hijr surrounding the UNESCO World Heritage Site of Bat in north-central Oman (**Figures 112 and 113**).

Bat is one of the few known parts of the Oman Peninsula in which extensive third millennium BC (“Umm an-Nar”) archaeological monuments are still extant. The third millennium BC the Umm an-Nar were in direct contact with Mesopotamians to the west and the Harappans to the northeast. Mesopotamia is characterized by state-level social and political organization, with a strong hierarchical system. On the subcontinent, the Harappans (also known as the Indus) can be characterized as “civilization without the state”: that is, a highly developed complex socio-political system lacking a pinnacled hierarchy. In contrast to both the Mesopotamians and the Harappans, the Umm an-Nar culture is a highly integrated middle-range culture with extensive socio-political and economic linkages over the entire Oman Peninsula maintaining important trade relationships with both Mesopotamia and the Indus (**Figure 112**). The basic structural differences in the cultures make their exchanges fascinating both as an example of ancient interactions and as an important contribution to our understanding of culture contact.

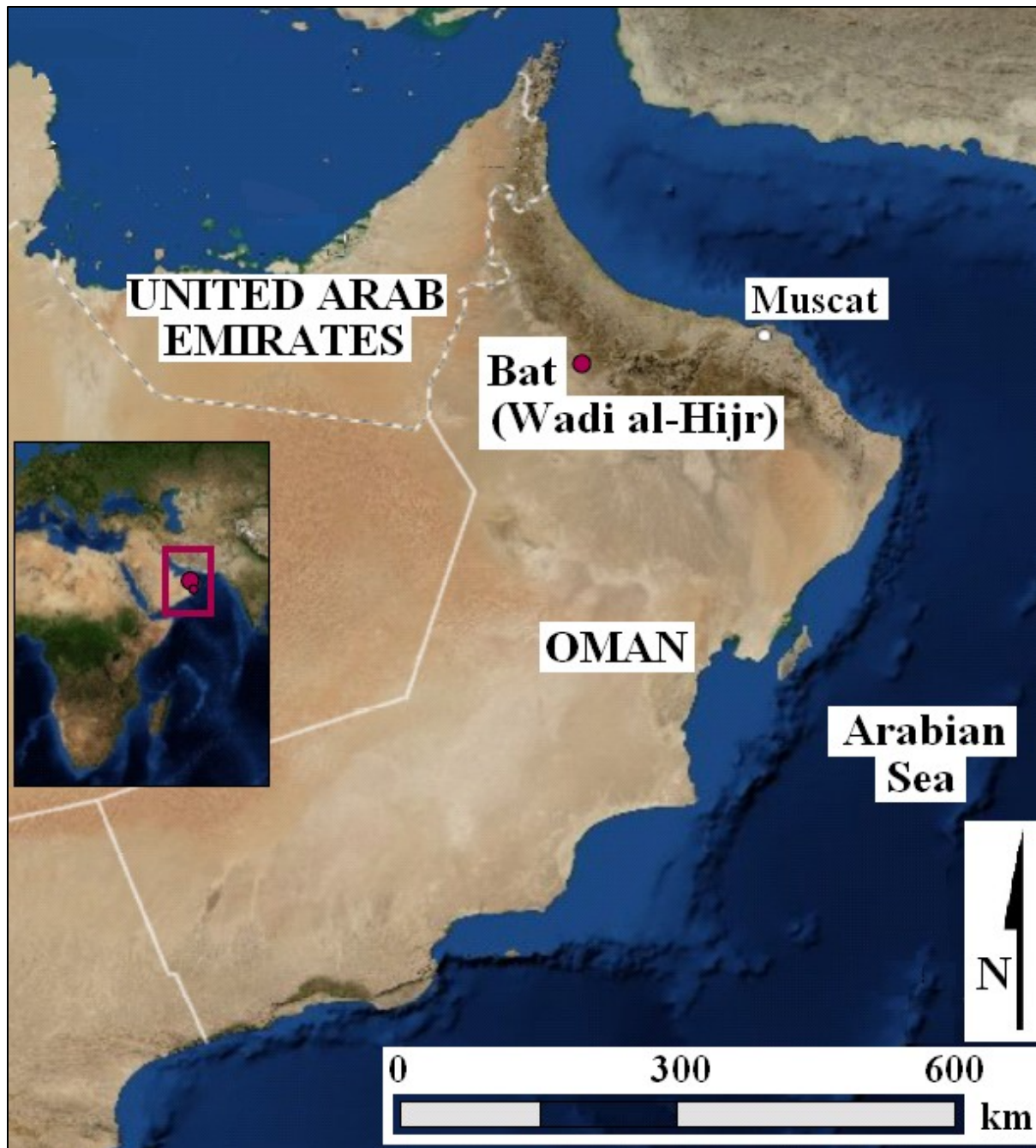


Figure 112. Location of Oman in South-central Asia.

Recent development is radically changing this landscape and the experiences of the people who live there. This digital repository project, at its most basic level, is an attempt to document this archaeological heritage so that cultural heritage can be taken into account by future development projects at the local, regional, national, and even international levels. Throughout the third millennium BCE the site of Bat was a center of great importance, arguably second only to one

other settlement on the Oman Peninsula.

Excavations and providential survey of the Bat region began in the 1970s. Despite forty years of research and several surveys of the UNESCO site proper it was not until 2010 that extensive full-coverage archaeological survey was undertaken in the Bat region, thus allowing this important site to be situated within its environmental and archaeological context. Since Bat has become the main focus of research in understanding transitions to and changes in the Umm an-Nar culture, this research has application in any number of realms, from specific development plans for cultural heritage in the Bat area, to understanding interactions between wildly disparate cultural groups in the third millennium BC Middle Asian Interaction Sphere (Possehl 1007).

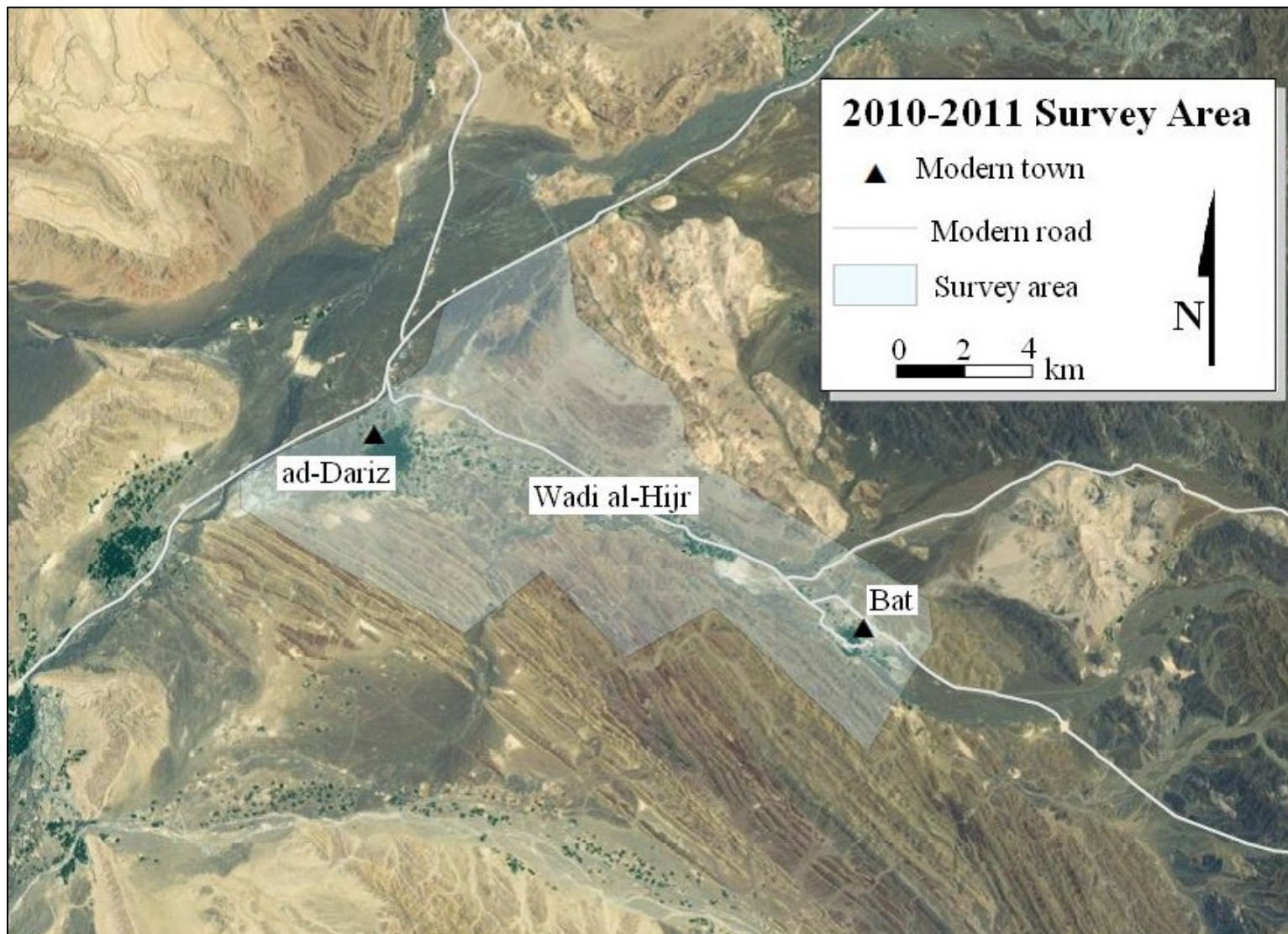


Figure 113: Location of the survey area in Oman

Yet the same problem that dogged earlier researchers existed: how to maintain the data and results in a way that was (a) stable, (b) accessible to future researchers, and (c) useful for heritage planning in conjunction with other development changes to the landscape in the area?

Changes and Omissions to the Project

There were two significant changes to the project. The first change was in the immediate audience and levels of access. The project was initially formulated as potentially encompassing four major audiences: (A) researchers; (B) development workers in the immediate area; (C) government servants responsible for decision-making on the national level; and (D) UNESCO employees and other members of the international community concerned about monitoring the World Heritage monuments as part of a larger landscape. Early on it became expedient to set aside the outward-facing application component and focus on the ways in which researchers store and access data in the Wad al-Hijr area. At the same time the structure of the digital repository was built to reflect the potential for additional audiences in later versions.

Efforts to Publicize the Project

The Beta version of this repository will be delivered to the Ministry of Heritage and Culture in the Sultanate of Oman. It will be available for immediate use by the Ministry, specifically as they formulate development plans for the project area.

The American-Japanese Bat Archaeological Project (AJBAP) will regularly access the data in their upcoming 5-year plans to continue surveying the region and its environs for archaeological remains. During that time decisions will be made in regards to integrating the newly-collected

data with the 2010-2011 survey data, using this project as a model.

This White Paper will be circulated as one of the CHII projects and highlighted in a less formal blog post on the MATRIX website. It will also be included as an appendix to this researcher's dissertation, which summarizes and analyzes the repository data.

In May 2013 there will be a program bringing together all research on the UNESCO World Heritage Site of Bat and its environs. This researcher will present the digital repository for its analytical and development capabilities, and invite other researchers into a discussion of creating a combined repository.

B. Accomplishments

Quantitative and Qualitative Accomplishments

The project sacrificed quantitative coverage in organization for qualitative coverage in order to form a flexible backbone repository structure.

There were four major goals for this project:

1. The curation of archaeological survey data
2. Familiarity with archaeological meta-data standards
3. Using KORA, conceiving of the relationships between data, storage, and access via digital repository structures, and confidence manipulating those digital structures
4. Creation in KORA of a repository capable of both qualitative and quantitative expansion

Curation of archaeological survey data. Before this project began, archaeological surveys of the research area had been undertaken seven times over the past 40 years; in no case has the data from those surveys been located, despite repeated attempts by a variety of researchers intimately linked to the projects. The original idea for this project, then, was to develop a digital storage facility that would manage all of the data files – many of which were born digital – while maintaining the particularities of the conditions under which the data were collected through the metadata. Archaeological survey data collected in 2010 and 2011 in 124 sq km section of the Wadi al-Hijr were the particular test case here. Data consisted of several types of survey forms, digital photographs, scanned and digitized hand drawings, born-digital and scanned maps, and coordinate data.

Familiarity with archaeological metadata standards. Archaeological data varies widely depending upon the type of data being collected and the kinds of questions the researcher seeks to answer, as well as region-, institution-, and subfield-specific standards. The conditions and research questions under which data were collected therefore must be maintained within the data themselves and in a manner that is accessible and understandable to any researcher accessing the data.

Several metadata sources were researched to understand different ways of thinking about the data. The Council of Europe's Cultural Heritage Committee created the International Core Data Standard for Archaeological Sites provided a monument-specific detailed list of metadata options. The Canadian Heritage Information Network (CHIN) data dictionaries provide a breadth of standard fields for describing archaeological data. As a dictionary, it standardizes relationships

between terms and is therefore useful in collections management system design.

Confidence structuring and manipulating data through digital repository design. KORA is a flexible, open-source online digital repository application capable of organizing, managing, and retrieving digital objects and metadata. Its flexibility makes it useful for working with different contents and metadata structures, which can be problematic when dealing with archaeological data.

The repository underwent several structural iterations of increasing simplicity. Each iteration was a response to the dialectic between data particularities and structural complexities. In general, as the structure increased in complexity and thus more closely reflected the sample survey data, the less flexible it became in integrating other kinds of archaeological data. In order to allow for the greatest flexibility all data are collected and related under the following five schema (**Figure 114**):

- Event
- Unit of Analysis
- Field Forms
- Visual Data
- Logs, Etc.

An *Event* constitutes a specific activity taking place in time. Examples of an Event are Site visits; Survey; Construction; and Excavation. Since an archaeological project alone usually includes aspects of survey, excavation, and laboratory analysis – any combination of which may be taking

place synchronously or diachronically – this was an important organizational scheme that will be particularly useful heritage management, research, and development.

The *Unit of Analysis* is primarily useful for researchers in comparing across units. An archaeological feature (e.g., a wall) may be one unit of analysis; an artifact may be another. Separating out these different categories will make organization and exploratory analysis of large amounts of data easier.

Field Forms are any and all paper documents created in the field (as opposed to in the lab), and the intent is curation of original field documents for later retrieval and analysis.

Visual Data includes maps; photographs; hand-drawn and digitally born drawings of artifacts; features; sites; and other media that may relate to an Event. “Other media” may including audio, such as an archaeologist’s tour of a site, or – quite frequently – a specialist’s visit and on-the-spot assessment of a specific artifact.

Logs, Etc. curates all other forms associated with the archaeological heritage. These include copies of permits; field journals; interim reports; digitized selections of archaeological comparanda; and any other public documents relating to the archaeological heritage of the area.

Every piece of data – stored in Field Forms, Visual Data, or Logs, Etc. – is associated with an Event, but may otherwise link with any combination of the other schema.

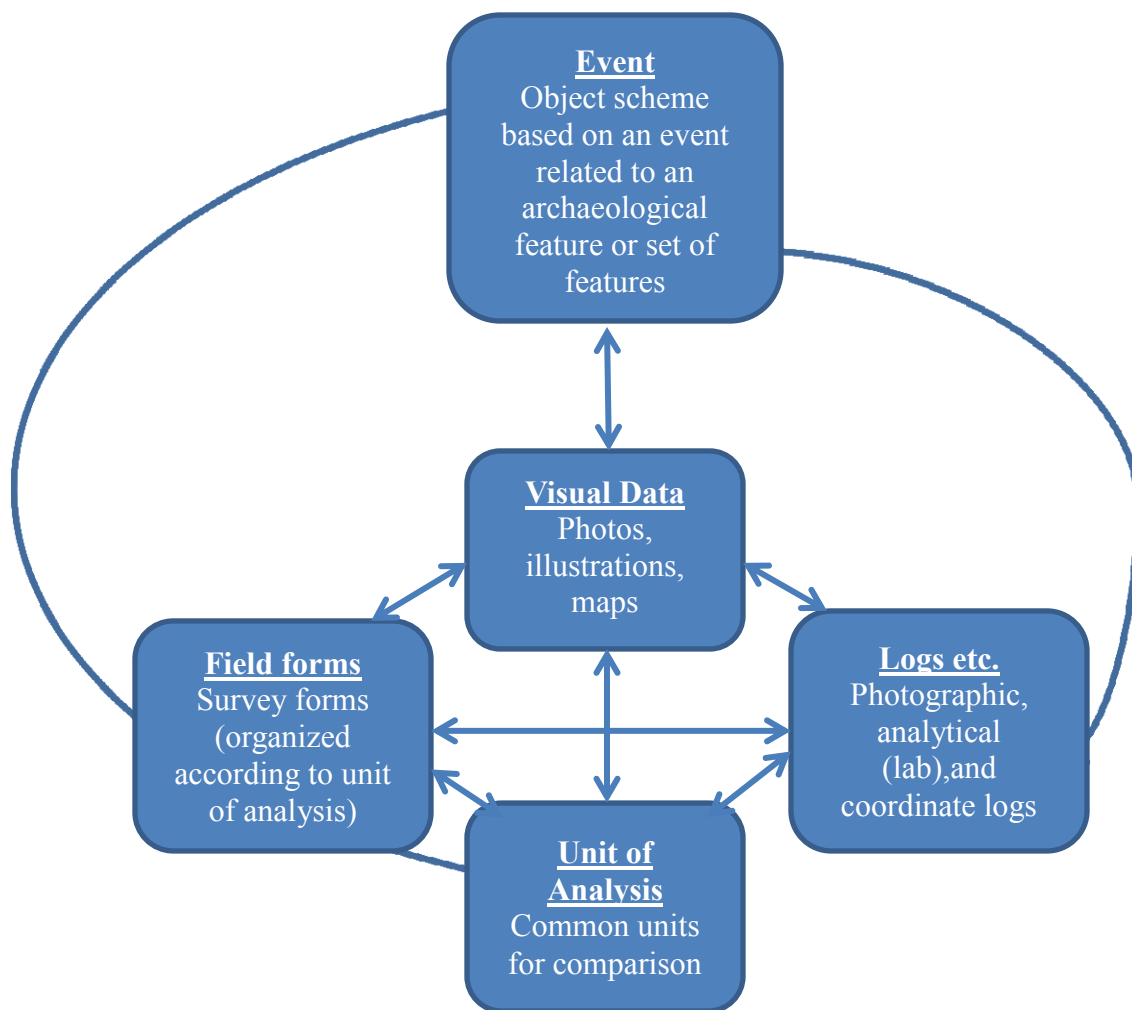


Figure 114. Relationships between Oman Archive schema

Creation of a repository capable of both qualitative and quantitative expansion. As is clear, major schema are very broad, allowing for easy extension of data types and linkages without compromising any of the associations already in place.

C. Audiences and Continuation of the Project

Audiences

The project has four major audiences. (A) Researchers. (B) Development workers in the immediate area. (C) Government servants responsible for decision-making on the national level. (D) UNESCO employees and other members of the international community concerned about monitoring the World Heritage monuments as part of a larger landscape.

Continuation of the Project (Future Plans)

As this was a start-up project, there is still much to do to make this project useful for all audiences.

There are several main areas in which this repository can grow, and much of this is dependent upon the researchers involved. For example, the archaeological data storage at the moment is focused on survey. For a number of reasons it will be important to expand this to include excavation results: for example, this repository would be greatly complemented by the results of salvage excavation mediation. In order to make informed decisions about extant archaeological remains it is important to have a full understanding of those archaeological remains that have been excavated, removed, or altered for a number of reasons. New information can help us to better understand, protect, and evaluate extant archaeological heritage, in addition to anticipating archaeological remains invisible in surface survey examinations.

The latter highlights a second goal for future applications of the repository: that of heritage

management. There are several directions for this. On a landscape in which resources are patchily distributed and localized, those areas that were best for human groups in the past are very likely to have remained popular throughout history and into the future. Therefore it is vital to have an understanding of the cultural heritage literally surrounding people today in order to make informed decisions about development (in its broadest sense) at the local, regional, and national scales.

Second, under Royal decree the Ministry of Heritage and Culture (Sultanate of Oman) is intent on documenting and maintaining Omani heritage, and is beginning a strong push to conduct a series of comprehensive surveys of the entire country. In conjunction with this project, Dr. Yasuhisa Kondo (AJBAP) will be leading a 5-year survey plan to complement the 2010-2011 survey data stored in this repository project. The integration of these intensive plans to create massive amounts of comparable data – on the research level of this and Dr. Kondo's data, and on the national scale – will require some system of digital curation, storage, and retrieval that is feasible for researchers and for ministry employees, who make daily decisions impacting the landscape across the country. For example, there is a major project in the works to build a trans-Arabian railroad from southern Oman, through the UAE, and over to Saudi Arabia. As initial plans suggest a coastal route, where the probability of archaeological sites is quite high, it is crucial to know how, when, and where to mediate archaeological sites prior to construction.

The creation of constraints – limitations on access – will be a simple but necessary step in the future. The repository is to be available to a wide variety of audiences with very different interests and agendas. For this reason every change to the repository – whether an ingestion or a

simple modification – is logged as a new Event and the data ingested is added and associated to the data it is updating; it does not replace earlier data. At this point anyone who ingests data may also make modifications (e.g., delete) data already entered. Again, what is to be created here is as much a log of changes over time (“When did looting begin at that site?”) as a tool for creating information about the ancient past (“Who has sought to date this artifact, what was the reasoning, and what was the conclusion?”). Site monitoring and action items related to future projects are important for long-term research and development plans.

Changes to the platform will also impact the project’s future. KORA is going through extensive review, of which this digital repository was a part. Based on these and other recommendations the platform will be considerably modified for ease of repository development, ingestion of materials, and access by other researchers and projects. Although the repository as it stands now will be put to immediate use by researchers and Omani employees as soon as December 2012, the extension of this repository into other adjacent and complementary regions, and for archaeological materials of all periods, is an important next step (as described above).

D. Evaluation, Long Term Impact, and Grant Products

The evaluation of the project is still underway. The initial goal was to create a permanent place for the long-term digital storage of archaeological survey data on and surrounding the UNESCO World Heritage Site of Bat in the Sultanate of Oman. This has been accomplished. Its evaluation will primarily occur beginning in December 2012, when it will be integrated into the 5-year AJBAP survey research plan. Beginning in January 2013 it will also be made available to the

Ministry of Heritage and Culture; this stage will include evaluation and updating the repository structure to provide access to specific Ministry representatives, with an extended period of supervision by this researcher as Site Manager. The primary grant product is the digital repository created in KORA.

APPENDIX E

Research Form Samples

___/05/ 2011 UTM: 40Q 04 E; 25 N (WGS84) Feat.#111 5

time: GPS#: 1 GPS acc:± Ave#: Wypt. #

Tracklog interval: 10m GPS notes

Location: plain/plateau/mid-slope/ridgeline/foothill/prominence/Other: _____
View from feature: N= E= S= W= _____
Visible: Tower/Tomb(s)/Settlement/None/Unkn/Other _____
Notes on surroundings: _____
See Feat. # 111

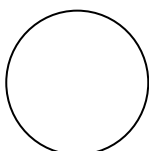
Dimensions overall (m): N-S: E-W: ht: _____

_____ wall: width(s): dir. (NA)/: _____

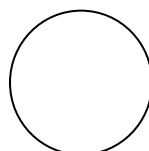
_____ ringwall visible? Y\N\NA

ind. where ringwalls visible:

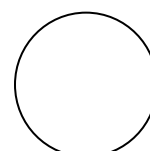
int



mid



ext



Stone: unworked→ground: 0-1-2-3; Local? (Y/N/Unkn) Dimensions: _____

Color: red/brown/black/gray/white **Soils:** (und/disturbed/unkn/NA); soil fill: 0-1-2-3-4-NA

Stones: triangular/Roofing/Block/Cobble/Frags/ Uses bedrock? Y/N/unkn

Tomb. #Chambers: (Unkn)/ Skins: Unkn/(# =) **door:** faces= HxW: _____

Plinth: (Y / N / Unkn) Corbelling: (Y / N / Unkn / NA)

Notes: _____

Period(s): (unkn)/ Stone reuse (Y\N\unkn) removal (Y\N\unkn): _____

Feature: Cairn/Tomb/Tower/Bldg(s)/Antiquity/Dam/Wall/Unknown/Other _____

Finds: NONE/Pottery(P/C) Lithic(P/C) bone(P/C) Met.Debris(P/C) Other: _____

Notes:

Photos: #s (total): (-) Overview photo (none) # (-)

Other photo (none) # (-) Stone photo (none) # (-)

Notes/comments: _____

See Feature #: 111 _____

Figure 115. Sample survey form.

[illegible]

Figure 116. Sample Field Photo Log.

photo #	feature #	date collected	material	object #	description	photo view	scale	camera height	comments
114-4566	100074	27-Sep-10	ceramic		Red ware base	Profile	20cm	32cm	-
114-4567	100074	27-Sep-10	ceramic		Red ware base	Side	20cm	32cm	-
114-4568	100074	27-Sep-10	ceramic		Red ware base	Other Side	20cm	32cm	-
114-4578	100101	26-Sep-10	ceramic		Coarse Red Ware	Profile	20cm	32cm	-
114-4579	100101	26-Sep-10	ceramic		Coarse Red Ware	Side	20cm	32cm	-

Figure 117. Sample Lab Photo Log.

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