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Geography and Environment

The Role of Geographical Information Systems (GIS) in Archaeological Tourism Assessment and development in Najran, Saudi Arabia

by

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ABSTRACT

FAULTY OF SOCIAL, HUMAN AND MATHEMATICAL SCIENCES

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THE ROLE OF GEOGRAPHICAL INFORMATION SYSTEMS (GIS) IN ARCHAEOLOGICAL TOURISM ASSESSEMENT AND DEVELOPMENT IN NAJRAN, SAUDI ARABIA

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To date, GIS has been rarely used as a planning tool to support archaeological tourism, despite the widespread archaeological application of GIS more generally. Archaeological tourism can be defined as travel to experience places, activities and artefacts that authentically present stories and peoples of the past. This study examines the role of GIS in archaeological heritage tourism and planning using, as a case study, Najran region in Saudi Arabia. As well as being an important historic trading hub, Najran includes significant archaeological sites, therefore it has the potential to be an alternative for tourists who might be looking at Yemen as a tourist destination especially when Saudi Arabia starts issuing tourist visas.

As an initial step, governmental archaeological records were combined with information from a literature review and fieldwork to develop a geospatial archaeological heritage database for Najran. Simultaneously, data on tourism accommodation and facilities were collated through a mixture of field surveys, Internet sources such as OpenStreetMap, and local tourism-promotion materials. Sieve analysis of the resulting spatial databases suggest that there are six archaeological tourist sites with high potential based on archaeology, accessibility and site characteristics. With the city of Najran dominating the provision of tourism accommodation and facilities, the most appropriate role for GIS is likely to be in combining knowledge of the spatial distribution of archaeological sites with tourism and amenities. The next step was to conduct a consumer survey to evaluate selected archaeological tourist sites, where the results indicate that those sites located outdoors are more likely to be visited in the future. The final step was to characterise the landscapes around the potential archaeological tourist sites in the Najran region, e.g. mountains, vegetation, wadis etc.

This thesis provides a GIS-based management tool for the development of tourism in Najran Province in line with the rapidly developing national tourism policy.

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Declaration Of Authorship

I, Ali Alawer, declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

[title of thesis]: **The Role of Geographical Information Systems (GIS) in Archaeological Tourism Assessment and development in Najran, Saudi Arabia**

I confirm that:

1. This work was done wholly or mainly while in candidature for a research degree at this University;

2. Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;

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7. Either none of this work has been published before submission, or parts of this work have been published as: [please list references below]:

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Date: 17/08/2018

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Chapter 1

Introduction

1.1 Introduction

From the early 1990s, Geographical Information Systems (GIS) has become an industry standard for archaeological, historical and geo-spatial modelling, affording researchers unprecedented access to spatial and visual data. This has not only redefined historical understandings of archaeological artefacts, but also provided a link between past and future uses of global sites. Associated with such research tools is the concept of Viewshed analysis and spatio-historical archaeology, popularised by Lake et al. (1998). Technology and mapping capabilities have also become enhanced and more comprehensive in nature (Ogburn, 2006; Paliou et al., 2011; De Montis and Caschili, 2012). Yet, the degree of consistency in the research objectives underlying such geo-spatial assessments has not altered over this time frame; in fact, technology has itself validated earlier research initiatives, putting emphasis, over time, on the merits of GIS mapping and both conceptual and contextual analyses of archaeological sites. There is a large body of literature concerning the archaeological applications of GIS. There is, however, very limited literature that uses GIS to plan for tourism at archaeological sites. This PhD thesis seeks to address this lack of applied GIS work on archaeological tourism. It applies GIS to archaeological tourism in Saudi Arabia, where there are a number of additional national and regional priorities that need to be addressed in order to exploit archaeological sites and diversify the economy away from primarily petroleum into a broader-based one, and tourism could be part of that process. This would be compatible with the vision of Saudi Arabia in 2030, which aims to attach more priority to domestic tourists, along with international tourists, by facilitating the issuance of tourist visas, which is expected to start happening in the current year, i.e. 2018 (SCTNH, 2018). In addition, this vision of 2030 calls for tourist projects to be given much greater priority by investing in museums and archaeological and historical sites to create tourist attractions which can play a bigger role in the national economy (Taylor, 2016).

Saudi Arabia is considered to be a country rich in archaeological and cultural heritage sites, these number more than 4,000, and rock-art sites up to 1500; these belong to different eras, from prehistoric period to the Islamic era (Khan, 2013). The majority of these sites have significant characteristics that deserve exploitation through tourism. For example, there are some archaeological sites in Saudi Arabia (see Fig 1.1) dating back to the era of the old and intermediate Arab kingdoms; some of these are believed to have been the capitals of those ancient kingdoms, e.g. the villages of Al-Faw, Dadan (Al-Ula), Al-Hijr (Madâin Sâlih), Dumat Al-Jandal and Taima (Al-Ansary,

2008). Regarding these sites and ancient kingdoms, Al-Ansary and Tairan (2005: 97–106) concluded that, in the southern texts, Qaryat Al-Faw was called Qaryat Dhu Kahl, while it was known as Qaryat al-Hamraa or Dhat al-Jnan by the inhabitants who lived there during a period of great prosperity. This site is located about 700 km from the capital city of Saudi Arabia, 'Riyadh city', towards the south-west and about 300 km before the region of Najran. This site was the capital of the Kindah Kingdom for eight centuries, from the first century BC to the fourth century AD. Furthermore, amongst the findings at this site are houses, squares, streets, a marketplace, temples and tombs, in addition to inscriptions which indicate the relationship of this kingdom with other Arabian Peninsula kingdoms, such as the Kingdoms of Nabataeans and Lihyan (Al-Ansary and Tairan, 2005).

Moreover, the site at Madâin Sâlih, or Al-Hijr, located in the northern region of Saudi Arabia, is known as the second capital of the Nabateans Kingdom (168 BC to 106 AD), after Petra in Jordan. It contains Nabataean tombs that have dates and are elaborately carved, in addition to architectural decorations and inscriptions; in the Islamic period this site also had a railway station belonging to the Ottoman Empire (Al-Ansary, 2008; Al-Utaibi, 2012). To the south of the Al-Hijr site is located Dedan or al-Khurayba, a former name of al-'Ula oasis, the capital of the kingdoms of Dedan and Lihyan (Al-Utaibi, 2012; Al-Said, 2011). This site dates back to the 2nd millennium BC (Al-Said, 2011). As shown in Figure 2.2, Al-Ula is located on the incense caravans road, running from south to north, and that made the site important in the past, especially for trade (Al-Said, 2011; Al-Utaibi, 2012). This site has tombs and inscriptions, variously royal, pilgrim and commemorative inscriptions, perhaps from the 6th century BC (Al-Said, 2011). In addition, there is the ancient town of Al-Ula(Al-Bida Oasis), which was built in the 13th century AD (7th century AH), where the most important antiquities are the Nabataean tombs carved into the mountains; these resemble the Nabataean tombs found in Petra and Madain Saleh, and the region is dotted with many archaeological sites that indicate settlements from 1700–1050 BC, through the civilization of the Nabataeans (168 BC–106 AD) up to the medieval Islamic period (Al-Ansary, 2008; Al-Utaibi, 2012).

There is also the site of Taima, this location was a central point on the ancient trade route between the kingdoms of southern Arabia, Mesopotamia and Egypt (Al-Utaibi, 2012). This site has many antiquities from the pre-history period to the Islamic period, including a barrier wall from the time of the Babylonian King Nabonid (555–539 BC), hills of archaeological interest, ancient cemeteries, wells and a number of palaces (Al-Ansary, 2008; Al-Utaibi, 2012). These are not the only antiquities sites in the northern region of Saudi Arabia, there is also Jubbah, Kilwa, Al-Shuwaymis, Dumat Al Jandal and Ash-Shuwayhitiyah. However, Jubbah, Kilwa and Al-Shuwaymis have the largest rock sites depicting life on the Arabia peninsula (Kan, 2013; Al-Utaibi, 2012). Moreover, Dumat Al Jandal and Ash-

Shuwayhitiyah encompass the oldest Islamic antiquities, such as Omar mosque (Al-Utaibi, 2012). In addition, there are other archaeological sites spread over Saudi Arabia that are no less important than the aforementioned ones, and these should be exploited by the Saudi economy.

Reflecting the importance of Saudi archaeological sites, there are four archaeological sites included on World Heritage Lists (UNESCO, 2015): Al-Hijr Archaeological Site (Madâin Sâlih), At-Turaif District in ad-Dir'iyah, Historic Jeddah, the Gate to Makkah, and Rock Art in the Hail Region of Saudi Arabia. In addition, there are another ten archaeological sites on the Tentative List awaiting nomination (UNESCO, 2015): Darb Zubayda (Pilgrim Road from Kufa to Makkah), Hejaz Railway, Syrian Hajj Road, Egyptian Hajj Road, Al-Faw Pre-Islamic City in Central Arabia (Qariah), Rijal Almaa Heritage Village in Assir Region, Zee Ain Heritage Village in Al-Baha Region, Al-Ahsa Oasis Cultural Heritage Landscape, Bir Hima a rock art site in Najran, and Dûmat Al-Jandal Historical Oasis in Al-Jawf Region.

However, the identification and preservation of historic sites of archaeological interest has emerged as a priority in protecting the countries socio-cultural legacy, whilst simultaneously stimulating interest in future archaeological tourism and income generation. Located in the southwest corner of Saudi Arabia, close to the Yemeni border, Najran is a remarkable example of multi-period archaeological heritage landscape. As well as being an important historic trading hub, Najran includes significant sites from the former Yemeni kingdom, which elsewhere are otherwise inaccessible to tourists because of ongoing political insecurity in modern-day Yemen. Therefore Najran has the potential to be an alternative location for tourists.

In 1975, the Najran Museum of Archaeology and Heritage was opened at the famous Al-Ukhdud site, affording visitors and residents the opportunity to explore key artefacts and relevant elements of the rich, 6,000 year human heritage. Saudi Arabia continues to redefine the role which informatics play in improving the efforts of the Saudi Commission for Tourism and National Heritage. Najran region provides a unique archaeological and architectural destination for tourism, however, more intuitive and analytical evidence is required to understand the potential spatial demand and supply of tourism in the region. This spatial evidence should focus on unearthing the demand for archaeological sites, potential for tourism, and aid in decision making and planning of touristic activities. For this reason, GIS mapping, spatial analysis, and archaeological site comparisons will be the underlying analytical methodologies used to develop touristic potential, particularly in relation to crafting a future tourist driven economy within the region.

Figure 1.1: The significance of archaeological sites in Najran and other Saudi regions.

1.2 Rationale of the study

One justification of this research is that Najran still has significant archaeological and architectural heritage. In addition, traditional and historic lifestyles still exist in Najran region especially in the form of traditional buildings, as well as marriages and religious events in the region, such as Eid Al-fitr and Eid Al-adha, which is still dominated by the local customs and traditions.

The Saudi Commission for Tourism and National Heritage (SCTNH) recognised the archaeological and cultural significance of regions in Saudi Arabia such as Najran. This prompted a restoration of many of these sites of archaeological importance to enhance tourism and contribute to sustainable growth. Although there has been excavation of many of these sites, there is a lack of research aimed at exploring their relationship with tourism i.e. archaeological tourism. This aspect is explored in this thesis by combining tourism information, archaeological heritage and landscape potential, and cultural artefacts to draw spatial pattern between tourism and archaeology.

1.3 Problem statement

Najran region is both a potential internal (national) and foreign (international) tourist destination related to archaeological and natural sites. This includes the availability of high mountains, spacious plains, desert areas, and public parks, all of which enhance tourism. However, the region requires scientific studies of the potential to help for planning and sustainable development.

The initial challenge of this study is that at present archaeological tourism in the region of Najran is very limited especially from outside of Saudi Arabia and the relationship between sites and the sources of tourist attractions is not clear. For example, archaeological sites and heritage buildings in the region of Najran are not at present prepared and configured for tourists.

For example, Altheeb (2012) recommended converting the Al-Markab site to a tourist destination to display archaeological inscriptions and to help raise awareness of the importance of archaeology to tourists. Also, he recommended a transformation of the Al-Ukhdud archaeological site to an open-air museum.

Another challenge is the suitability for tourism of archaeological sites with the current level of services available. This challenge is to be studied and evaluated by the author in order to develop archaeological tourism in the region of Najran. This thesis also aims to identify the attraction of the archaeological sites and assess the services required for tourism. In general the service sector in Saudi Arabia has developed significantly and especially for tourism (Aldakhil, 2007; Bogari, 2002; Al-

thagafy, 1991; Al-Hajji 1989). There is evidence that accessibility of sites is important and instrumental for development (Lea and Simmons, 1995; Aldakhil, 2007). The spatial distribution of archaeological sites and site-related services in Najran region is not clear in terms of accessibility.

Geographical Information Systems (GIS) technology has the capability to enhance planning, matching potential demand to supply, due to its capabilities for the integration of spatial and non-spatial data, and multivariate analysis. In this study, GIS will be used to increase our understanding of the spatial relationships between archaeological sites and the possibility extent of creating tourist destinations to these sites in Najran region.

1.4 Aims and Objectives

The aim of this thesis is to examine the role of GIS in archaeological heritage tourism and planning, using Najran region, Saudi Arabia, as a case study. One aim of this GIS study, in addition to creating maps for distribution, is to determine the accessibility of archaeological tourist sites, and delineate the landscape characteristics around them. The specific objectives are:

- To review the distribution and characteristics of archaeological sites in Najran region and build a spatial database suitable for archaeological tourism planning.
- To create a short list of archaeological sites of high potential tourism value based on this database and tourism
- To estimate potential domestic demand for archaeological heritage tourism at short listed sites in Najran.
- To examine short listed archaeological sites in relation to the spatial distribution of landscape character.

1.5 Research application

The thesis will be applicable to the following policy areas:

- Improving the current infrastructures of archaeological heritage sites for tourism.
- Determine the suitability of future infrastructure for archaeological sites.
- Setting up the future plans for tourism for archaeological sites.
- Management of archaeological sites in order to find out which sites need maintenance such as restoration, or add services such as roads for easy access to those sites.
- Developing potential archaeological tourism.

1.6 Thesis outline

This thesis has eight chapters. Chapter 1 is an introduction and contains the rationale for this study, the statement of the problem, the aims and objectives of this research, and the possible utilization of this research in the future. The background, archaeology and heritage of the Najran region, and archaeological tourism using GIS, are covered in Chapters 2 and 3, respectively, while the development of a spatial database for archaeological-tourism planning is addressed in Chapter 4. In Chapter 5, a consumer survey is explained to evaluate selected destinations. Landscape characteristics around the potential archaeological tourist sites are covered in Chapter 6, whereas a discussion of the implications for managing archaeological resources for tourism is presented in Chapter 7. The thesis conclusions are described in chapter 8.

Chapter 2

Background, Archaeology, Heritage of the Najran Region

2.1 Geography and Location

The Najran region occupies in the south-west part of the kingdom of Saudi Arabia (KSA), along the border with the Yemen Republic between longitude 52^{o} - 43^{o} and latitude 20^{o} - 17^{o} (Alansary and Almareeh, 2007) see figures 2.1.A, and 2.1.B. It is mostly covered by sand and rock outcrops (al Saud et al., 1999). It occupies an area of approximately 365,000 sq. km., with high mountains gradually increasing northwards and westwards in height and which vary between 900 – 1800 m above sea level and in the west parts to 1200 – 1100 m. In the middle of the region lies Wadi Najran which runs eastwards to the western edge of the Empty Quarter (al Saud et al., 1999, Alansary and Almareeh, 2007, Basonbal, 2010).

Najran is the capital of Najran region which is divided into several districts such as Sharora, Habbona, and Bader Al-Janub etc. (al Saud et al., 1999). In fact, as Al-Ansary and Al-Mareeh (2007:11-12) reports, the Najran province is bounded on the east by the Eastern region, on the west by Asir region, on the north by Riyadh region and the south by the Republic of Yemen.

The administrative province of Najran has three major topographic units as mentioned by Alamri et al., (2003:19-29) and Al-Ansary and Al-Mareeh (2007:11-12):

A- The low-lying area of Wadi Najran (A 'wadi' is a watercourse that flows only in the rainy season). The area of settlements is extensive on both banks of the wadi from western highlands until it vanishes into the western rim of the Empty Quarter. Underground water is still available and that allows for productive agriculture in the region, specialising in date gardens, grain and citrus fruits.

B- The Highlands Regions: Najran is surrounded by chains of mountains in three directions to the west, north and south. The existence of these physical features gives this region wonderful vistas, and also a mild temperate climate, especially in summer due to the height above sea level.

C- The Desert Region: This region is located to the east of Najran, generally begining at the point where the margin of the valley approaching to the Empty Quarter. This area is known locally as the “sand of Yam”- which refers to the name of a tribe in this region. The settlement in this area is the town of Sharora (Al-Ansary and AlMareeh, 2007:12).

Furthermore, while land use in Najran region has been limited for some activities, such as agriculture, it expanded, especially after 1972, to include both residential and agricultural areas due to the development that has taken place in Saudi Arabia (Youssef, 2014: 2020). Current land use of Najran can be categorised as residential land, urban areas, agricultural fields, green areas or parks, roads networks and bare soil (Elkhrachy, 2015). There are also protected areas, mining areas and military zones, based on the observations of the author of this study who visited Najran to do fieldwork in 2016.

Figure 2.1: The location of Najran, Saudi Arabia

Figure 2.1B: The location of Najran with some physical features and other Saudi regions (source: https://www.britannica.com/place/Arabian-Desert?oasmId=542).

2.2 Climate evolution of Najran region

The Najran region lies in the south of the Arabian Peninsula, an area that has undergone several past climate changes that may have affected human populations--particularly changes in precipitation. For example, during the Palaeolithic period, there were active river movements, suggesting relatively high precipitation at certain times (Zarin et al., 1979). This was followed by a humid climate with moderate temperatures during the Neolithic period (Khan, 2013, McClure, 1979). In the Bronze Age and subsequent periods, the climate became dry and warm (Khan, 2013), and there was desert expansion and intensification of desertification, as in the desert of the Empty Quarter (Parker, 2010). In addition, some rock art may indicate the climate of the period(s) it belongs to, such as drawings of camels, which indicate a warm period (Khan, 2013, Jennings et al., 2013), as camels are normally used by Bedouin as they move across deserts.

Currently the Najran region is characterised by a mild temperate climate, especially in summer. Temperatures vary between 14^{o} – 37^{o}C, depending on altitude. In winter, it is rather cold in highland areas (Al-Ansary and Al-Mareeh 2007: 12).

2.3 The name of Najran

The word 'Najran' was used both for the town itself and for the wadi of Najran (Alamri et al., 2003, Alansary and Almareeh, 2007). In this region there is a place which is called 'Al-Ukhdud' most likely the location of the ancient city of Najran, that is recorded in the inscriptions of the southern Arabian Peninsula as 'N J R N' (Alamri et al., 2003). In this period 500 BC – AD 622, prosperity was widespread in southern Arabia- including Najran, "it became one of the prominent towns along the frankincense trade route, with commercial relations with both south and north Arabia" (Al-Ansary and Al-Mareeh, 2007: 12).

2.4 The population in Najran

The population of Najran is estimated at 650,000 people (Alansary and Almareeh, 2007). However, the people in Najran are divided to two groups (Urban and Bedouin) as reported by (Alansary and Almareeh, 2007):

A- The urban group who traditionally work in agriculture and live chiefly along the wadi banks. However, with the recent development of Najran, while some agriculture still exists, the main employment now includes professionals, such as teachers and engineers, and a range of jobs in the service sector.

B- The Bedouin group who to this day migrate with their flocks of sheep, goats and camels in the desert during the rainy season, and back again to the cultivated areas in the dry season. While occupations may be changing, people still live a traditional life in other ways, illustrated by occasions such as weddings and family celebrations.

2.5 A Major Caravan Centre

In Najran around the second millennium B.C domesticated camels contributed to growth and expansion of the caravan trade over long distances into the desert (Alansary and Almareeh, 2007). From 500 B.C to the rise of Islam Najran grew into a major caravan city connecting the northern and southern parts of the peninsula due to its strategic location, fertile agricultural soil and plentiful supply of water (Alamri et al., 2003, Alansary and Almareeh, 2007). The commodities were from the southern Arabian Peninsula such as frankincense, myrrh and incense, in addition to spices from India, silk, fine cloth, and precious stone from China (Al-Saud, 1996). These goods were brought to the South Arabia ports, and that linked the south Arabian with its markets around the Mediterranean Sea and Gerrha, in the east on the Arabian Gulf, and into Mesopotamia (Al-Saud, 1996). These goods were exported to the ancient world via overland caravan routes that congregated at Najran (Figure 2.2) (Al Saud, 1996, Alamri et al., 2003; Alansary and Almareeh, 2007; Basonbal, 2010):

1- Route originating from Yemen to Najran, this route at Bir Hima divided into two branches:

1.1- Route leading eastwards via Qaryat Al-Faw, Al- Aflaj, Yamama (Al-kharj) and Gerrha, where route bifurcates to:

A- Route running east to the Arabian Gulf

B- Route northward to Mesopotamia and the Levant

1.2 - Route originating from Bir Hima towards northwest of Arabian Peninsula via Jarash,Makkah, madinah, Dadan (Al-Ula), Midyan (Albed'a),Sela(Aqaba), and Petra, where it bifurcates into two branches:

A- Route running north to Levant

B- Route to Gaza and Egypt

2 - Another route originating from Yemen to Najran then from there towards oasis of Yabrin, where route bifurcates to:

A- Route from Yabrin Oasis to Gerrha on the Arabian Gulf coast then to Iraq

B- B- Route from Yabrin to Yamama (Al-kharj).

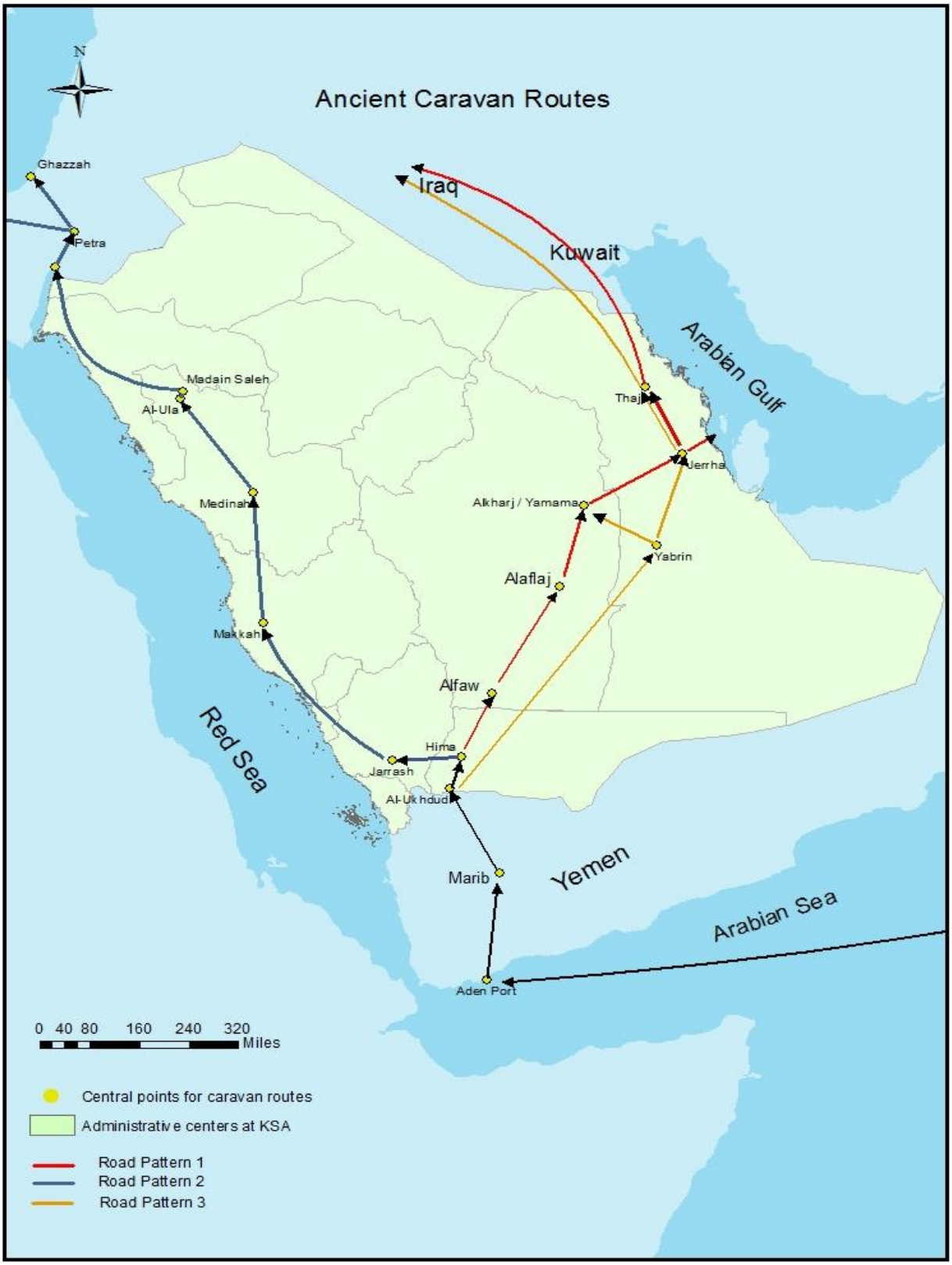


Figure 2.2: The ancient caravan routes.

2.6 Najran and the Yemeni Kingdoms

During the ancient trade era, the Najran site was probably important to the southern Arabian kingdoms (Ma'in, Saba, Qataban, Hadramout), due to its proximity (figure 2.3), and it was the first station for the caravans that passed to the east or the north of the Arabian Peninsula and to the Mediterranean see figure 2.2.

Figure 2.3: The Najran region with ancient overlapping of Ma'in Kingdom at Yemen (Dake, 2012)

In the third and fourth centuries B.C the Ma'in kingdom dominated the ancient trade routes in the Arabian Peninsula to the sea of the Mediterranean. Some believe that the Najran was under the rule of a Ma'in kingdom during this period (Alamri et al., 2003). At the third century ancient trade began to reduce due to conflicts in the south of the Arabian Peninsula. By 250 AD the Himyarites dominated the Sabaean area and they had become rulers of the southern Arabian Peninsula. During this period Najran was a member of alliance with the Himyarites, because of its location between the Himyarites area in the south of the Arabian Peninsula and the region belonging to Byzantines and the Sassanids in the north of the Arabian Peninsula (Alamri et al., 2003).

The Himyarite state probably started in the first or second centuries BC and flourished during the second century BC to 525 AD (Gibson and Wilkinson, 1994). Najran is believed to have been under the rule of the Himyarite state starting from the third century BC (Alamri et al., 2003). The last king

of this kingdom was Yusuf Assar Yathar (Dhu Nuwas), who was Jewish and made Judaism the official religion of the state. The Christian religion was introduced to the Najran region in same period.Dhu Nuwas tried to prevent people from converting to Christianity but he could not, he then gathered a huge army and besieged the people of Najran for about six months (524-525 AD). Dhu Nuwas gave them two options: convert back to the Jewish religion or death, (Alamri et al., 2003). As a result, approximately 20,000 were killed during this period and majority buried in a trench at Al-Ukhdud (Alamri et al., 2003). And this is probably the reason of the name of the A-Ukhdud site as mentioned in section 2.12.1. After the massacre and persecution by Dhu Nuwas, the king of Abyssinia sent an army estimated at about seventy thousand fighters supported by the Byzantine State, in order to occupy the Himyarite state and the south of the Arabian Peninsula (Alamri et al., 2003).

The State of the Ethiopia continued to rule the south of the Arabian Peninsula for approximately fifty years, until the people of Arabian Peninsula appealed to the emperor of Persia for help. The emperor sent a huge army and managed to drive out the Ethiopians and maintained Persian rule in the south of the Arabian Peninsula until the advent of the Islamic era (Alamri et al., 2003). Despite what happened in Najran it regained its position as it an oasis of fertile agricultural land and was a famous Arab market during the period that followed the Al-Ukhdud incident, known as the pre-Islamic era (Alamri et al., 2003).

2.7 Date of Saudi-Yemeni border demarcation

The Yemen is one of the oldest civilizations, and was the most important of the ancient Kingdoms of Saba, Ma'rib, Qataban, and Hadramout (Figure 2.3). The southern border of Saudi Arabia is adjacent to the Republic of Yemen, and this has a historical value to Najran region in Saudi Arabia. The Najran region has inscriptions and epigraphy for example, writings of South Arabia (Musnad) which are widespread in Yemen. In addition, the ancient architectural style could be similar to the model of Yemen. However, the demarcation of the border between the two countries changes a lot of things, such as the modern architectural style.

The demarcation of the border took place in 1934, in the Kingdom of Saudi Arabia in Taif. The Taif Agreement has since been renamed (Al-Ghamdi, 1996). In 2000, Saudi Arabia and Republic of Yemen agreed on treaty referred to as the treaty of Jeddah. The treaty resolved the international dispute between Yemen and Saudi Arabia and recognised the land and maritime boundaries between the two countries (Al-Enazy, 2002).

2.8 Archaeology in Saudi Arabia

Antiquities are considered important for the investigation of the nature of human cultures in ancient times, so they must be preserved and exploited, according to the convention concerning the protection of the World Cultural and Natural Heritage, which was adopted by the General Conference of the United Nations Educational, Scientific and Cultural Organisation at its seventeenth session in Paris, on 16 November 1972 (UNESCO, 1972).

There are three groups of antiquities for the purpose of this convention:

A- **The Monuments Group:** this includes the architectural works, works of monumental sculpture and paintings on buildings, elements or inscriptions of an archaeological nature, cave dwellings and combinations of features, which are of outstanding universal value from the point of view of history, art or science.

B- **The Architectural Heritage Group:** this contains groups of separate or connected buildings which, due to their architecture, their homogeneity or their place in the landscape, are of outstanding universal value from the point of view of archaeology, history, art or science.

C- **The Historic Sites Group:** this includes works of man or the combined works of nature and man, as well as archaeological sites which are of outstanding universal value from a historical, aesthetic, ethnological or anthropological point of view.

However, in the same year, 1972, the Saudi monuments regime classified antiquities into two groups (Ministry of Finance, 1972):

A- **Fixed monuments:** these are related to land such as natural caves or areas which are quarried, which were dedicated to the needs of past humans, the drawing or digging by humans on rocks to pictures or inscriptions or writings as well as the ruins of the cities and the installations built into the hills accumulated historic buildings and installations for different purposes such as mosques and other places of worship, castles, palaces, houses, hospitals, schools, playgrounds, bathrooms, cemeteries, forts and fences, dams and canals. Also, the associated buildings which are related to the windows and columns and balconies and stairs and ceiling crowns and similar architectural features.

B- **Portable monuments:** They are manufactured to be necessarily separate from the ground or historic buildings and can change their location, such as sculptures, coins, inscriptions, manuscripts, textiles and artefacts, whatever the purpose of the material and aspects of use.

The Kingdom of Saudi Arabia covers 2.15 million sq. km, and it is one of the least explored countries archaeologically in the world (Kennedy and Bishop, 2011), however, it has benefited from the efforts of some travellers and archaeologists who have worked on decoding the symbols and writings left by ancient civilisations (Al-Khathami, 2007).

2.9 The History of Archaeological Research

According to Al-Ansary and Al-Mareeh (2007:46-48) several travellers visited the Arabian Peninsula and wrote especially about Najran. Carsten Niebuhr (1733 - 1813 AD) was the first European traveller to refer to Najran; he copied some important ancient inscriptions, such as Musnad writing, and he published two books, one in 1772 and the second in 1774. In 1870 AD Neibuhr was followed by a French traveller, Joseph Halevy, who took back to France about 686 texts of inscriptions collected from south Arabia from around 37 different sites and published an article in 1877 on his trip to Najran. The next explorer who visited Najran in 1936 AD was St John Philby but his report was not published until in 1952 (Ryckmans, 1981, Alansary and Almareeh, 2007).He described the enclosed area of the old city of Najran the remains its buildings and its ditches, He also identified more than 122 inscriptions from various sites in the Najran region. However, Philby made a second trip to Najran in 1951, accompanied by K.Rychmans, J. Rychmans and P. Lippens, the latter having written a book in French in 1956 (*Expedition en Arabe Centrale*). In his book he describes how he and K. Rychmans and J. Rychmans - stayed in the Al-Ukhdud for about 4-5 days, conducting studies among the piles of rubble of the ancient city, and found around 20 carved inscriptions and the drawings of a snake, a man's hand and a horse skeleton (Al-Ansary and Al-Mareeh, 2007 :46-48).

In 1976 the Comprehensive Archaeological Survey Programme was initiated for Saudi Arabia (Adams et al., 1977). The north and south regions of Saudi Arabia had been surveyed and this was illuminated by parallel or similar data from Jordan and Yemen (Kennedy and Bishop, 2011). However, Jordan provided fascinating data from the Basalt Desert of the panhandle Harrat ash-Sham; and there are stone-built structures in the Hadramaut reminiscent of one type in the Jordanian harra (Kennedy and Bishop, 2011). Further down the west coast of Saudi Arabia there are several lava or harrat landscapes, some of which included stone-built structures similar to those in Jordan (Zarins et al., 1979, Gilmore et al., 1982, Kennedy and Bishop, 2011).

2.10 The Archaeology of the Najran Region and Surrounding Areas

The Najran region has archaeology dating from several ages; the Palaeolithic, Neolithic, and Islamic periods.

2.10.1 The Palaeolithic Period

The Najran region is one of the locations in the Arabian Peninsula that was settled by humans since the early Palaeolithic, according to the second preliminary report on the southwestern province derived from the comprehensive archaeological survey programme on the provinces of Saudi Arabia by Zarins et al., (1981).

During the Palaeolithic period, human were dependent on hunting wild animals for food, while also gathering wild fruits using primitive stone implements (Alansary and Almareeh, 2007).

This period is divided into the lower Palaeolithic, the middle Palaeolithic and the upper Palaeolithic periods.

- **The Lower Palaeolithic**

This period is divided to three parts, which are the lower-Acheulean, the middle Acheulean and the upper Acheulean.

A) - The Lower-Acheulean or the Oldowan Industry

During the 1980 season a series of quartzite pebble and stone tools were found that probably date to approximately (1.8-1.2) million years ago. These implements were in a site known as Shuaib Dhdha, "a small subsidiary wadi of Wadi Najran" west of Najran (Zarins et al., 1981). These implements included scrapers, primitive bifacial instruments, blades and hammer stones (Alansary and Almareeh, 2007).

B) - The Acheulean

The Acheulean period is specified as approximately (300,000-100, 000) years ago. This age is divided into three periods: Early Acheulean, Middle Acheulean and Late Acheulean (Petraglia, 2003).

- **The Early Acheulean**

The materials of this period are not widely known and described and their presence in Saudi Arabia is tenuous at best (Zarins et al., 1981).The material found at the northwest fringes of the Al-Rub Al-Khali (Empty Quarter) indicates the Lower Acheulean based on the recovery of cordiform, ovate hand axes and limandes (Zarins et al., 1981, Petraglia, 2003).

- **The Middle Acheulean**

The tools in this period are characteristic of the Upper Acheulean on the basis of the defined pattern of biface, presence of definitive tool types, and the use of the hard vs. soft hammer (Zarins et al., 1981). There is a location which belongs to this age is Bir Hima. The materials on this site are lanceolate and trihedral bifaces, polyhedrons, spheroids, trihedral picks, choppers and bifacial knives, all flaked by a hard hammer (Zarins et al., 1981).

- **The Late Acheulean**

In this period it was noted that the tools were different from those in the periods of the Early Acheulean and Middle Acheulean. The tools of this period were found in the Bir Hima location, and the site was located in jebel embayments amongst a scattering of natural ferruginous quartzite (Zarins et al., 1981). Additionally, at the south of Bir Hima, extra Middle/Late Acheulean sites, mostly smaller handaxes with an ovate, cordiform or other specific shape, all shaped by a soft hammer (Zarins et al., 1981).

The Middle Palaeolithic (The Mousterian)

The Mousterian period is specified as approximately 100,000-11,500 years ago. The tools in this period were characterised on the basis of the Levallois technique, with smaller, more efficient blades and flake production, and the presence of disc and tortoise cores. A location which refers to this period was found on a low-lying terrace overlooking Wadi Hima. This contains rhyolite tools from a dense scattering among the natural materials (Zarins et al., 1981:17). The raw materials were found in the quarry only 1/2 km from the source, which was upstream in a high and massive exposure of rhyolite. The assemblage included flake choppers, massive blades, Levallois flakes, convergent scrapers, end scrapers, disc cores, and retouched flakes form a large and impressive repertoire (Zarins et al., 1981:17). The material collected totalled 257 pieces and the Levallois technique used in this location is 13.2% of the total (Zarins et al., 1981:17).

- **The Upper Paleolithic**

The previous surveys within Najran have been reluctant to deal with the material tentatively assigned to this period. In the site which called Bir Hima there were some materials attributed tentatively to the Upper Paleolithic, but that is not enough. Due to the dominance of Mousterian materials with fresh patina it seems they maybe younger (Zarins et al., 1981). In the 1979 season, similar pieces were found in selected locations and attributed potentially to this period of the Upper Paleolithic. These pieces contain re-knapped, bi-ended, steep and scrapers, flakes and blades (Zarins et al., 1980, Zarins et al., 1981).

2.10.2 The Neolithic and Chalcolithic

The Neolithic and Chalcolithic period was specified as approximately 11,500 – 3200 years ago. In this period the people achieved the first steps towards stability through animal husbandry and husbandry of some plants in addition to the mastery of industrial tools of different forms (Alamri et al., 2003, Al-Khathami, 2007). In this period people started a gradual transformation from a life of hunting wild animals and gathering to the life of herding , agriculture and increased sophistication of housing and food (Alamri et al., 2003, Al-Khathami, 2007). There is also an indicator of the initiation of production for making artefacts tools in this period (Alamri et al., 2003).

New phases of human life appeared, especially after the agricultural and pastoral revolutions that had a significant role in changing lifestyle of the population. Domestication had profound societal impacts on with the appearance of shepherds who represent the first nucleus of the communities in the region (Alamri et al., 2003). In this period we see the agriculture stabilise and cooperation among people, which led to increased production and the appearance of crafts and then to commerce. These factors were prerequisites for the emergence of cities (Alamri et al., 2003)

Sites that belong to this period, included Abar Kutmah, Almondafin, Janoub Al-Madbatihat, Jaladah, Eriqalber, Sharurah, Al-Duraib and Abar Hima (Zarins et al., 1981, Christopher, 1982). Also Neolithic tools were found in the Empty Quarter as mentioned by (Zarins et al., 1981:20) which include the: 'presence of stemmed bifacial points, rhomboidal points, foliates, lanceolates, bifaces, various types of scrapers, blades, drills, retouched flakes, burins, ground stone axes, choppers, discs, ground stone industry, principally made on sandstone, consists of circular types, rectangular types and some tools made from steatite and obsidian. Also found in this location was Ostrich shell and fresh water shell'.

2.10.3 The Bronze Age

The Bronze Age is specified as approximately 3200 - 1300 B.C. In this period there are a lunate pommel daggers which are very common in the rock art across the Arabian peninsula (Jebel Qara extend from Najran to Yemen, and Jol statue-menhirs in Yemen) and in Mesopotamia and Egypt, suggesting a time line of use for over a millennium from 2500 to 1500 BC. They are clearly Bronze Age weapons (Newton and Zarins, 2000: 161). In addition, Bir Hima rock art includes people depicted using distinctive metal weapons which probably represents the nomadic groups found throughout desert Arabia in the Bronze age who are contemporary with the Bronze period populations in Yemen using the same weapons (Newton and Zarins, 2000). The rock at Jebel Kowkab contains individuals depicted using such daggers (Newton and Zarins, 2000). However, the main animals represented on the rock panels are wild camels being hunted by horse riders see Figure 2.4, (Khan, 2013).

Furthermore, there were female statuettes found in Al-Ukhdud belong to this period (Al-mazroo, 2001).

Figure 2.4 Wild camels perhaps hunted by horse riders, Najran (Khan, 2013)

At the beginning of the second millennium BC the depiction of camel herders in the south of the Arabian Peninsula was concurrent with formation of human societies in the region. Shepherds were the major reason for trade routes wild activity and the emergence of a number of commercial cities in the south, centre and north of the Arabian Peninsula, due the nomadic herders having navigate over long distances (Alamri et al., 2003, Al-Khathami, 2007). But, the animals or cattle gradually disappeared in this period while cattle brands became camel brands, and that indicated to climate extremely hot and arid in the Bronze Age, contrast to the climate in the Neolithic period, which was cold and humid (Khan, 2013).

This region was prosperous at the end of the second millennium BC. Najran was one of the leading commercial cities in the south of the Arabian Peninsula in this period with abundant water and fertile soils, in addition to its strategic location, all of which increased its importance. Najran became a central point of contact between the north and south of the Arabian Peninsula from the first millennium BC until the beginning of the Islamic period (Alamri et al., 2003, Al-Khathami, 2007).

2.10.4 The Iron Age

The Iron Age is specified as approximately 1300 - 330 BC. The ^{14}C dates on the early human settlement of the central walled area of the Al-Ukhdud probably date to the mid to early first millennium BC (Zarins et al., 1983). In addition, Al-Ukhdud pottery dating back to the mid-first century BC or the late first quarter of the first millennium BC till the Islamic period (Basonbal, 2010) confirmed early human settlement of the central Al-Ukhdud. The surface finds of ceramic pieces from Bir Hima and Al-Ukadud belong to those wares which were similar to wares found in Al-Faw site (Zarins et al., 1979, Zarins et al., 1981, Zarins et al., 1983).

The ceramic pieces at archaeological sites are classified according to their form, size, levigation (purity and fineness of clay), temper and decoration into nine types, but at these sites seven are reported by Zarins et al. (1983: 28–29; see Table 2.1).

Table 2.1: Types of ceramics belonging to the Iron Age, as found in Najran region.

Ceramic category	Descriptive
Type 1	This kind composed of large jars and bowls with crude levigation and chaff temper. The bases in this type include full and slight rings as well as double ring. Rim types include straight, lipped, everted, and inverted. Body thickness is usually greater than 1.5 cm.
Type 2 (A)	This type is a finer levigated version of type 1.
Type 3 (B)	This pattern includes medium to smaller type jars with crude levigation and chaff temper. The bases in this type include full and slight rings, as well as straight, lipped, everted rims are characteristic. Body thickness is usually 1 - 1.5 cm.
Type 4	This type is a finer levigated version of type 3.
Type 5	This Type includes medium to small bowls with crude levigation and chaff temper. The bases in this type are including full and slight ring types. The majority of rims are straight with several examples of lipped, slightly everted and inverted rims being present. The body thickness is less than 1 cm.
Type 6	This type is a finer levigated version of type 5.
Type 7	This type includes medium to small flat-based vessels with better chaff temper and levigation.

The ^{14}C dates from Wadi Rimah (about 120 kilometers northeast of the city of Riyadh) in stratified context suggest a range of 1300 B C to 635 BC. The ceramic material is fairly homogeneous with the material reflecting the A - B Types (Al-Faw wares). In addition to the types of ceramic material in the above there is a Type 8 (Type K) in Al-Ukhdud site, which is distinctive as coarse, sand-tempered

wares together with a number of unique features including rim and basal configurations. This pattern is essentially Ethiopic in origin and found at a small number in South Arabia sites such as Najran (Zarins et al., 1983). However, in Najran a significant percentage of this ware occurs at the dam and near the traditional house of southern Arabian type near the dam; likewise, in Hadhramaut a complete vessel that is indicated to pre-fifth century BC (Zarins et al., 1983).

2.10.5 The Roman Period

The Roman period is specified as approximately 330 BC- 240 AD. At the Al-Ukhdud site was found the head of lion, which is made of bronze with a separate paw, which showed is three claws.In addition thre were bronze plinth inscriptions which dated to Roman period see Fig. 2.5, (Smith, 1937).

Figure 2.5: Bronze lion head and bronze plinth inscriptions, Najran, Al-Ukhdud site (Smith, 1937)

Furthermore, in Najran a ceramics have been found which include buff ware together with a simple green glaze ware, which is the South Arabic corpus from the Hellenistic period. Away, from the central walled area (Al-Ukhdud) one piece was found of highly weathered ware suggesting a

Nabatean pottery (Zarins et al., 1983). Moreover, a piece of imitation Greco ware was found in the northeast square of the Al-Ukadud. Also, in the same site three sherds appeared to be imitation Roman red wares or late Roman ribbed wares (Zarins et al., 1983). In addition objects made of marble found in the Al-Ukadud are similar to those found in al-Far'a fort in the northwestern region and dated late Roman Period (al Zahrani et al., 2001).

2.10.6 The Byzantine/Sassanid Period

This period is specified as approximately 240 – 622 AD. In Najran there was a continuous occupational sequence which can be seen in a pottery corpus in this period. The pottery corpus including Byzantine reflects a basic continuation of South Arabia patterns with the gradual introduction of new elements (Zarins et al., 1983). The first Byzantine period utensils (classified F) found in Al-Ukhdud represents the basic types B and E of wares from the southern Arabian Peninsula with slight variations. The type F-wares consists 'low rim flat dishes, jars with deeply incised neck decoration, and tall vases'. Also, there is lid with a Byzantine Cross forked engraved in it, which clearly demonstrates the pottery corpus belonging to this period (Zarins et al., 1983:33). While, some may attribute such crosses in ceramic materials to Late Roman period, which returns to the fifth and sixth centuries AD (Zarins et al., 1983).

In the Oman citadel there is a pottery with high-angle rims probable identical with type F wares (Zarins et al., 1983: 33).

Furthermore, we can distinguish the ceramic type of the Byzantine period by another type which could be called M-wares. This type of pottery has a gradually colour from red to brown, chaff-tempered, and wheel-made; as well this type has a unique feature which is the bases with small tapered legs connected with the body (Zarins et al., 1983). Also, it can be characterized by virtue of its cut-out, incised decoration which contains of several geometric shapes (Zarins et al., 1981, Zarins et al., 1983).

In the northeast part of the Al-Ukhdud site at least five sherds were found in 1982 AD, of M-wares form the Byzantine period (Zarins et al., 1981, Zarins et al., 1983, al Zahrani et al., 2001).

Moreover, there are other types of the wares which can be called type N, P, and H. Type N-wares very similar to the type M with disparate in levigation, seem finer and low cruder in shape and a buff slip is common in these wares and one example found in Al-Ukhdud included a cross motif (Zarins et al., 1983: 33). While, type P-wares are wheel-made smoothly levigated, with varied shapes of the necks and actual bases from quite high to very low. Also, the exterior colour is a buff. Occasionally, a goblet cup exterior decorated by incised wavy lines has been found (Zarins et al., 1983: 33). The final

type H wares which clarify a separate category for handles without ledges or lugs (Zarins et al., 1983: 33).

2.10.7 The Islamic Period

This period started in 622 AD (1 AH). The settlement remains in this period can be divided into three divisions: The Umayyad period, The Abbasid period, and The Post- Abbasid Period.

In the Najran area, during the early Islamic period until at least the 9th century AD (3rd century AH), although it was a reduced settlement, it was thriving. There is pottery from the outer town of Al-Ukhdud which contains blue glazes with moulded relief attributable to which period is the 9th century AD (3rd century AH) (Zarins et al., 1981:32). Gold glazes and the pale white of the Ummayad period are succeeded by an abundance of Abbasid blue glazes and splash wares in the 13th century AD (7th century AH). No materials of late period have been recognised in the Najran area. For the Ottoman period, extensive remains were found in the countryside, along the Red Sea coast, characterised by the use of thin, fired bricks alternating with local stone and lava blocks, in addition to many sites using barrel vaults, rounded, tapered towers with ventilation shafts and relieving arches (Zarins et al., 1981:32-33). In terms of the quality of the material used sites have been identified by the presence of "celadon, glass bottles, European imports (principally English and Dutch china plates and cups), clay pipes, glass bracelets, a distinctive red ware with a fabric-impressed body and punctuated rim design, hand-painted coffee cups, a buff ware with a cream slip and orange and purple painted designs, steatite, and green-glazed vessels" (Zarins et al., 1981:33). Material remains and local building styles related to the last 300 years were noted. In Najran, especially in the Neshmi castle, the former governor's residence and administrative centre, the distinctive decorative elements and use of mud brick were noted (Zarins et al., 1981:33).

Radiocarbon dating ^{14}C confirmed the later occupation of the Al-Ukhdud site during the Islamic period from the presence of glazed blue and splash wares related to the Abbasid period (Zarins et al., 1981:25). Also at this site were the ruins of a mosque built by Umar ibn Al-Khattab (Alamri et al., 2003, Basonbal, 2010), in the period of Caliph Umar from 633 to 644 AD (13 to 23 AH).

- **The Umayyad period**

This period was specified as approximately 662-750 AD (41-132 AH). The early Islamic shapes and utensils continued largely from an earlier Sassanian period (Byzantine and Ethiopic) (Zarins et al, 1983: 34). The potteries and wares of Umayyad period are characterized by buff-slipped, red design or dark-slipped and white-paint utensils. These distinctive wares could be similar to those painted

wares found in Najran. In addition, they are recorded in Oman citadel and elsewhere such as Heshbon and Qasr Hallabat (Zarins et al, 1983: 34). However, the Umayyad period has two pottery types U and V wares. Type U ware is similar to the type F ware of the Byzantine period but in here characterised by incised wavy lines and combing; and it has a white slip over which red/ purple paint filling the incision of the design. Whilst, type V ware is distinctive with thick white painted interior slip on bowls and sometimes yellow paint; or the slip is slightly glazed (Zarins et al, 1983: 34). The Umayyad period was follow by the basic Byzantine traditions with the continuation of types are F, M and N wares; in addition to U and V wares that are led to the emergence of classical Islamic glazes (Zarins et al, 1983: 34).

- **The Abbasid Period**

The Abbasid period is specified as approximately 750-1100 AD (132-493 AH). This period includes distinctive glassware; but it is distinct and separate from the Hellenistic glazes (Zarins et al., 1983). However, in Najran there is a type of wares which called J is one of the dominant categories in the Abbasid pottery which is characterized by the fundamental alkaline, monochrome blue/ green glaze and the ^{14}C dated to 785 AD, and this category has numerous parallels, such as at Darb Zubayda and elsewhere (Zarins et al., 1983). In addition, there is another type R of pottery which is common in Najran and more widely in the northeast section, Darb Zubaida and elsewhere. This type has splashed -ware which utilizes as a tin glaze of various colours (yellow, green, and brown) and these glazes are streaked and mottled over a buff body (Zarins et al., 1983). Moreover, there are another type of Q-wares in Najran, and these are a typical feature of in this period and which include the under incised and glassed sgraffiato (decoration produced by scratching onto surface of pottery) (Zarins et al., 1983). The final type (S) which wares are represents lustre ware forms, and this lustre ware bowl has a fine white glaze and gold lettering or designs (Zarins et al, 1983: 34-35). Furthermore, in the Al-Ukhdud site pottery of decorated glazed sherds in green and white colours which are similar to those in the site of Athar and Al-Mabiyat site (Al-Ula) are attributed to Abbasid period (al Zahrani et al., 2001: 21).

- **The Post- Abbasid Period**

This period is post 1100 AD (493 AH) or medieval Islamic period. In Najran there have been found numerous ceramic pieces probably attributable to this period such as green glazed sherds with incised triangles and wavy lines parallels as found in Bahrain (Zarins et al, 1983). In addition sherds of pottery similar to that found in the comprehensive survey of 1980 in Asir region and Tihama coastal sites, often associated with Ottoman products are characterised by buff body with orange

slip and purple paint designed on the sides and the neck (Zarins et al, 1981:33; Zarins et al, 1983:35). Similar sherds have been found from Palestine and Jorden (Zarins et al, 1983:35).

Furthermore, in Najran a number of porcelain pieces have been found of plain white and blue/white which belong to medieval Islamic period probably in the 15-18th century AD (802- 1111 AH)(Zarins et al, 1983:35).

2.11 Rock Art

A large number of locations have been recorded and documented that feature rock drawings, such as animals, humans, plants, markings of tribes, in addition to the inscriptions in the Thamudic, Musnad and Kufic alphabets see table 2.2 (Alamri et al., 2003). These depictions date back to Neolithic period (10,000 - 3,200 BC) and characterise an era when there were many developments of tool use population, stability, production, housing construction and making of pottery and stone tools. Whilst, some of these depictions may be due to the latter part of the Palaeolithic (50,000 - 10,000 BC) (Alamri et al., 2003). There are also a number of engravings accompanied by writings (Thamudic, Musnad) belonging to the subsequent period (the beginning of the first millennium BC even the Islamic period) and representing the Islamic era through Kufic writings with the disappearance of animal and human drawings to some extent (Alamri et al., 2003). In the Najran region, writing and ancient inscriptions consist only of writings and inscriptions carved on rock. Some of these are known as Thamud alphabets and others as Musnad alphabets (Arabic calligraphy southern old); in addition to a large number of marks and rock drawings and some early Islamic Kufic writings and very few writings with Nabatean calligraphy; often some rocks have all or some of these kinds of inscription (Alamri et al., 2003).

However, Zarins et al. (1981:34-36) noted four main periods of rock art, recognised during the study of the South-Western province of the Saudi Kingdom, which are:

A) - Early Hunters Period (Early Holocene)

B) - Hunting and Pastoral (Neolithic - late second millennium BC)

C) - Literate (Late second millennium BC - 7th century AD)

D) - Islamic (After Hijra, 622 AD - present)

The Early Hunters style has been previously recognised in the Arabian peninsula in the Northern, Central and Western regions and suggested in later time that this style represent the post-Pleistocene hunting and gathering by the indigenous population in the western half of Arabia and is

assignable to an early Holocene moist phase within the Peninsula (Zarins et al., 1981). This style has been described in as 'Heavy, Engraved Outline' and it is used on a large scale plan incorporating such animals as ibex, gazelle and oryx (Zarins et al., 1981). In the Bir Hima area, there are a large number of figures depicting long-horn bovids in a distinctive profile, fat-tailed sheep and almost life-size representations of human, dated ca. 5000-2500 BC which could be assigned to this period (Zarins et al., 1981). In this area Bos/primigenius was not domesticated, with Bos only hunted in its wild form; the dog was the only animal that had been domesticated (Zarins et al., 1981, al Saud et al., 1999).

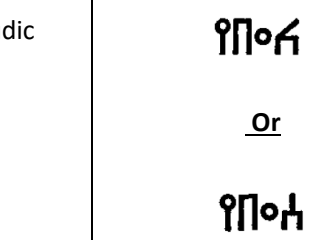
The hunting and pastoral style depicted in Bir Hima is generally men standing in formal poses with what appear to be moustaches, beards and neck ornaments including necklaces, torques and in several cases anklets (Zarins et al., 1981). In addition to wearing headdress of some type with decoration, some have only single elaborate projection, but body dress is restricted to short loin cloth, and several men are shown holding a small shield and spears and another wearing a pommeled dagger in the belt waist (Zarins et al., 1981).

This location contains numerous hunting aspects of the depicted art such as the short-horned bovids, camel, oryx, fat-tailed sheep and gazelle; other animals are shown, but not depicted struck by spears. These include the ibex and ostrich (Zarins et al., 1981). During this period the camel was present in the Arabian Peninsula but was not domesticated, only hunted; in addition to that mentioned, the men appear in rarer cases to be fighting each other and a bird appears in one exceptional scene with out-stretched wings and is shown with intricate body work (Zarins et al., 1981)

The Literate period is described as “comprised of rock art styles associated with the formal writing of south Arabia and Thamudic scripts” (Zarins et al., 1981). Only experts in palaeograph and pre-Islamic Arabic scripts can readily distinguish between such scripts as Thamudic, Safaitic, Lihyanite, Dedanite and others (Zarins et al., 1981). Thamudic is a script that was originally known in Najd, Hejaz, Tabuk and is now known as Taima script; so that used by bedouin tribes in Northern Arabia, and some of this script has been found as graffiti in South Arabia, for example in the Bir Hima area, “a profusion of artistic material accompanies the written graffiti. At a number of locales are found depictions of women which the local Badw called Alia” (Zarins et al., 1981).

The Islamic period, is contains of rock art styles a number of Kufic inscriptions were recorded, such as in the Birhima area. Also, in this period rock art depictions of hunting ostrich, smaller-scale battle scenes, and horse and camel riders wielding long spears were found (Zarins et al., 1981, Alamri et al., 2003).

Table 2.2: Types of Inscriptions, such as Thamudic, Musnad, Kufic (Adams et al., 1977, Philby and Tritton, 1944) Al-Said, 2004).

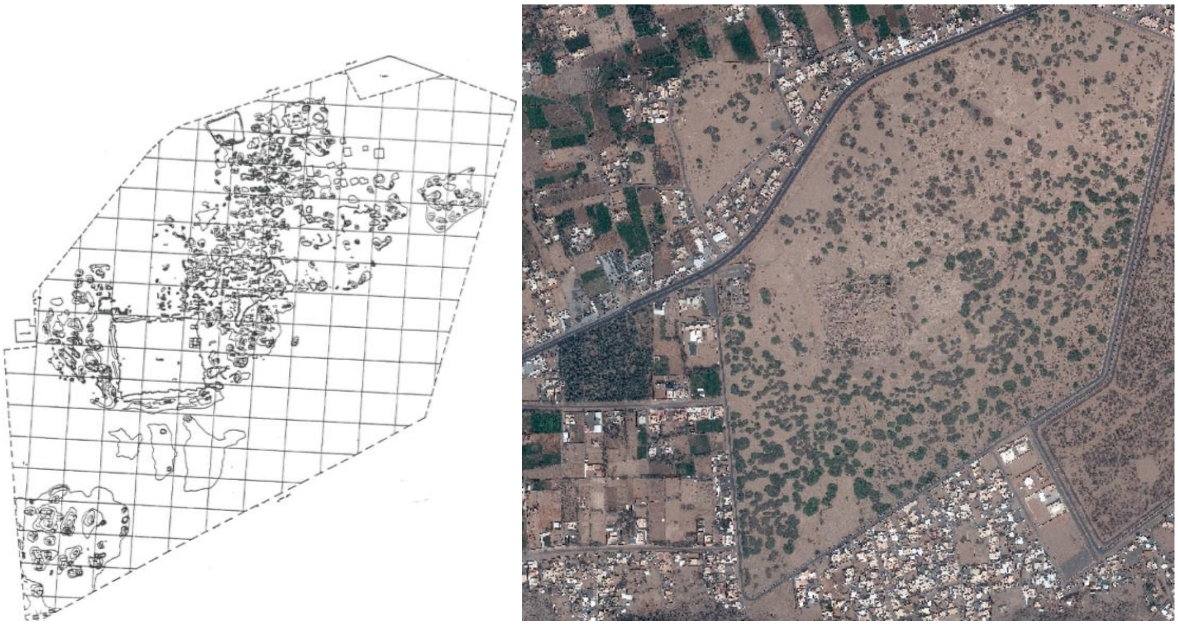
Script	Example	Translation	Est. Dates
Thamudic		S'BY is a person name in Thamud	Perhaps between Bronze period to Iron age or the early of Roman period
Musnad		Tawq bin al-Haytam is a person name	ninth century AD
Kufic	غفر الله لطوق بن الهيثم امين	May Allah forgive Tawq bin a Al-Haytham Amen	ninth century AD

2.12 The archaeological sites in Najran region

In Najran region there are many archaeological sites revealing settlement in past ages. These include the following sites:

2.12.1 The Old Najran City (Al-Ukhdud)

This site Located on the banks of the southern Najran Valley with a perimeter of around 1300 m x 1100 m, (Figure 2.6.a and figure 2.6.b) has been surrounded by walls since 1985 after it was been vandalised by people who used the tractors to remove the building stones and soil to use in the construction of their houses and erecting bank around their farms (Al-Zahrani, 2002).



(A) (B)

Figure 2.6.a A General Plan of the Al-Ukhdud site (Al-Zahrani, 2001). Figure 2.6.b An Image of Al-Ukhdud site (Source: Institute of Space, King Abdulaziz City for Science and Technology)

However, this location was one of the sites that were located at the crossroads of ancient trade from south, north and north east of Arabia (Al-Subail et al., 2005). Confirm of that as mentioned by Zarins et al., (1983:36) 'Najran was an importan focal point of the spice trade because of occurrence of the term WD'B *(وضب أو ودأب)* on formal buildings. (Doe, 1979) maintains that the term was used to denote major handling posts of the incense, specifically in association with Manaean activities (Yemen history of Ma'in). Thus, the term WD'B occurs no less than eight times at Ukhdud, far more than at any other recorded site'.

The current Arabic name of the ancient location, al-Ukhdud (the trench), is derived from the Quran (Sura 85) epithet applied to the city in connection with the Christian martyrdom suffered under the Yamani king Dhu Nuwas in 523 AD (Zarins et al., 1981:23).

Transliteration:

'Qutila as-habu alukhdood, Annari thati alwaqood, Ith hum AAalayha quAAood, Wahum AAala ma yafAAaloona bilmu/mineenashuhood'. (Quran, Sura 85).

'Woe to the makers of the pit of fire, fire supplied abundantly with fuel. Behold, they set over against the (fire) and they witness all that they were doing against the Believers' (Quran, Sura 85, vv.4- Yusuf Ali translation)

But, in the site is no building or structure has been found that can be linked to the church or the place associated with the burning of the Christians by King Yosif Assar Yathar (Ryckmans, 1981).

Anyway, there are some sites in Al-Ukhdud area as follows:

A- Castle:

This site is slightly irregular and rectangular in shape about $235\mathrm{m}^2$, and it is surrounding by formal walls recognised to be as the largely classic style in South Arabia. In addition to, this site includes a large number of the remains of building which were destroyed (Zarins et al., 1983). The height of the outer wall is more than 3.5 meters around eight courses of stones in some part of the northern wall see figure 2.7; whilst in the south wall has about five courses of stones that are still above the ground (Ryckmans, 1981:56). This site has a domed structure probably have been a Christian church or earlier pagan temple (Zarins et al., 1983: 23). Despite this no inscriptions referring to the spread of Judaism and Christianity in Najran have been found.

Figure 2.7: The castle in Al-Ukhdud site (Fieldwork 2014)

However, as reported by Zarins et al., (1983: 23) Philby, 1952 described the central walled area as a 'castel' which covering around twelve acres with buildings visible; and in the neighbourhood of the ancient city there is evidences of canals and artificial lakes or a reservoir. This area has been confined by a ditch with water emanating from the river upstream, and then draining back into it below the city. In addition, this location has about thirty quadrangular units built in well-trimmed stone blocks in regular horizontal courses (Ryckmans, 1981: 58). As well as, in this area are flat circular mill-stones (Figure 2.8) and two or more vertical oil presses (Zarins et al., 1983). This maybe the ancient market area in Nagran (Al-Utaibi, 2007).

Figure 2.8: A grinding stone from Al-Ukhdud (Fieldwork 2014)

B- Western area

This area is located approximately 200 m, west of the Castle and is of very low elevation. The area ends in a mysterious scatter of dense ceramic material (possibly pottery production) which continues until we reach the new city (Zarins et al., 1983: 23).

C- The hill

This hill is located to the west of the castle wall; and the fence surrounding this hill contains traces of architectural buildings. Behind this hill from the West might have been a moat surrounding the city but not extending completely around it, and high on both sides of the trench parallel to the gate may be the bases of the bridge was erected in front of the gate (Ryckmans, 1981, Zarins et al., 1983).

D- The remnant of the cemetery

The graves of the cemetery are located at the south of castle, at a distance of 80 m. The graves are grouped together regularly in line forming rows of parallel lines and each grave is surrounded by a small stone rectangular in shape of approximately 3.5 x 2.5 m. Additionally, the surface of this cemetery contains a sampling of ceramics and that probably relate to the main use of the cemetery in the Byzantine period (Zarins et al., 1983: 24).

E- Dam

The dam is located in the south of Al-Ukhdud; which was used to divert Torrent water for irrigation. Near the dam a Himyarite inscription contains eight lines written in late Sabaean letters of the fifth - sixth century AD. (see Fig. 2.9) (Zarins et al., 1983: 25).

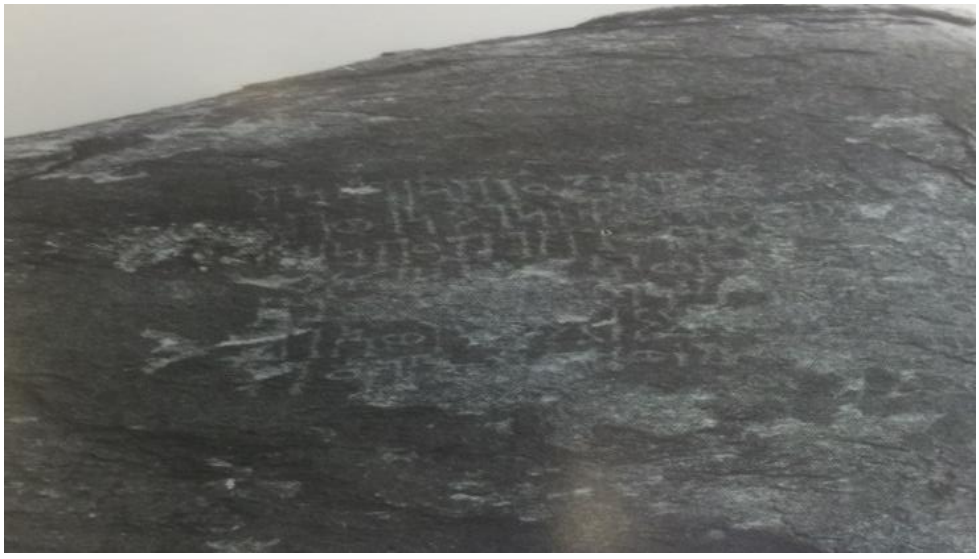


Figure 2.9: An inscription locate near the seil dam at the base of Jabel Sawada (Zarins et al., 1983).

A- Palace (Qasr)

on the northern side of the castle there are remains of a building that is perhaps the latest building in this location (Al-Utaibi, 2007) as shown in figure 2.10.

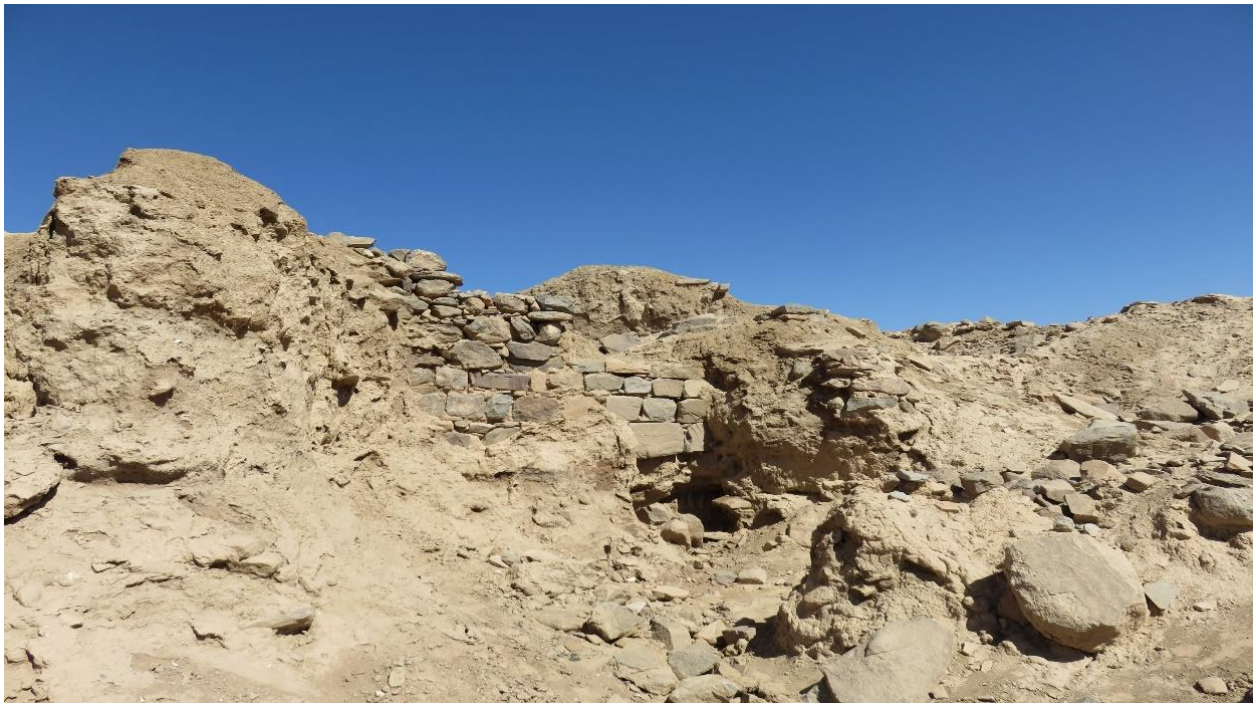


Figure 2.10: The remains of the place (Qasr) in Al-Ukhdud (Fieldwork 2014)

'The ancient Najran site was visited by Philby in 1936, but his report was not published until 1952. His report provides a description of this location, a number of photographs and sketch maps' (Ryckmans, 1981:55) as shown in figure 2.11.

Figure 2.11: Map of Al-Ukhdud site in 1936, published 1952 (Zarins et al., 1983).

'Philby-Ryckmans- Lippens revisited the Al-Ukhdud site in 1951 AD, but their plan has not been published only recently' see Fig. 2 12, (Ryckmans, 1981) whilst the comprehensive plan of this site was accurate, the interior details are approximate. This was a reason for the excavation in 1982 AD (Zarins et al., 1983).

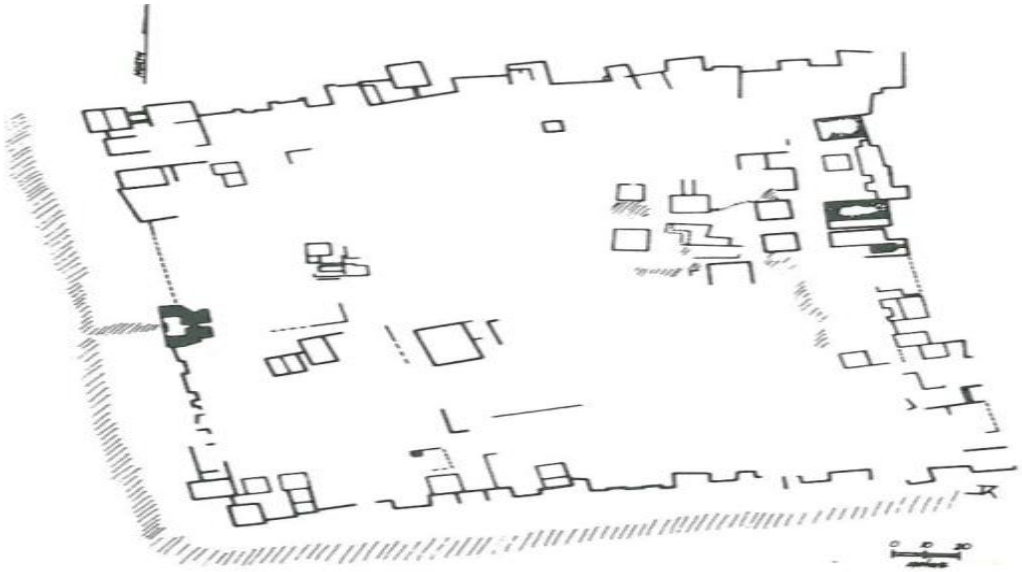


Figure 2.12: Map of the walled area of the Al-Ukhdud site, 1951 (Ryckmans, 1981)

In a modern study of the site in 1980, a team from the Deputy Ministry of Antiquities and Museums dug an experimental and small trench 2 X 2m, in the southeast corner of the main walled area of the Al-Ukhdud site see Fig. 2.13, (Zarins et al., 1981). However, over three meters of stratified material was excavated and divided into four levels, although sterile soil was not reached. A corbon-14 dating results from excavation a date from 535 BC to 235 AD. The later date (235 AD) for the upper levels of the excavation an earlier date (535 BC) was suggested for a level near the bottom of the excavation (Zarins et al., 1981:24).

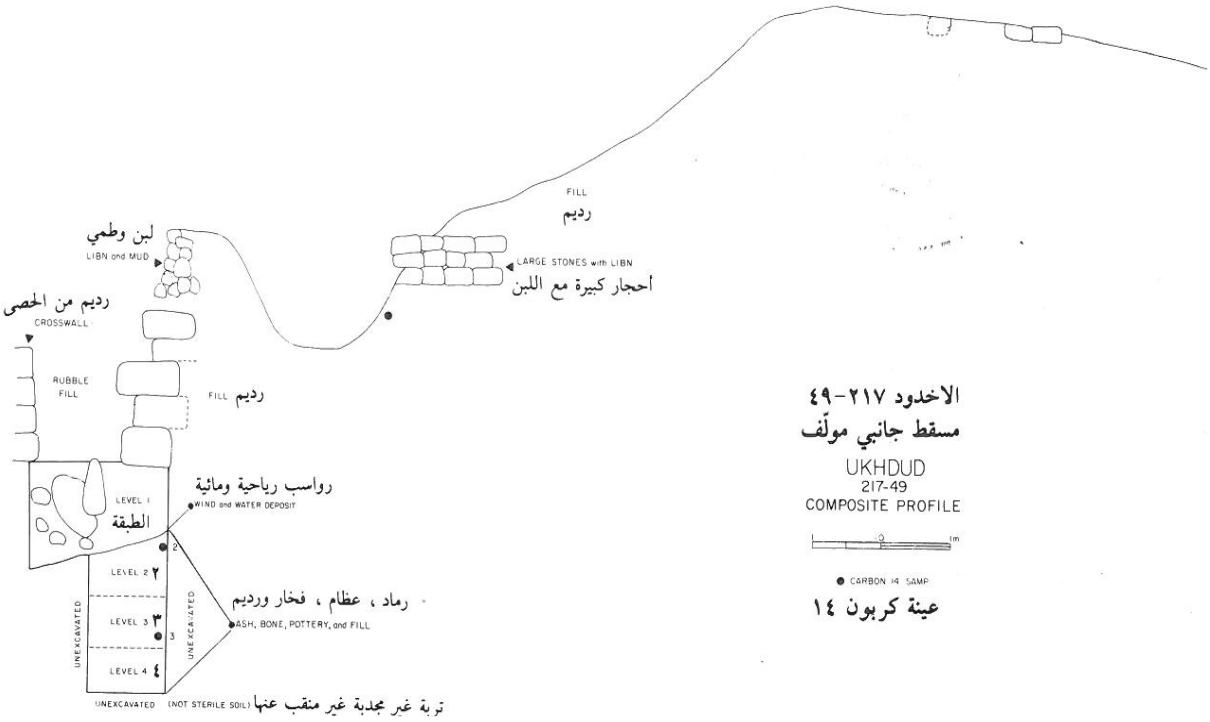


Figure 2.13: Composite profile of 2 x 2 m, excavation unit, 1980, in Al-Ukhdud site (Zarins et al., 1981)

In 1982, the excavation in the Al-Ukhdud was expanded to cover an area of 8 x 6m, after removing the surface ruins and uncovering sections of a staircase, stone walls, one complete room and three partial rooms (Figure 2.14 and 2.15). Three walls were also uncovered and two exterior foundational walls running in different directions (Zarins et al., 1983:28). The structures and excavation indicate at least three major phases of settlements (Zarins et al., 1983:28). In addition they found a numbers of ceramic pieces which based on decoration, size, levigation and temper; as well as three female figurines (Zarins et al., 1983: 30-31).

Architectural style in the south of the Arabian Peninsula is characterised by the construction of main exterior walls, which typically use a large, rectangular, coarse ashlar blocks with the joints of blocks filled by small cobblestones (Zarins et al., 1983:28). The human settlement at this site dates between the mid-first millennium BC (*Iron Period*) and the beginning of the Islamic era (*Abbasid period*) (c.500 BC - 800 A.D) (Zarins et al., 1983).

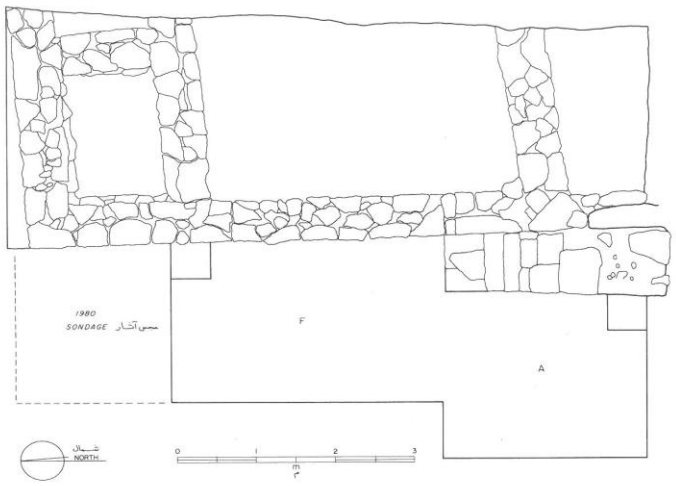


Figure 2.14: Excavation unit in the Al-Ukhdud area (Zarins et al., 1983)

Figure 2.15: General views after the Excavation 1982, inside the Al-Ukhdud site (Zarins et al., 1983)

In 1997, at the site of al-Ukhdud the team chose three locations for further excavations. First was at the south west of the castle, the second was inside the castle building (no.39 according to the previous excavation team 1982), and the third site was in the north of the castle (al Zahrani et al., 2001:13) An ancient of these excavations follows:

A- Excavation south west of the castle

The excavation was started by removed the surface debris, sand, mud and rocks. Through the excavation the wall appeared clearly and after that sand, animal bones, pottery sherds, and small pebbles (al Zahrani et al., 2001:14-15). The excavations revealed a building with unequal measurements, northern length 8.6m; western length 8.25m; southern length 9.3m; eastern length 8.0m long (al Zahrani et al., 2001: 15). The building had no evidence of the main entrance and it was comprised of six rooms; which four small rooms located in the east side of this area (south west of the castle), and in front of it on the other side are large rooms whereas in the middle is located a large courtyard extend from north to south which separates the rooms small, large (Figure 2.16). The walls of this building were built by irregular rocks; as well as their shapes not organized. In addition the walls inside this unit are less irregular than walls outside (al Zahrani et al., 2001:14-15).

Figure 2.16: Aerial photo of the site located south-west of the castle after the excavation (al Zahrani et al., 2001)

B- The Excavation of the building (unit) no.39

The work on this building was continued from the former work team in 1982, in an attempt to date the settlement in the northern part of the fort (al Zahrani et al., 2001). This site is located in the northern part inside the castle, overlooking from the southern side main road running from east to west. Between this building and the adjacent units are small passages. The excavation found animal bones, pottery sherds (25 cm), ash, charcoal, seeds of burnt dates and a unit of architectural almost rectangular in shape; the length of its northern and southern wall being 13.40 m, whereas the

western wall is 11.70 m, and eastern wall is 11.55 m (al Zahrani et al., 2001:16). Furthermore, it consists of two sets of identical rooms in the east and west separated by a corridor stretching from north to south (see Figure 2.17). The external walls were built with large stones with more attention and care, while the interior walls were built with small irregular stone with less care. In the middle of the room was found the remains of a large cylindrical stone that was perhaps used as the base of the pillar, and plaster traces appeared on the interior walls. (al Zahrani et al., 2001:16-17).

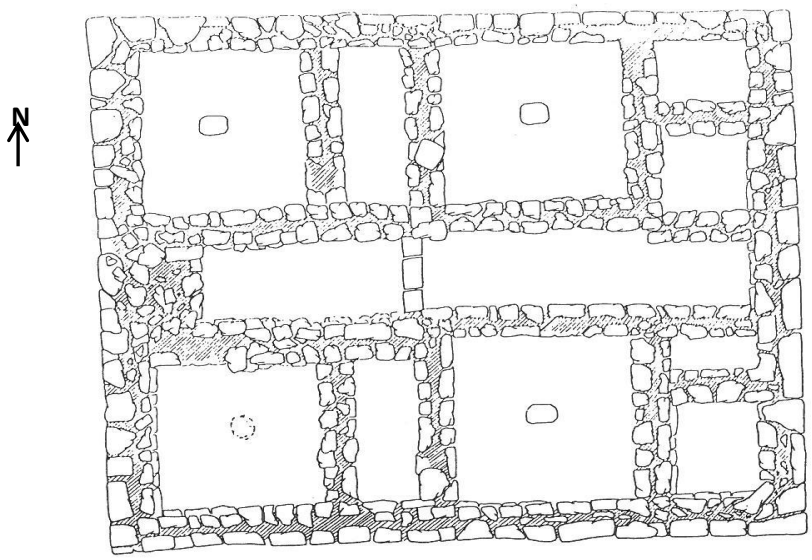


Figure 2.17: Unit no.39 after excavation (al Zahrani et al., 2001)

C- Excavation at the north of the castle

The excavation at this location was of a mound located at the north of fort of al-Ukhdud, with a network of 42 squares around the site, each consisted of 5m x 5m. This revealed the presence of pottery sherds, pieces of bones, burned soil, ash, charcoal varying in thickness (5 -15 cm), and a building (unit) (al Zahrani et al., 2001:17). However, the architectural unit found was built with well-arranged heavy stones and it had a stairway that appears in the south eastern corner (see Figure 2.18 and 2.19). Behind the stairway there were two small rooms attached to the south eastern part of the unit wall, as well another stairway with a direction to the southern corner that ended in platform of stone that has a Musnad inscription of a word like 'Daup' and some animal figures (camels or horse), that are likewise repeated on many walls of the building of the fort of Al-ukhdud (al Zahrani et al., 2001:17-18). Anyway, perhaps this room building was used as a place for religious activities and social gatherings. Also, the part of this building was used as a mosque in the early Islamic period with no mihrab (niche in a mosque), as was common in early Islamic mosque where

its longer part is oriented towards Makkah (Qibla or direction of the Muslims) (al Zahrani et al., 2001:18).

Figure 2.18: Excavation site located north of the castle the (al Zahrani et al., 2001)

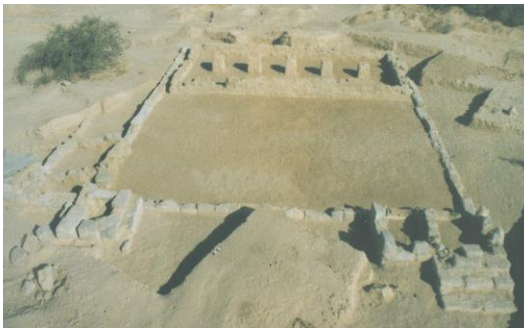


Figure 2.19: The site on the north-east side of castle after excavation (al Zahrani et al., 2001)

In addition to the above; archaeological objects have been found at the Al-Ukhdud site; which are similar to those found in Qarriyat al Faw (about 300 km from Najran). These include large Jars as well as the smaller jars decorated with green glazed are dated to between 500 BC and 200 AD (al Zahrani et al., 2001). Whereas the objects made of marble in the Al-Ukadud are similar to those found in the al-Far'a fort in the northwestern region and dated late Roman Period, the lids made of marble are similar to those from al-Faw (al Zahrani et al., 2001:20). Also, found at the Al-Ukhdud site were incense burners which are similar to those located at the Thaj site and dated approximately 300 BC to 300 AD, also found at al-Aflaj dated to the Hellenistic period; whilst at al-Faw they are dated 200 BC to 500 AD. The stone incense burners at Al-Ukhdud are similar to these in al-Faw in shape and some inscriptions engraved in Musnad mentioning some kind of perfume and is dated between 200 BC and 500 AD (al Zahrani et al., 2001:20). Furthermore, a clay figurines and pottery sherds similar to those from Thaj are dated to approximately between 300 BC and 300 AD. Also, pottery sherds found similar to those in al-Jubail are dated to between 200 BC and 200 AD. These pottery sherds are similar to type 7. This type of pattern contains a paste colour of impure orange or light brown, wavy edges or unusually have an extension of the body bent to the outside, and the burning carried out in a good way located at al-Faw and dated between 200 BC and 500 BC (al Zahrani et al., 2001).

The pottery sherds found during the excavation at the north of the fort, included type no.1 of the unglazed pottery and glazed sherds located during the first season in Al-Ukhdud in 1982 are attributed to the Byzantine period (Zarins et al., 1981:34 and al Zahrani et al., 2001:20). In addition, pottery of decorated glazed believed to green and white colours, similar to those at the site of Athar

in 1982, are believed to belong to the Abbasid period. These are similar to those found at the Al-Mabiyat site (Al-Ula) again attributed to Abbasid period (al Zahrani et al., 2001:21).

The results of the excavations suggest that the residents of the Al-Ukhdud practiced trade; as mentioned in the inscriptions concerning the trade of frankincense witch was prevalent at that time. In addition, some objects found indicate the residents of the Al-Ukhdud were involved in agriculture as well as trade. Also, the abundance and diversity of pottery sherds indicates that it was manufactured locally and there was a well-established pottery industry at that time (al Zahrani et al., 2001:21). In 2000, the team work of Deputy of Antiquities and Museums continued the excavation on the site of al-Ukhdud. There were three main purposes of the team during this season as listed below (Al-Zahrani, 2002: 13):

A- To implement a network or grid on the site and determines the location of key points to help implement future actions at the site.
B- To select some architectural units for excavation, these were units No. 42, and No. 44, these unit were selected on the basis of the outline which was prepared in 1982.
C- To register and document the finds out of the excavations onto drawings and photography

Therefore, the team selected two units which were no.42 and no.44 for excavation (Figure 2.20) and laid a grid onto two of squares of 5m x 5m each; and these joined units shared a common wall oriented from east toward of west**.** As was the case with building no.39 which was excavated in 1997 AD which was built with large and very large stones (Al-Zahrani, 2002:13-14). The interior area was composed of a number of different-sized rooms and their walls built with medium stones; but not very well shaped unlike the stone of the exterior walls (Al-Zahrani, 2002: 14).

Figure 2.20: General view of unit 42 and 44, at the end of excavation in Al-Ukhdud site (Al-Zahrani, 2002).

Moreover, as mentioned before, vandalism and unauthorised excavation it was hard to give more an accurate architectural plan of these two units. Furthermore, they are similar to the style of unit no.39; that was excavated 1997, with little different in the scheme of the houses and the distribution of the main units with the exception of some storage rooms and the wider northern wall than in unit no.42 (Al-Zahrani, 2002:14).

As reported by Al-Zahrani 2002: 15-16; the artifacts discovered in this year's excavations which were:

A- Pottery Jar. Pear shaped large jars probably used for storing grains.

B- Bowls. Pottery bowls of various size glazed with red colour (Figure 2.21)

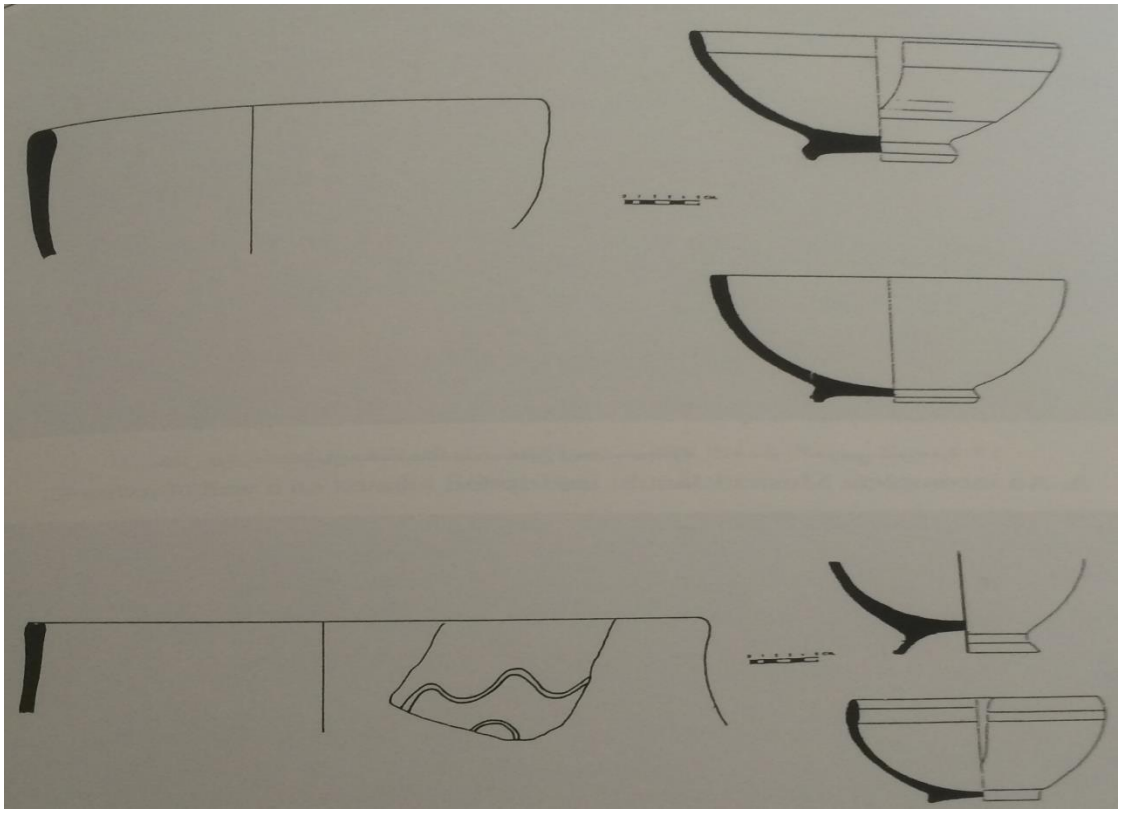


Figure 2.21: Medium sized bowls in (Right side), whilst the red painted bowls in the (left side) (Al-Zahrani, 2002)

C- **Pots with wavy edges**. Several pots with wavy rims in different size were found. And some of these were perhaps used a liquid filters, as in some; small holes are located under the rims and on the body. Also, some of these were decorated with small circular depiction on the body of the pots and sometime decorated forms inside (see Figures 22 and 23).

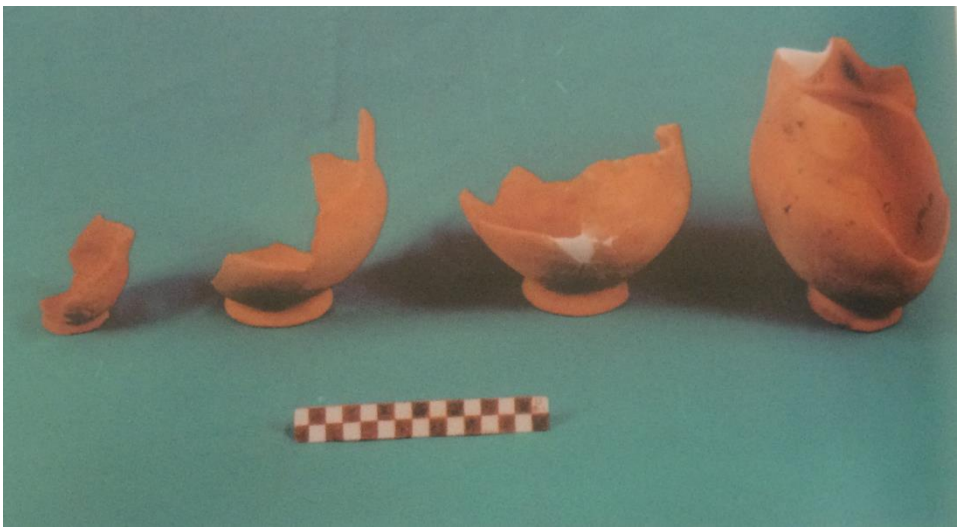


Figure 2.22: Pots with wavy rims (Al-Zahrani, 2002)

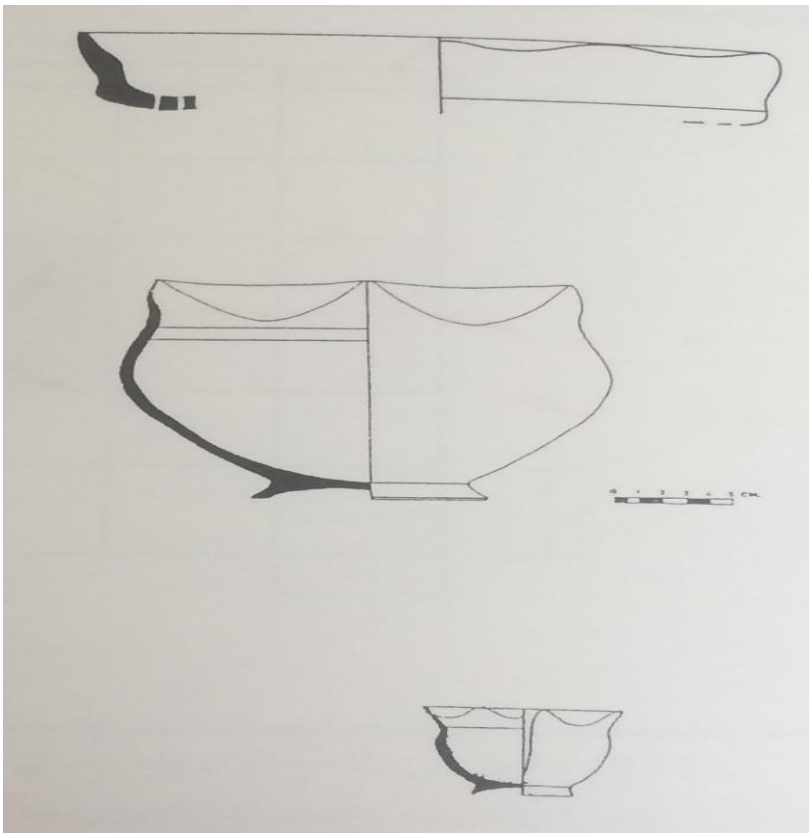


Figure 2.23: Samples of filter pots with wavy rims (Al-Zahrani, 2002)

D- Cooking pots. A number of them are found incomplete, while only are whole small pot was found. (see Fig. 2.24)

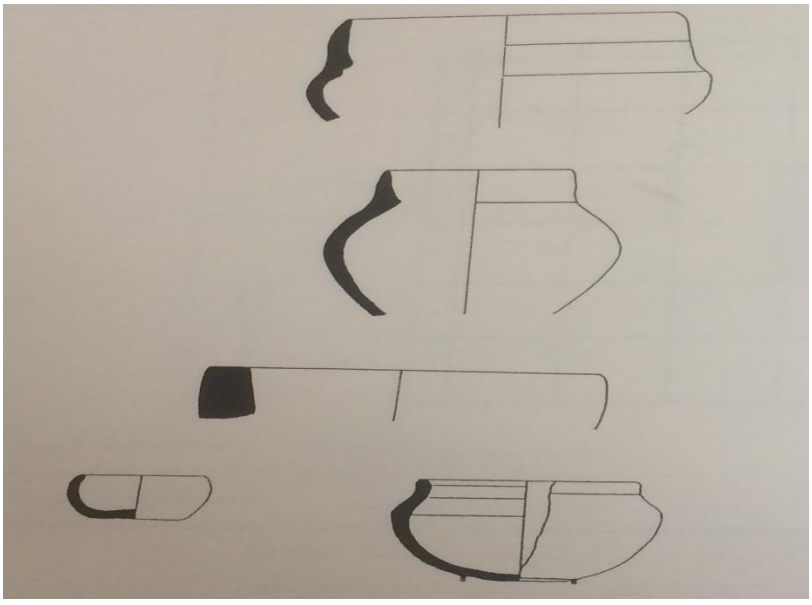


Figure 2.24: Samples of some bowls and cooking pots (Al-Zahrani, 2002)

E- **Pottery oven**. It was located exterior the residential units near the north-eastern wall. It is opened from two sides and has a diameter of 50cm, at the base and 37cm, at the top and the hight is 72cm. (see Fig 2.25)

Figure 2.25: Pottery ovens open on both sides, narrowing upward (Al-Zahrani, 2002).

F- **Decorated pots**. Several shards of medium sized pots which show decorations in green colours.

G- **Steatite pots**. There are a number of steatite pots found such as cooking pots, plates, and bowls some with handles and some repaired with bronze. Also, one has a Musnad inscription engraved inside a broken part of the steatite pot. (see Fig.2.26).

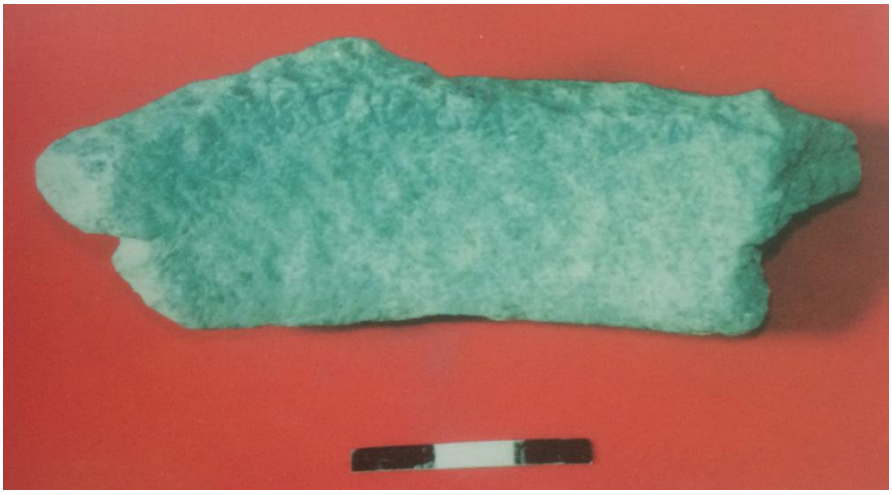


Figure 2.26: Part of steatite bowl with Musnad inscription engraved inside the body (Al-Zahrani, 2002)

H- Metals. Important metal used as handles used for the repairing of steatite bowls in addition to a part of knives or a dagger or lancer. Also, objects of silver about 9 cm were found (see Figures 2.27 and 2.28)

Figure 2.27: Part of a metal bowl and small metal (Al-Zahrani, 2002)

Figure 2.28: Silver bar (Al-Zahrani, 2002)

I- Coins. There were six metal coins found of circular shape, 1 to 2 cm, in diameter, but, the words and motifs are not readable (Figure 27).

Figure 2.29 Several bronze coins (Al-Zahrani, 2002)

J- **Beads**. Three beads of different size were found.

K- **Wooden objects**. Part of a wooden comb with decorated motifs was found.

L- **Glass**. Three pieces of the body of some glass pots were found of different shapes and colours.

M- **Incense burners**. There were three incense burners found on the site (see Fig. 2.30).

Figure 2.30: Square shaped incense burner (Al-Zahrani, 2002)

N- **Needles**. The needles found were of different size and shapes.

O- **Ostrich egg**. There were several pieces of ostrich eggshell found on the site.

P- **Grinding stone**. There were a number of grinding stone found in the room of unit no.42. They vary in diameter from 40 to 50 cm.

Q- Stone water reservoirs. There were two large sized stone water reservoirs found on the site (see Fig 2.31).

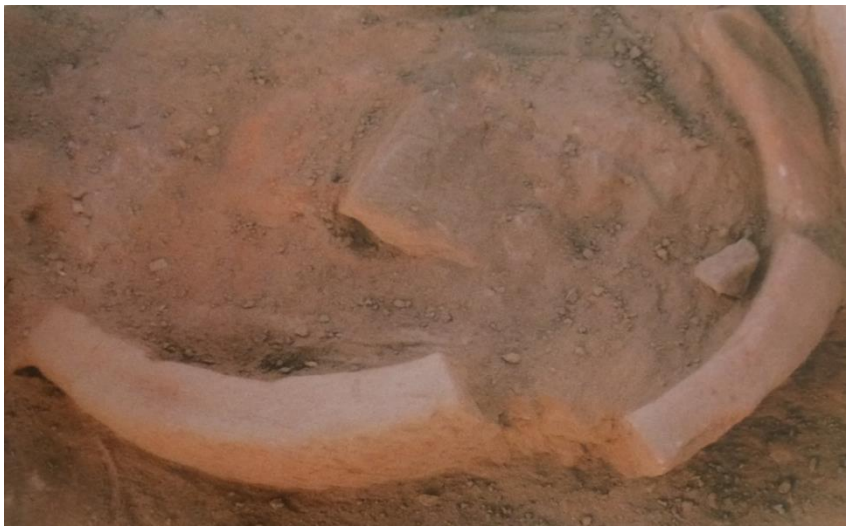


Figure 2.31: Stone water basin *in situ* located in one of the rooms of section 42 (Al-Zahrani, 2002)

R- Marble pots. There were two parts found, one with base and handle, and another decorated with incised parallel lines on its face.

S- Inscriptions. There were found inscriptions which were incomplete and unclear Musnad inscriptions, some of these inscribed on the incense burners and some engraved on the stones of the walls of excavated residential units. One of the steatite stone incense burner has the name 'Mawiyah' on it (see Fig. 2.32).

Figure 2.32: An incomplete Musnad Inscription located on a wall of section 42 (Al-Zahrani, 2002)

In 2003, excavation continued, on the site of al-Ukhdud, which is located on the east side of the fortress by the work team of the Deputy Ministry of Antiquities and Museums as an extension of their work during the previous seasons (see Fig. 2.33). They divided the site of excavation into nine squares; each of 10m x10m, in area (Al-Subail et al., 2005). Unfortunately, in the excavation area many walls of the architectural units were found that had collapsed. These had been destroyed by tractors for farming, and the fertile land was ploughed for plantation and farming (Al-Subail et al., 2005:11). In many places the team faced difficulty in recording soil layers except in three rooms located in the northern area of the limits of excavation (see Fig. 2.34); which were two small rooms and another room comparatively middle-sized perhaps was for storing food such as wheat and dates (Al-Subail et al., 2005).

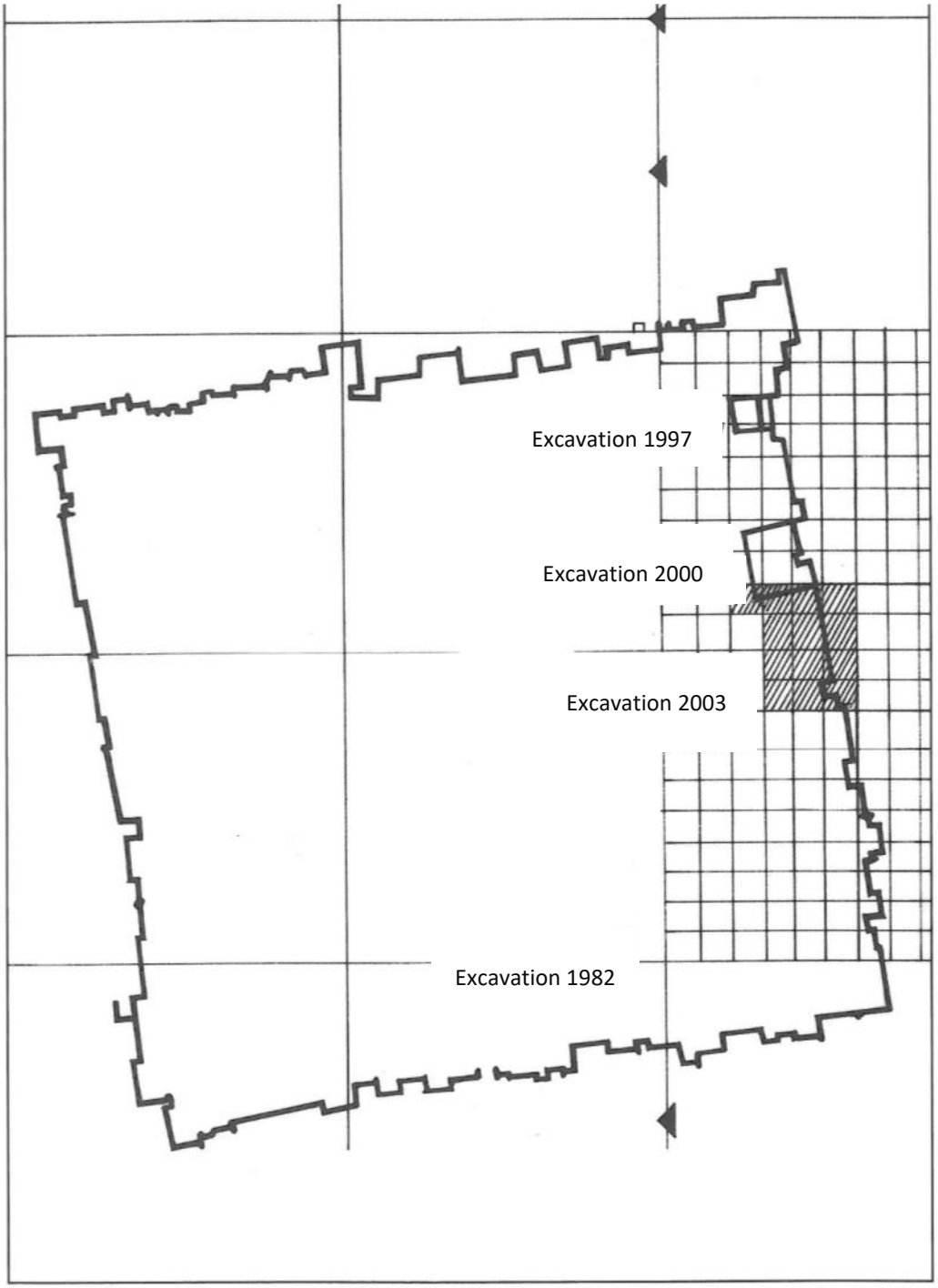


Figure 2.33: Excavation at the Al-Ukhdud (Al-Subail et al., 2005) modified dated at the plan by researcher.

Figure 2.34: The site before excavation (Al-Subail et al., 2005)

All the discovered architectural units were built with solid stone which varied in size and shape, for instance large size stones used in the exterior walls; and a medium-sized stones usually used in the interior walls with gypsum which was used for cementing and plastering (Al-Subail et al., 2005:12). Moreover, some walls in the outside part included names or drawings (Ibid. 2005:12). In generally it is difficult to describe the rest of the architectural formations discovered for the reasons mentioned above, but it could be observed in the east of the three small rooms (storage) are two small rooms and another two larger rooms. In addition a large lintel of a door at the south part of this unit connected to broken walls (see Fig 2.35) (Al-Subali et al., 2005:12).

Figure 2.35: The site after excavation (Al-Subail et al., 2005)

In this unit there was an inscription on a metallic plate that reads: 'Temple of the deity Sulaiman' (Figure 34), this may suggest where religious rituals were performed, and in the adjacent room was found bones and pottery sherds probably denoting offerings and sacrifices for deities (Al-Subail et al., 2005:12).

Figure 2.36: Bronze plate with Musnad inscription (Al-Subail et al., 2005)

The artefacts discovered during this year were: Jars, cups, goblets, goblets or bowls, pottery jars, water cooler, pottery strainer, Steatite strainer, pottery lid, marble ware, steatite wares, marble grinder, stone grinder, glass objects, incense burners, pottery incense burners, and shells (Al-Subail et al., 2005).

There was an inscription found in the al-Ukhdud excavation in the 4th season that was found on a rectangular shaped bronze plate (broken into two parts) which usually hung in the ancient temples on the south of Saudi Arabia, and it is engraved with Musnad inscription containing of seven lines (Tiran, 2005:15).

These inscriptions could be attributed to a period between the first century BC to the second century AD (Tairan, 2005)(see Fig. 2.36).

Transliteration (Tiran, 2005:15):

1- ‘S L M N /…Z R M/Z A H L /M L K N
2- S L A / Z S M W Y A D Y / K A B T N / B H J R N / D H
3- R B / N…W T R Z / S L M N / ZSM
4- W Y / …H J R N / A Z N / Z S M
5- W Y / … S L M N / B A Z N
6- Z S M W Y / ...Y Th W / B N H W / W Q N Y H W
7- …Th W / B N / TH,W B / Y N A M’

Translation (Tiran, 2005:15):

1- ‘Salman/ bin/ …./Zahram from trible Malkan,
2- Offered of Samawi in his temple (KABTN) in the city,
3- Dhar b (n…..) w t r z Salman Dhu Sama,
4- Wi(……) the city is Dhu Sama strength or his own power,
5- Wi(……) in power or authority
6- Dhu Samawi …….be blessed by (the deity), his properties or his slaves.
7- (and his home)…….the reward (the reward with which) he was benefited’.

Second: engraved on a fragment of a bronze plate (Tiran, 2005:16):

There is an inscription which was a part of a line on a bronze plate (figure 2.37) which reads as below:

‘ …Z…(S M W Y / B Z T / M)……..

…. Dhu Slamawi that m …..’

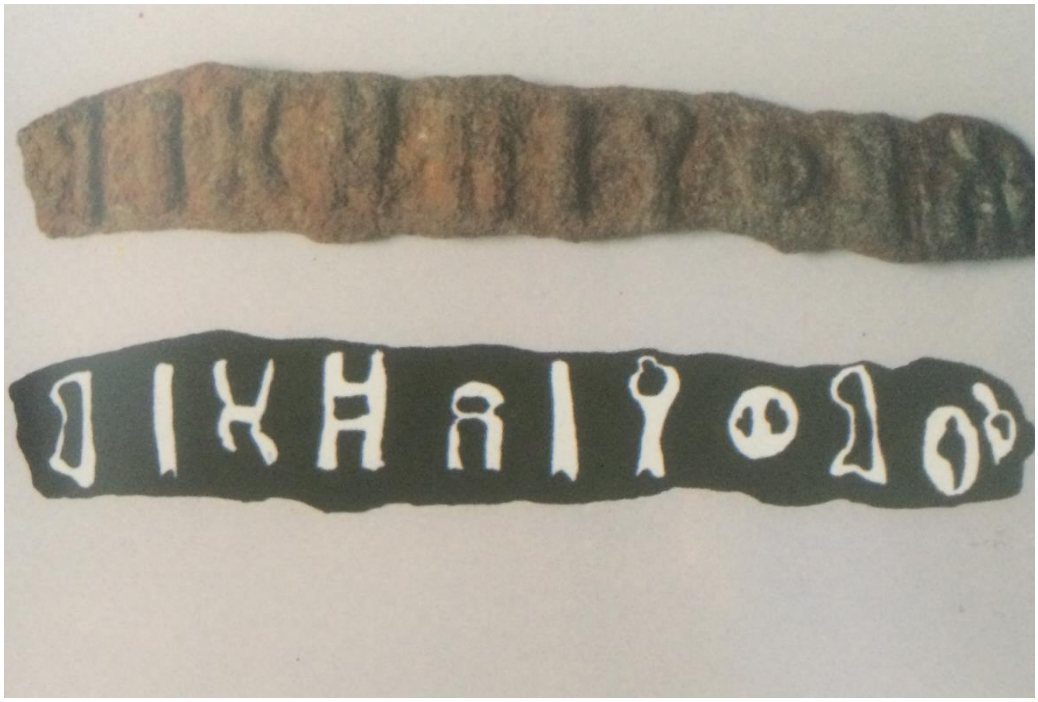


Figure 2.37: Part of bronze object containing Musnad inscription (Al-Subail et al., 2005)

Third: inscription on a bronze plate (Tiran, 2005:16):

There was an inscription on ‘a fragment of a bronze plate that included five letters at the end of the first line of the script, which reads:

…….. (Z Y D M / H)

Z y d m: probably it is noun or name of someone, that called Zaid, as is well known in the Sabaen inscription.’

Fourth: inscription on a wall (Tiran, 2005:16):

‘There are two inscriptions which are on:

A- A rectangular shaped sand sedimentary stone rock located on the first layer of a wall with a Musnad Inscription for four letters (y l f m). This perhaps means in English a "veil".

B- A rectangular shaped sand sedimentary stone rock located on the first course of a wall with a Musnad Inscription of four letters (m r d ea). This word was mentioned in the Qatbany inscription and in the Sabaean inscription as a title of poetic verse. But "morad" in the classical Arabic is "scented with perfume and saffron"’.

In 2004, the excavation team of the Deputy of Ministry of Antiquities and Museums continued excavation at the site of al-Ukhdud for a fifth season, due to the tantalizing results of previous seasons excavation (Al-Sabail et al., 2006). The work team continued the excavation in the eastern part of the fort, by choosing units which were units no.49 and no.45, in addition to work on the ditch located between the fort and the mosque which was discovered in 1997 (Al-Sabail et al., 2006:11).

However, in the eastern side of the fort in which unit was located no.49, excavation took long time to remove the strongly adhering stones and hard soil (see figure 2.38 A, B and C) and after digging they found a unit built with well-shaped stone blocks, although in the walls facing east there was some protuberances. It contains 18 small stores and the major part of a small room in the shape of English letter 'L' were which was destroyed and collapsed down (Al-Sabail et al., 2006:11).

Figure 2.38.A: Building no.49 before excavation (Al-Sabail et al., 2006)

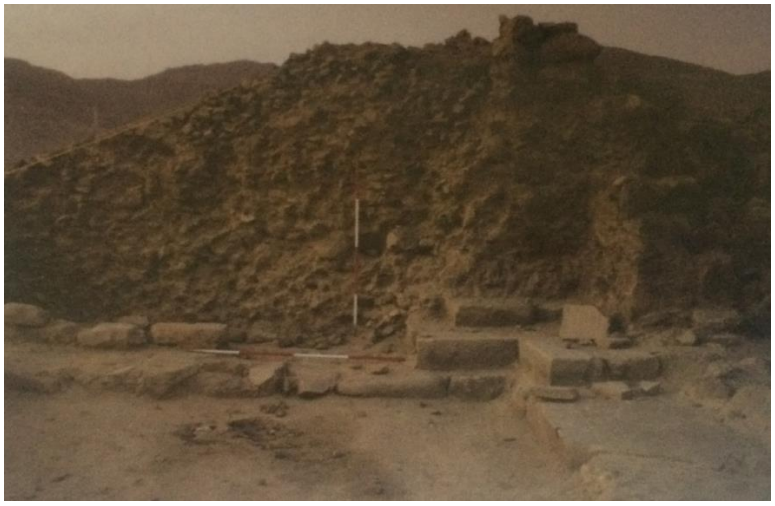


Figure 2.38.B: Debris that covered wall in north eastern side (Al-Sabail et al., 2006)

Figure 2.38.C: Floor with tiles and sounding in room no.49 (Al-Sabail et al., 2006)

In this unit stones were found with inscriptions engraved with names perhaps that of the owner, while some stone blocks had images of snakes and animals probably incantations for the house (Al-Sabail et al., 2006:12).

Furthermore, in the northeast of unit no.49 was the unit n.45, which was destroyed, except some exterior walls (see Figure 2.39). This unit composed of 16 small rooms with bench-like elevated

platforms attached to this building on the western side, whilst in unit no.49 they were attached to the eastern side as a possible support for the last step of a stairway (Al-Sabail et al., 2006:12).

Figure 2.39: Building no.44 before excavation (Al-Sabail et al., 2006)

In the southern side of building no.45 was found a cubic stone engraved with holes on its surface probably indicating to the base of two statues, as well as in one of its faces with the remnants of a marble slab was attached with two bronze screws (see Figure 2.40) (Al-Sabail et al., 2006).

Figure 2.40: Base of a statue located in the southern part of building (Al-Sabail et al., 2006)

Musnad inscriptions were found on several stones such as 'w d ab' (see Fig. 2.41), whilst some stones includes another engraved names that may be indicate of the owner of building (Al-Sabail et al., 2006). Unit no.45 was perhaps used as a temple as suggested by the base of standing statue (Al-Sabail et al., 2006:12).

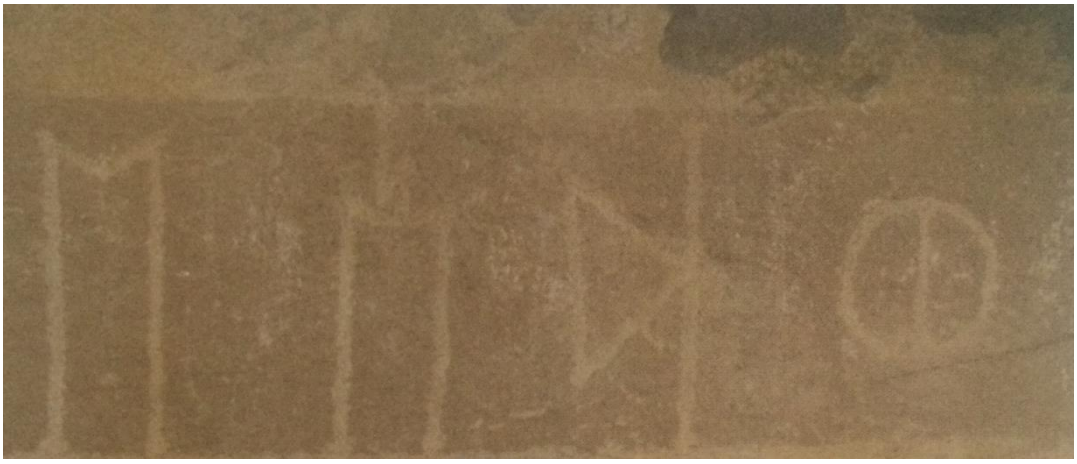


Figure 2.41: South Arabic inscription which located outside the fort (Al-Sabail et al., 2006)

The excavation team continued the digging a small hill to test stratigraphy in area which was located between the fort and the mosque and know more about the archaeological layers, settlement pattern and chronology. At this site was found the four walls of a large room built with medium-sized stones, and a test excavations was implemented in one of the corners of the room but the wall ended and there appeared hard and solid virgin soil (see Figures 2.42.A and 2.42.B) (Al-Sabail et al., 2006)

Figure 2.42.A: The northern area before excavation (Al-Sabail et al., 2006)

Figure 2.42.B: The northern area after excavation (Al-Sabail et al., 2006)

Eventually, from this season the important artifacts were reported by Al-Sabail et al., (2006:13) which included:

A- Five Musnad inscriptions, some were engraved on rocks used for the construction of houses, whist others were carved on stones scattered in east of the fort on which were the names of persons.

B- Pottery objects and sherds of cups, plates, lids, jar, bowls etc. (see Figures 2.43.A, 2.43.B, 2.43.C and 2.43.D)

Figure 2.43.A: A pottery bowl from building no.49 (Al-Sabail et al., 2006)

Figure 2.43.B: Part of bowl from northern of Al-Ukadud (Al-Sabail et al., 2006)

Figure 2.43.C: Pieces of glass objects from building no.49 (Al-Sabail et al., 2006)

Figure 2.43.D: Pottery lids of some pots from northern Al0Ukhdud (Al-Sabail et al., 2006)

C- Objects of steatite soapstone (Figures 2.44.A, 2.44.B, 42.C, and 2.44.D)

Figure 2.44.A: Incense burner from building no.49 (Al-Sabail et al., 2006)

Figure 2.44.B: Stone incense burner from building no.45 (Al-Sabail et al., 2006)

Figure 2.44.C: Steatite lamp from building no.45 (Al-Sabail et al., 2006)

Figure 2.44.D: Part of small stone basin (Al-Sabail et al., 2006)

D- Glass objects

E- Marble objects

F- Incense burners (see Fig 244.A)

G- Lamps

H- Metal objects including a small, thin gold object (see Figures 2.45.A and 2.45.B)

Figure 2.45.A: A Bronze bracelet from building no.45 (al-Sabali et al., 2006)

Figure 2.45.B: A Bronze ring from northern trench (al-Sabali et al., 2006)

I- Coins

J- seals

In 2012, The team of Saudi and the French Archaeologists worked as group to register and documenting the Islamic inscriptions in Najran. During this season they found 228 inscriptions from Sabaeen and Talmudic inscriptions. They worked in eight sites in Najran which were; Qarn al-Safaran, Al-markab, Aldrwh, Al-Kaukab Mountain, Al-Subail, Al-Hisan quhmat, Umm Al-ayadi, and Jabal of Wuarik (Al-theeb, 2012: 35-46). See table 2.3 in below:

Table 2.3: Inscriptions and rock drawing numbers found in Najran 2012 AD (Al-theeb, 2012)

Site	**Scripts / Languages**	**Numbers**
In mountain of south of Al-quriziaht Wadi. This refers to after third century AD.	Nabataean	1
(Sabaeen) All sites except Aldrwh site. In Qarn al-Safaran site found two Inscriptions refer to third millennium BC.	Sabaeen and Talmudic	228
……	Latin	1
In Al-quriziaht site (long text around 6 lines), and in Al-Drwh site found inscriptions and one from these refer to 678 AD (59 AH), Also, found two inscriptions in, Al-markab site include the name of al-Caliph Omar (This person is the Third president after prophet Muhammad). * The Majority of this inscriptions indicate to the first and second Islamic century	Islamic (Arabic)	66
In Al-markab site, but unfortunately, it was graffiti by the visitors.	Contemporary Arabic	12
Umm Al-ayadi (animal drawing such as: ibexes and human hands)	Petroglyph Rock drawing	72

In Al-Hisan quhmat the inscriptions are located beside the Al-quriziaht wadi and included three inscriptions which were in Thamudic script that probably indicate a memorial inscription, in addition to a number of mounded graves in this site (Al-theeb, 2012: 45).

2.11.2- Bir Hima

Hima is one of the most important archaeological areas in Najran and it dates from the Stone Ages, as well as Pre-Islamic history. This site has castles, cemeteries and a number of wells called Abar Hima. Also, this site contains epigraphy and inscriptions, and it has perhaps the most important of the petroglyphs that contains twelve Sabaean inscriptions which tell us about the King Yusuf Assar Yathar; and his army's triumph over the Abyssinians army in approximately 518 AD and the number of men killed and the amount of booty won by this king (see Figure 2.46) (Beeston, 1985, Alansary and Almareeh, 2007).

Figure 2.46: The historical inscription at Bir Hima for the exploits of Himyarite King Yusuf Asar Yathar (fieldwork, 2014).

In addition to these Sabaean inscriptions there were two Islamic inscriptions written in Kufic script located adjacent to the inscription of Himyarite King; Yusuf Assar Yathar (Alansary and Almareeh, 2007).

Moreover, the Bir Hima site was an important place for the travellers and artists to carve inscription of their daily life, weapons and animals as well as, hunting, war battles, dancing, swords, shields spears, arrows, camels and horses and cavalry on horseback or camelback (Murad, 1980). What is more, in the Southern region engraved naked women that belong to 8th Millennium BC, similar to that in the ancient Egyptian civilization were found (see Figure 2.47, Murad, 1980). The women have triangular torsos, long neck, narrow waist, wide buttocks, and long hair and the local Bedouin call it

the image of a goddess “Alia”, which was a prehistoric queen and goddess ruling all over Southern Arabia (Khan, 2013:459, see figures 2.48.A and 2.48.B).

Figure 2.47: Naked woman similar to ancient Egyptian civilization Found in the Southern Province 8th Millennium BC (Murad, 1980)

A B

Figure 2.48.A and B The "Alia" on earlier Bedouin inscriptions (Khan, 2013)

In addition on another rocks located in north of Hima which include a human and animal (see Figure 2.49) the man is taller than woman and his muscular while the woman is fat or pregnant. But it is clear that the man, woman, and the “ibex” are carved closely together to show complete synchronization and unity; while the camels on the same rock are later additions (Khan, 2013: 462). The man appears to be carrying a spear in his right hand; touching the Ibex horns, and a lance with a shield in his left hand (Khan, 2013: 462).

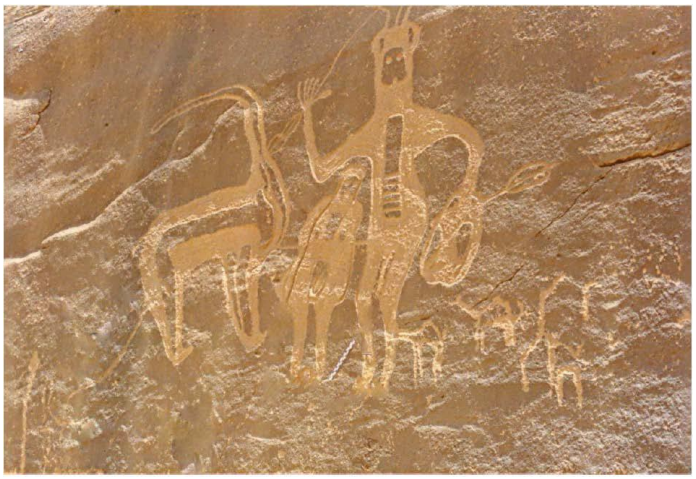


Figure 2.49: The unique and meaningful composition of human and animal, is located north of Hima, Najran, Southern Arabia (Khan, 2013)

Furthermore, this site is the most important station for convoys coming from the south of the Arabian Peninsula to the north and vice versa (Al-Ansary and Al-Mareeh, 2007) (see Figure 2.2).

2.12.3 Abar Kutmah

This site belongs to Neolithic period and it located in the western of Al-mnkhali centre in the quarter empty. The site contains white limestone, stone tools, pottery, and two wells, one has a square wellhead (see Figure 2.50), whereas the second has circular wellhead (Alamri et al., 2003, Al-Khathami, 2007).

Figure 2.50: Well in Abar Kutmah with square well-head (Al-Khathami, 2007)

2.12.4 Al-ajma

This site lies in Shuaib Dahda at the Northwest of Najran. It has stone tools dating back to the Palaeolithic period (Alamri et al., 2003, Al-Khathami, 2007).

2.12.5 Jaldah

This site is located in the east from the southern part of the Tuwaiq Mountains, and its distance about 86 km from the centre of Al-mnkhali. The implements found in this site belongs to the Neolithic and the flint tools are characterized as being extremely fine and of high proficiency in manufacture (Alamri et al., 2003, Al-Utaibi, 2007). Also, this site includes granitic rocks and it has one undated inscription, that contains five lines and it is a request for forgiveness (Alshaban, 2007).

2.12.6 Alknawer

This site is located in distance about 203 km from Najran to the north from route of Sharurah - Najran, in an area covered with sand dunes. This site contains several archaeological sites separated by sand hills (Alamri et al., 2003, Al-Utaibi, 2007).

2.12.7 Janoub Al-Madbatihat

This site is located in the south edge of Tuwaiq Mountain chain in a flat area, which has a lot of sand. It has a set of stone implements belongs to Neolithic period (Alamri et al., 2003, Al-Utaibi, 2007).

2.12.8 Shu'aib Dahda

This site is located towards western of Najran Valley, and it stream flows into the wadi Najran. According to the stone implements found in the bank of Valley, it belongs to the lower Palaeolithic period. Furthermore, this site includes at least six foundations of buildings of stone (150 x 110 m) and pottery, which is similar to some pottery on the Al-Ukhdud site (Alamri et al., 2003) and at the north of the site there are a number of boulders with south Arabic graffiti and drawings (Zarins et al., 1981).

2.12.9 Althwilah

This site located about 80 km, northwest Najran on the road of Najran- Dhahran Aljanoub. This site consists of branches or narrow tributaries that branch from one of the valleys surrounded by highlands from all sides. This location belongs to the Acheulean period and the Mousterian period (Alamri et al., 2003, Al-Utaibi, 2007). There are also several circle cemeteries that are distributed over the heights overlooking the valley and the diameters ranging between 4 and 7m, and a height of up to about two meters. As well as, these tumuli lies beside the remains of constructions built from stone. The history of this construction and tumuli back perhaps to the first or the second millennium B.C (Alamri et al., 2003, Al-Utaibi, 2007).

2.12.10 Shamal Gharb Althwilah

This site is located approximately 18 km, northwest of Althwilah. This site is towering and its rocks predominantly red, and there are a number of piles stones and cemeteries, in addition to the circular stone tools similar to those stone tools found at the site Althwilah (Alamri et al., 2003, Al-Utaibi, 2007).

2.12.11 Al-qiran

This site is located approximately 1 km, to west of Najran airport, also its distance around 400 m, at the base of a mountain. It contains the walls and foundations of buildings of stone slabs, installed vertically in addition to a number of stone circles which diameters ranging approximately between 3 and 4 m. Moreover, this site contains a number of the handles, rims, and bases of tools are somewhat similar to some forms of pottery at the site of Al-Ukhdud, which date back perhaps to the first millennium BC (Alamri et al., 2003, Al-Utaibi, 2007).

2.12.12 Gharb Jabal Al-qiran

This site is located about 3 km, to west of Al-qiran mountain, in a small space between rocky blocks, and is covered by sand. However, it has the basis for a number of buildings, some of them rectangular shape, whereas one is circular shape with diameters ranging between about 2 and 4 m, and the height up to almost one meter. This location has pottery shards that are spread on the surface of the site, some of these shards have the red thin Roman-style, in addition to shards with a brown colour, and the others with a red lining similar to the pottery found at the site of Al-Ukhdud (Alamri et al., 2003, Al-Utaibi, 2007).

2.12.13 Sad Al-madiq

This site is located near to the Najran Dam, and contains a set of long waterways carved in the rock. It seems they are used to divert the torrents of water to the fields adjacent to the area (Figure no.40) The width of these watercourse up to 90 m, depth around two meters, and its stretch along up to 120 m, (Alansary and Almareeh, 2007). At this site a plaster layer was found probably it represents part of the control gate to runoff and converted. South of Al-Ukhdud where there is an irrigation system that is similar, but large stones were used in the construction of canals to divert torrents water into basins are controlled during the irrigation to agricultural fields (Al-Utaibi, 2007).

2.12.14 Al-duraib (Qarn al-safaran or Qariya Qadima)

This site is located about 20 km, to East of Al-Ukhdud. It contains remains of buildings foundations (420 x 250 m) similar to the architectural layout of the Shu'aib Dahda site. In addition to pottery shards found at this location are similar to the shards styles found at Al-Ukhdud. This suggests the two sites belonging to the same historical period (Zarins et al., 1981).

2.12.15 Qala Al-hamdah

This site at Al-juaira includes a set of castles and buildings, in addition to, watchtowers. The site pottery shards have a red colour mixed with sand, a brown mixture with black granules, and another mixture with steatite (see Fig. 2.51). Furthermore, it has number of small mineshafts vertical, and some mining infrastructure (Alshaban, 2007).

Figure 2.51: The castle of Al-hamdah (Alshaban, 2007)

2.12.16 Fara Bilal

This site contains a set of Islamic inscriptions and epigraphy. It has more than fifty rock panels containing inscriptions religious, and assertions of faith, as well as some poetry (Alshaban, 2007).

2.12.17 Aldrwh

This site contains more than twenty Islamic (Kufic) inscriptions and epigraphy. All are supplication, for a person named Daud bin Sulaiman bin Yazid, in which God is called on for assistance (see Fig. 2.52), (Alshaban, 2007). Also, there is a script for a woman asking her god for forgiveness (see Fig. 2.53). In addition, they contain a number of inscriptions of the names of people (Alshaban, 2007).

Figure 2.52: Kufic inscriptions for a person named Daud bin Suleiman bin Yazid (Alshaban, 2007)

Figure 2.53: Kufic inscriptions for woman asked her god for forgiveness (Alshaban, 2007)

2.12.18 Sheiab Barran

This location includes around twenty epigraphy's (Alshaban, 2007).

2.12.19 Bir Khadra

This Islamic site about 200 m; from Bir Khadra (Well) contains Inscription undated (Alshaban, 2007).

2.12.20 Jubal Arair

This site includes sixteen inscriptions undated and short texts, but some texts are truncated. All these scripts centred around the themes of affirmation of faith in God and asking for forgiveness from him, along with a number of names (Alshaban, 2007).

2.12.21 Jubal Kharwa (Shu'aib Naooqah)

This site contains one inscription in the eastern-side of this mountain, that is a request for mercy (Alshaban, 2007).

2.12.22 Jubal Bint Hamer (Al-Hamra)

This site located on the banks of Wadi Najran, to south of Al-qabil site. It contains three inscriptions Graffiti, all these scripts centred on thankfulness, confirmed that God but Allah and that prophet Muhammad is the Messenger of Allah, and the oneness of God, and supplication (Alshaban, 2007).

2.12.23 Jubal al-masmmat

This site contains two inscriptions, half of the first one contains four lines, and the second one has two lines (Alshaban, 2007).

2.12.24 Silsilah Jubal Al-Qara

This site is located about 9 km, to northwest of Hima. Al-Qara site as a series of interconnected mountains and these contains inscriptions and epigraphys (Alshaban, 2007). The most common epigraphy this site are scenes of people fighting or ritual dances which perhaps suggest these are representations of deities (Kabawi et al., 1996:57; khan 1993). However, the mountains (Silsilah of the Jabal Al-Qara) have a number of sites:

A- Kashim Ain Camel (Ann Camel)

This site contains eight Islamic inscriptions undated, characterised by the small size of the scripts. All these scripts revolved around certain people praying for mercy, and asking for forgiveness from God (Alshaban, 2007).

B- Najd Khrir

This site located within Al-Qara Mountain, about 20 km, to northeast of Hima site. It contains three inscriptions undated that confirms the oneness of god (Alshaban, 2007).

C- Shu'aib Al-sammah

This site located within a series of Al-Qara Mountains, and it contains nine inscriptions all undated. All these scripts are characterised by their small size, and concentrate on asking for forgiveness and mercy from God (Alshaban, 2007).

D- Briqa Al-Ceiba (al-Kaukab Jubal)

This site is located on east part of Al-Qara Jebal; and it contains one undated inscription include a name of unknown person (Alshaban, 2007). In addition there is Alia and several Thamudic inscriptions carved at the base of mountain around the reservoir (see Figure 2.54), (Khan, 2013).

Figure 2.54: The Alia and several Thamudic inscriptions are engraved in which are at the base of Jabal al-Kaukab (Khan, 2013)

E- Shu'aib Shasa (Shashah):

This site is about 25km, to the Northeast of Hima. It contains one Islamic inscription (Alshaban, 2007). Also, in this site a male and female are depicted in standing postures with full realistic sexual details (Kabawi et al., 1996:57). This site also contains a few drawings belonging to more recent periods (Kabawi et al., 1996).

F- Shu'aib Suhai (Najd Suhai)

This site is located about 35 km, to northeast of Hima site. The north side of this site includes thirteen inscriptions undated, and the majority of these texts are to ask for forgiveness and mercy from God (Alshaban, 2007).

G- Shu'aib Haqool

This site is part of a series Al-Qara Mountains, includes inscription on the eastern facade of the mountains overlooking the Shu'aib. This script confirms the person his eligibility in his residential home, in addition to the request of the vulva and the mercy of God (Alshaban, 2007).

2.12.25 Jebal Al-markab

These mountains are located in the east of Najran. These include a set of inscriptions and epigraphy undated which include religious phrases, and requests for forgiveness as well as the names of people (Alshaban, 2007).

2.12.26 Jubal Sunh

This site is located about 70 km, to northwest of Hima. The rocky faces include some inscriptions which can be classified as inconsequential, due to the short texts and non-completion of some of them (Alshaban, 2007).

2.12.27 Upper Nasla Mountain

This site is located in the South-eastern part of Najran; and it includes inscriptions in Kufic script and a reproduction beside it in Musnad script. But the content of these inscriptions does not indicate the date, but through study the letters of the alphabet it is suggested that they are probably ninth century AD (end of third century A H) (Al-Said, 2004).

2.12.28 Umm Rigaibah Mountain

This site contains a few drawings belonging to more resent period such as human figures, cows, camels and other animals (Kabawi et al., 1996:56-58).

2.12.29 Shagar in al-Kaukab area

This site contains a few drawings belonging to more resent period (Kabawi et al., 1996).

2.12.30 Kab'at Najran

This site lies 25 km, northeast of the Al-Ukhdud site. The name of this site Kab'at Najran probably has been mistakenly applied as no monumental architectural remains are found in this location. However, at this site solely there is a semi-circular double row of stones around a central pillar (see Figure 2.55). In addition there is pottery in which is contemporary with the pottery in Al-Ukhdud site (Zarins et al., 1981). This site built in the style of the Ka'ba and probably the Arabs may pilgrimages to it in ignorance before Islam.

Figure 2.55: Kab'at Najran (http://s1.zetaboards.com/anthroscape/topic/5218760/1/)

2.12.31 Almondafin

This site is located in the Empty Quarter desert in the Najran region. The surface of this site includes obsidian artefacts (bladelet, fragment and flakes), which have been dated to the seventh- sixth millennium BC Neolithic period (Khalidi et al., 2013).

2.13 Importance of Najran archaeological sites

From the overview in section 1.1 (see figure 1.1) and the detailed descriptions presented in this chapter, it is obvious that Najran is rich in archaeological sites, and this provides an opportunity for archaeological tourism in the future. In any case, having given a brief overview of the characteristics of some of the archaeological sites in Najran region, some of those can be highlighted here; for example, among the most important sites in Najran are those at Al-Ukhdud and Bir HIma, where Al-Ukhdud site represents the city of Najran in previous centuries, as the findings at this site, e.g. stone houses, millstone, pottery etc., indicate the prosperity of this site in times gone by. Along with Bir Hima site, inscriptions, rock art and other archaeological characteristics indicate the importance of this site in ancient times; in particular it has six water wells that still exist in the present day, these were used by the owners of convoys passing this site when the ancient caravan trade road was in use. In addition, these two locations, Al-Ukhdud and Bir Hima, are located at the crossroads of ancient trade roads, going to and coming from Yemen, to the north of the Arabian Peninsula.

In addition to the archaeological characteristics of these two sites and other sites in Najran, they also have another important advantage as they are situated geographically between several ancient kingdoms. For example, to the north of Najran, about 300 km from its centre, lies the historic village of Al-Faw (capital of the Kingdom of Kinda), which existed from the fourth century BC until the fourth century AD (Al-Ansary and Tairan, 2005). Findings obtained during excavations at this site indicate that this kingdom was contemporaneous with the Kingdom of the Nabataeans and the Hayyan, and others (Al-Ansary and Tairan, 2005).

Located to the south of these archaeological sites in Najran are the ancient kingdoms of Yemen, which shows the importance of Al-Ukhdud site, as this site contains inscriptions on the walls of buildings, repeated eight times, that indicate that this site was an important one for the spice and incense trade, which were associated activities in Ma'in.

According to Al-ansary (2008), there are cultural links between ancient Najran (Al-Ukdud), Al-Faw (Kinda) and ancient Yemen kingdoms. Given the cultural links between these sites, these can be involved in archaeological tourism; tourist itineraries can be created among archaeological sites in Najran, in addition to linking these sites in field of tourism with Al-Faw archaeological site, as well as coordinating with tourism programmes in Yemen, which would be possible if the conflict in Yemen stops. Then, mutual tourist itineraries can be created that include Najran, and these would be of value due to the similarities of the civilization at these archaeological sites, especially if stakeholders try to develop and restore the incense road and ancient trade roads for exploitation in the field of tourism, so that new tourist itineraries connect all the archaeological sites related to the ancient trade routes.

The compatibility and similarities of archaeological sites in the south of the Arabian Peninsula, especially in Najran and neighbouring areas, would be of touristic value; however, in the case of creating tourist itineraries including Najran archaeological sites, neighbouring regions and Yemen, it would be possible to apply the same notion to the eastern and northern regions of Saudi Arabia to create tourist itineraries between archaeological sites in those regions too, in addition to linking archaeological sites in eastern Saudi Arabia with sites belonging to the Gulf Cooperation Council (GCC), in addition to the North Kingdom, in order to profit from the area’s archaeological heritage and link up with private Jordanian tourism programmes at the site of Petra, because of the great similarities between this site and Madain Saleh, which is the second capital of the Nabataeans (Ansari, 2008).

2.14 Najran Museum

One of the highlights of the work done by the SCTNH branch in Najran is that it is currently working to develop the Al-Ukhdud site, and this was clear to the researcher of this thesis during his visit to this site in late 2016. Corridors had been created within the site and there was rebuilding of Najran Museum still under way, adjacent to the Al-Ukhdud archaeological site. The previous Najran museum opened to visitors in 1987, it contained a gallery, offices for administration and staff, a drawing lab, a photography studio, a restoration lab, a TV hall, a researchers' room, a gallery especially for visiting exhibitions, warehouses and a library, which contained sets of specialized books, periodicals and brochures (SCTNH, 2016).

However, according to the deputy director of Najran tourism, the new museum building occupies an area of 16,800 square metres, and the cost of this project is SAR 51,824,281. This museum will include a number of showcase galleries, e.g. a Pre-History gallery, an Islamic period gallery, a gallery celebrating the unification of the Saudi Arabia and a gallery showing the Saudi way of life, in addition to visual-presentation rooms. Also will be a gallery for visiting exhibitions and presentations, a library and storage. Besides these features for visitors, there will be ample parking spaces. The façade of this museum will reflect part of the heritage of Najran. Currently, Najran treasures are displayed in the National Museum in Riyadh, as there is no alternative museum in Najran region while the new one is still under construction and development. It was expected to be completed in December 2015, having been started in December 2013.

In addition to the museum at Al-Ukhdud site, stakeholders can exploit Bir Hima archaeological site and turn it into a museum in the open air, so visitors can enjoy inscriptions and other archaeological characteristics at this site. However, while the possibility of Bir Hima having a museum is encouraging, as it would be low-cost, it is clear that the cost of re-establishing and developing the current Najran Museum is very high, which might be the reason for the lack of museums in Najran region.

Compared with other regions of Saudi Arabia, Najran region has considerably fewer museums; Riyadh, for example, has six public museums, in addition to other private museums (SCTNH, 2016). The most well-known of these is the National Museum, Riyadh, which has the following spaces: main hall, exhibition halls (including eight permanent hall and a temporary exhibition hall, additional space for future expansion and administrative offices, in addition to facilities including storage space for collections, research rooms and laboratories (Adib, 2007: 332–342). The presentations in this museum are spread across eight halls based on particular themes: Hall for Humans and the Universe,

Hall of the Arabian Kingdoms, Hall of the Pre-Islamic Era, Hall of the Prophetic Mission, Hall of Islam and Arabia, Hall of the First and Second Saudi States, Hall of the Unification of Saudi Arabia, Hall of the Two Holy Mosques and Hajj. This museum is a national landmark of Saudi Arabia, it includes many reference to the history of the country, so the visitor can combine recreation and knowledge (Adib, 2007).

The existence of appropriate infrastructure in other Saudi cities could provide them with more opportunities to exploit archaeological sites such as Mecca, Riyadh and others. Therefore, Najran region needs more attention from the government in order to exploit its archaeological sites within the field of tourism.

2.15 Conclusion

Najran, located in southern Saudi Arabia, spans desert to the east and mountains to the west and north. The population is currently estimated to be c. 650,000 people. Currently the area has a warm, dry climate, but water is available and the region has includes fertile agricultural lands. The climate has changed over time. Moister conditions prevailed in Palaeolithic and Neolithic times, while there has been drying in recent millennia. These changes have affected ancient human populations and are partly reflected in the archaeology, which spans the period from the Palaeolithic to the Islamic Age. From c. 500 BC to the rise of Islam, Najran was strategically located at the intersection of ancient trade routes connecting the northern and southern parts of the Arabian Peninsula. One route came from Yemen into Najran, where it divided into two, one branch heading towards northern parts of the Arabian Peninsula, eventually arriving in Egypt and the Levant, and a second leading east. The border with Yemen has been historically fluid and long disputed. The Saudi-Yemeni demarcation was finally agreed in 2000, resolving an international dispute between the two countries.

This chapter provides a detailed survey of archaeological sites located in the Najran region; it can form the basis of an archaeological catalogue, which could be important for tourism in the future. Sites include such monuments such as Al-Ukhdud and Bir Hima. Several sites feature inscriptions and petroglyphs, many unique and in good condition, and some sites have archaeological material from more than one period of time. Such characteristics give value to these sites and would make them attractive to tourists, who would find interest in visiting them. The availability of such archaeological sites in Najran is comparable to that in other Saudi regions, but perhaps extra value of the Najran region stems from its long history as a strategic trade location and its proximity to the ancient Yemeni kingdoms in the south and the Kinda kingdom in the north. Najran is mentioned in inscriptions linked to those earlier kingdoms, which means that it also probably flourished during past periods of prosperity.

The Najran region contains only one museum, however, which is currently under development at the Al-Ukhdud site. The lack of museum resources could be due to the high cost of establishing museums; an alternative might be for the government to use archaeological sites, such as that at Bir Hima, as museums in the open air. Arguably, it makes sense for these archaeological sites to be included in a geographical database that includes all their features, in order to help determine the most appropriate sites for tourism in terms of site characteristics. This process will be addressed in forthcoming chapters.

Chapter 3

Archaeological Tourism and GIS

3.1 Introduction

The purpose of this chapter is to conduct a literature review of archaeological tourism and GIS. It begins with assessing possible concepts/definitions of tourism. The term tourism is associated with a number of other ideas: archaeological tourism, heritage tourism, cultural tourism and ecotourism, but it will be argued that the most appropriate term for this dissertation is archaeological tourism, which aligns well with the goals of this thesis and with the needs of the primary stakeholders in this work.

These stakeholders include those who have an interest or whose business operates in the field of tourism, for example, the Saudi Commission for Tourism and Natural Heritage (SCTNH) and also investors in the field of tourism, such as tour operators. However, the term 'stakeholder' as used in this dissertation particularly relates to the SCTNH, as it is part of the government and is responsible for development of the tourism sector in Saudi Arabia.

The chapter continues by discussing regional trends within archaeological tourism in general and Saudi archaeological tourism in particular: Saudi tourist guidebooks, the segmentation of the Saudi tourist market, the current problem of tourist visas, and other factors influencing cultural heritage tourism in Saudi Arabia. There is also domestic tourism in Najran, which involves the local population, and their attitudes towards tourism are also of importance. This chapter will also highlight tourism planning for archaeological heritage sites, especially Saudi tourism planning. Finally archaeological tourism will be considered along with GIS, with a view to building an archaeological tourism database, evaluating suitable sites using multiple criteria, GIS and a landscape characteristics assessment, and assessing the intersection of social and online media with GIS and tourism.

3.2 Definitions of archaeological tourism, heritage tourism, cultural tourism, and ecotourism

Several terms are used in relation to tourist visits to archaeological sites. This section reviews this terminology and sets out the definitions of key terms used subsequently in this thesis. Archaeological tourism, or archaeotourism, refers to tourists who are travelling to archaeological sites (Wurz and Van der Merwe, 2005), as well as people who like to visit and experience ancient sites and historical places (Srivastava, 2015). Hoffman et al., (2002) point out, however, that archaeological tourism is a type of heritage or cultural tourism that targets visits to public and traditional places, interpretation centres, museums and ancient and historical sites in order to tell the stories of people who lived in the past. This might be a motivation for tourists who are strongly attracted to archaeological sites to learn about ancient civilizations that inhabited the region being visited (Srivastava, 2015). Whatever the motivation, archaeological tourism can be exploited in two ways: (a) opening up archaeological sites that have been discovered and (b) putting artefacts that have been extracted from archaeological sites into museums or archaeological exhibitions and thus shown to tourists (Mulaj, 2015). Ryan and Hsu (2011) point out that not all visits to sites of historic importance are motivated by an interest in things historical. They suggest that tourists visiting a museum are typically either (a) concerned with seeking key facts, (b) have a relaxation motive, (c) want social interaction and recreation with family members or friends or (d) are accompanied by children, as these are suitable places to visit, especially if the weather is too inclement to stay outdoors, such as on a rainy day. According to Yale (1998: 21), heritage tourism is tourism to sites inherited from previous generations and through the ages, which can imply anything from ancient buildings and artefacts to handicrafts and beautiful natural scenery. Heritage tourism concentrates on heritage and cultural attractiveness, and their attributes that have significance as tourism products (Poria et al., 2003).

Cultural tourism is tourism motivated by an interest in a region's culture or its people**.** But Richards (1996) points out that there are various attraction factors for cultural tourism: unique architecture, antiquities, museums and exhibitions, a good calendar of cultural events such as concerts, festivals and galleries, and good-quality hotels and restaurants serving good local cuisine.

Ecotourism has been defined by the International Ecotourism Society (TIES) as travel to natural sites with a commitment to preserving the environment and the well-being of local people (Watkin, 2003: 7). According to Weaver (2008), ecotourism is a form of tourism that is primarily based on natural attraction, and that can comprise cultural resources. It can, however, be said that ecotourism includes geotourism as it depends on views with beautiful natural ingredients that are frequented by tourists in order to enjoy natural landmarks and scenery.

From the definitions mentioned above, it can be concluded that the term tourism is associated with a number of other terms, e.g. cultural, heritage, archaeological, ecological etc. Since this study explores recreational visits to archaeological sites regardless of their motivation, the most suitable term here is archaeological tourism, and this will be used in the rest of this thesis.

3.3 Regional trends in archaeological tourism

In general, it is understood that foreign tourists visiting countries in the Middle East, especially Arab Gulf states, are few in number compared to states that encompass a diverse cultural heritage, and history and archaeological heritage sites, e.g. Jordan, Egypt, Tunisia, Turkey and Lebanon (Daher, 2007). Tourism in those countries increased in the 1990s, when most local tourist attractions and sites evolved and flourished through the establishment of different tourism festivals, recreational activity centres, resorts and shopping. According to the WTO (2012), non-resident tourist arrivals from Middle East countries to Saudi Arabia in 2011 numbered 11,098,731. But this figure probably refers primarily to people coming for pilgrimage (hajj), as the Saudi government does not issue tourist visas. Table 3.1 shows the countries of the Middle East and which of these countries issue tourist visas, as well as the direct contribution made by tourism to the gross domestic product (GDP) of these countries; in 2014, Lebanon (7.6%), Tunisia (7.4%), Jordan (6.2%) and Egypt (5.9%) saw the highest contributions to GDP. Note that the percentage for Saudi Arabia is probably mainly for pilgrims, not tourists. But if visas were available to international tourists wishing to visit Saudi Arabia, then there might be an increase in the contribution to GDP, especially as Saudi Arabia is rich in archaeological sites which could be of benefit to the country if optimally exploited within the scope of tourism organized in such a manner as to ensure the preservation of those places.

Table 3.1. Shows the countries of the Middle East, direct contributions to GDP (WTTC, 2015),and tourist visa restrictions.

Country	**2014**		**Tourist visa restrictions**
	Contribution of tourism to GDP (approx.)	**Percentage of GDP**	
Saudi Arabia	US$ 18.2 bn	2.4%	No tourist visas issued
Egypt	US$ 16.5 bn	5.9%	Issues tourist visas although some nationals do not require a visa, e.g. nationals from the Arab Gulf countries, while other nationals can visit for up to 15 days with a free entry-permission stamp on arrival, such as British nationals.
Lebanon	US$ 3.5 bn	7.6%	Issues tourist visas, though some nationals do not required a visa, travellers should be check visa requirements beforehand.

Table 3.1 cont.

Country	2014		Tourist visa restrictions
	Contribution of tourism to GDP (approx.)	Percentage of GDP	
Libya	US$ 2.2 bn	2.8%	There is ongoing conflict in Libya, so currently it does not issue tourist visas.
Syria	US$ 1.3 bn	4.6%	There is ongoing conflict in Syria, so currently it does not issue tourist visas.
Tunisia	US$ 3.6 bn	7.4%	No entry visa is required with the exception of Australian passport holders, who are required to obtain an entry visa.
Yemen	US$ 1.5 bn	3.5%	Issues tourist visas though some nationals do not required a visa, travellers should check visa requirements beforehand. Currently there is conflict in Yemen, so tourism is not recommended.
Jordan	US$ 2.2 bn	6.2%	Issues tourist visas though some nationals do not required a visa, travellers should check visa requirements beforehand.
Iraq	US$ 3.8 bn	2.6%	Requires an entry visa before arrival, with the exception of the Kurdish region, where tourists can get a visa, valid for 15 days, on arrival at the airport, though it cannot be used for travel elsewhere in Iraq.
UAE	US$ 16.8 bn	4.1%	Issues tourist visas.
Kuwait	US$ 3.0 bn	1.5%	Issues tourist visas.
Qatar	US$ 4.2 bn	2.0%	Issues tourist visas.
Bahrain	US$ 1.4 bn	4.2%	Issues tourist visas.
Oman	US$ 2.0 bn	2.6%	Issues tourist visas.

The experience of several other countries within the region provides insights into the economic development potential of the tourism industry and the market potential, were Saudi Arabia to prioritise its industry further. Jordan depends considerably on the revenue from its tourism industry, with archaeological, historical and natural resources contributing significantly to the GDP (Porter and Salazar, 2005; Fischer et al., 2009; Mahafzah, 2015). For instance, the government is responsible for developing sites in Jordan and is working hard to convert historical and antiquities sites into revenue generators, as well as seeking the necessary cooperation of various stakeholders in order to develop sites and reap the benefits (Porter and Salazar, 2005). The Jordanian government predominantly takes the initiative in the development of archaeological sites and leaves the development of a service economy to the community (e.g. hotels, restaurants, kiosks, tourist markets etc.), via some minor subsidies, in order to promote some competition between members of the community and also to provide jobs and sources of income for local residents (Porter and Salazar, 2005: 365-366). The Jordanian government, in the guise of the Ministry of Tourism and Antiquities, has endeavoured to identify potential markets for tourism, such as religious tourism, leisure and wellness tourism, environmental tourism, adventure tourism and volunteer tourism (Fischer et al., 2009: 18).

In the same area, Egypt is considered to be one of the most important historical and archaeological tourist destinations in the world as it boasts various historical sites that date back around 5,000 years (Homa, 2007; Helmy and Cooper, 2002). The presence of these sites offers opportunities to promote tourism related to archaeological heritage sites of ancient Egypt (Casson, 1974). It can be said that international tourism began in Egypt with Napoleon's expedition that opened up the country for research into the history and civilization of the Pharaohs (Berriane, 1999). Tourism in Egypt is represented by several sites, such as al-Hurghada on the west bank of the Red Sea and Arish on the Sinai Mediterranean coast (Berriane, 1999; Gouda, 2012). In addition, Pharaonic archaeological sites are marketed along with Nile Valley cruises (Berriane, 1999). However, Egypt is endeavouring to expand its tourist destinations whilst balancing growth with the need to conserve sites from the negative impacts that result from some tourists, especially with long-term tourism (Homa, 2007). In addition, developing further tourist areas will assist with the distribution of tourists across a wider zone of Egypt, and this will increase the potential economic benefits connected with the tourism industry (Homa, 2007). For example, the Egyptian government had a tourist project from 1994 to 2017 in the Sinai that aims to develop all tourist attractions and sites according to available and existing resources and to address distribution within a framework of integrated development (Homa, 2007). To achieve sustainable tourism development, this should be related to economic and social activities in order to support local citizens, conserve the natural and cultural environment and satisfy political targets (Helmy and Cooper, 2002: 515).

According to Helmy (2004: 485), Egypt is a developing country but it has managed to build one of the largest tourist industries in the Middle East. It has been facing the challenges of tourism planning since 1992, yet it has been able to meet these challenges by integrating sustainable development strategies in its economic development policies; tourism has even become the main source of foreign currency for the national economy at the present time.

Also in the Middle East, Yemen has many archaeological sites (Kersten, 2007; Mershen, 2007) and cultural heritage sites, in addition to its natural attractions, which should make it an attractive destination for international tourists (Mershen, 2007). But Yemen is currently affected by conflicts that deter international tourists from going to Yemen, and this fact could instead attract international tourists to the Najran region in Saudi Arabia, especially those tourists who are interested in visiting archaeological sites in order to see and enjoy inscriptions and rock art that tell the life stories of people in the past. Furthermore, the Najran region has a similar cultural heritage to that in Yemen, due to its proximity to Yemen, and that might offer an opportunity to invest in archaeological tourism in Najran as this region contains numerous archaeological sites dating back to different historical eras which could be an alternative for those tourists interested in Yemen, they could change their tourist itinerary to include Najran in Saudi Arabia.

Among the Gulf States, Oman has perhaps the most potential to become a tourist destination (Ritter, 1986). In 2012, Oman received more than two million inbound tourists (ONCSI, 2013). Langer and Car (2014) and Al Maashri et al. (2015) indicate that Oman has environmental and geographical diversity which includes magnificent cultural and natural landscapes to attract tourists, resulting in enormous growth in the tourism sector, which contributes to the GDP of the country. In addition, Oman contains many historical monuments, such as castles, forts, towers, and Museums (Al-Rabduwi, 2014; Henderson, 2015), as well as being rich in archaeological sites that indicate human activity and settlements in the region dating back to the Stone Age, which have significant value as cultural heritage for tourism (Al-Thagafy, 1991). Oman has endeavoured to diversify its economy through investing in the tourism sector, which is an important non-oil producing sector that contributes to growth in the national revenue (Winkler, 2007; Langer and Car, 2014; Khan and Krishanamurthy, 2016).

In contrast, Kuwait has not been completely open to inbound international tourists, but government agencies and stakeholders are endeavouring to providing leisure amenities for people who live in the country (Al-Thagafy, 1991). According to Joseph (2015), 90% of the spending on domestic tourism comes from Kuwaitis and residents of the country, and only 10% from abroad, which means that Kuwait's population is reviving this sector. In 2013, almost 73.3% of domestic tourism was leisure

tourism, while 26.7% was from tourism for business and conferences (Joseph, 2014). In Kuwait, it is predicted that the number of tourists visiting Kuwait will rise to 485,000, with an increase in spending of 4.6%, by 2023, and that opens up important opportunities for investment in this sector over the coming years (Joseph, 2014).

Also in the Arabian Gulf is the United Arab Emirates (UAE), which aspires to be a world leader in tourism (Henderson, 2006; Henderson, 2014) due to its natural and cultural heritage attractions as well as the availability of waterfronts, beaches and shopping sites that make it attractive for tourism (Henderson, 2006). Despite the presence of a small number of ancient buildings that still survive in the UAE (Stephenson and Ali-Knight, 2010), the government has an interest in converting the remaining ancient courtyard houses and buildings into cultural heritage sites in order to promote inbound tourism (Henderson, 2006); for instance, Hatta village in UAE was rebuilt to represent the UAE's cultural heritage and attract tourists (Orbasli, 2007). In addition, the Tourism Development and Investment Company (TDIC) in UAE anticipates 1.5 million tourists per annum coming to the cultural district in Abu Dhabi by 2018 after establishing this district, and this would add to the UAE's existing cultural and amusement activities for tourists (Ponzini, 2011).

In the UAE, "guests can join excursions into the desert, which is the scene for camel safaris, dune driving, sand skiing, exploring wadis in four wheel drive vehicles, sunset barbeques and visits to isolated Bedouin villages, forts and oases" (Henderson, 2006: 93). Dubai, in the UAE, is considered important for commerce and finance in the country (Henderson, 2014), particularly its shopping malls, conference facilities and sites for public tourism (Mershen, 2007). Hence Dubai is no longer dependent solely on oil revenues, as it has become an important tourist destination, not only for people in the Middle East but also Asia and the Indian sub-continent (Daher, 2007). This has made the UAE a good target for tourists from many countries. Tourists appreciate its indoor ski resort in the middle of the desert, its towers and malls.

Qatar has been planning, building and improving its infrastructure since 2004, when the summer festival of Qatar started in order to attract more local tourists, and Qatar is aiming to receive 50 million travellers per annum by 2015 (Daher, 2007). In addition, Qatar has sought to revive cultural and archaeological tourism through the design and construction and design of the a new National Museum, which is located around near the Emir's historic Palace; while the design of this museum is modern, it is inspired by ancient Bedouin life and the hot desert climate (Al-Mulla, 2014), in order to attract tourists to visit and enjoy the artefacts found within it. The basic role of a museum is to house and conserve artefacts found during excavations at archaeological sites and present those to tourists in an organised way (Al-Belushi, 2015).

Most Middle Eastern countries allow international tourists to enter on a tourist visa, usually without restrictions. Jordan and Egypt have a number of archaeological sites, such as Petra and the pyramids, respectively, where there has been investment in tourism, hence tourist visas are issued to allow international tourists to visit those archaeological sites, which brings financial benefits to them and gives a to boost to GDP. In contrast, while Saudi Arabia has many archaeological tourist sites, these are not much exploited for tourism, generally attracting only local tourists, as the Saudi government does not issue tourist visas to attract international tourists to these sites. This is likely the main obstacle to foreign tourists coming. The Saudi government does, however, issue other types of visas, which will be discussed in section 3.3.3.

3.4 Saudi archaeological tourism

Saudi Arabia is rich in archaeological sites attractive to domestic or international tourists. In general, these archaeological sites are not exploited to attract tourists, rather the stakeholders' main emphasis is on the maintenance and preservation of these sites. Whilst such maintenance and conservation are a positive point. due to these archaeological resources not being renewable, if they were exploited, as is the case in Egypt and Jordan, which see a financial return on similar sites, this would help to fund the amenities needed by tourists. Furthermore, visiting archaeological sites as tourists is instilled in young people, especially the domestic audience who want to know about the people who lived in the past and their simple lives, and this is evident from the buildings, artefacts and inscriptions that still exist at many archaeological sites.

Sadi and Henderson (2005) indicate that Saudi Arabia pays little attention to international tourism, despite the considerable untapped potential at sites with heritage, cultural and natural appeal. Alodadi and Benhin (2015) note that Saudi Arabia needs to diversify its economy, rather than relying solely on oil production. The same researchers point out that tourism is an important economic resource that should be utilized in Saudi Arabia, especially religious tourism which could have a significant impact on Saudi economic growth. This is supported by Yusuf (2014), who believes that Saudi Arabia must exploit international tourism by lifting the restrictions on tourist visa as this would have the greatest impact on Saudi's economy. In contrast, the majority of tourists at the present time are internal ones, and some others from Gulf Cooperation Council (GCC) countries as GCC nationals do not require a tourist visa. Seddon and Khoja (2003) point out that holiday periods in Saudi Arabia are the optimal time for tourism, especially for families. So, it can be said that stakeholders ought to exploit vacation periods by encouraging tourist visits to archaeological sites, given the abundance of archaeological sites in Saudi Arabia, and this would help to develop and preserve those sites. Srivastava (2015) refers to sites and activities suitable for archaeological

tourism that could raise awareness of the country's cultural and archaeological heritage, such as museums, ancient historical sites, archaeological sites, places of celebration and traditional festivals that have classical activities, e.g. folk dances.

3.4.1 Saudi tourist guide books

Although there have been previous tourism studies on Saudi Arabia, they do not mention tourist guidebooks on Saudi Arabia. There are, however, some guidebooks for tourists to Saudi Arabia, such as Lonely Planet and others. These guidebooks have been written to provide sufficient information about the destination country in order to assist tourists to get to places worth visiting. According to Lippman (2012: 115-116), there was one offered by a Saudi company covering a duration of two weeks of tourism in Saudi Arabia during the autumn of 2009, and their daily tourism plans are as shown in Table 3.2. This probably concurs with Walker et al. (2013: 242) who describe touring in Saudi Arabia over three weeks; the tour begins in the first week by going to visit historical and cultural landmarks in Riyadh, Al-Ula and Jeddah, while the final two weeks would be in the south-west of Saudi Arabia, including Yanbu, Taif, Abha, Jizan and Najran.

Table 3.2 Tourist destinations in Saudi Arabia to visit over two weeks, offered in autumn 2009 (Lippman, 2012: 115-116).

Destination
In the capital city, Riyadh, a tour of some sites as shown below: - The centre of Riyadh with historic sites such as the national museum, and Masmak Fort; - Dir'iya historic palaces; - The camel market; - Modern shopping malls located in the highest buildings of the city, known as Al-Mamlaka tower (*or the Kingdom Centre*) and Al-Faisaliah tower or centre.
Tour of Najran, which includes the visit of museum, historic castle, dam, and the old wells astride the caravan trade route.
A tour of Abha city that includes a local museum, surrounding mountains, a ride in a cable car from the top of the highest mountain, known as Al- Souda mountain, towards terraced mountainside villages and finally to Asir National Park.
Tour of Jeddah which including the visit of local museum, old city of Jeddah and its popular market, and then visit an open-air sculpture museum on the beach, thereafter proceed to the beach in order to eat at an outdoor restaurant.
Travel to the north-west corner, towards Al Ula, in order to visit the ancient city of Madain Saleh which includes astonishing and wonderful ruins dating back to the Nabateans, analogous to those found in Petra at Jordan, as well as the ancient railway station and remains of the Hejaz Railway that was destroyed in the First World War. In addition to, do a tour the desert surrounding this site in a four-wheel drive vehicle.
Travel overland towards a neighbouring area to the north called Al-Jouf; on the way visit Taima, which refers to the ancient kingdom of Midian through Aramaic Inscriptions at this site.
Tour Al-Jouf and the surrounding area that was formerly home to the Assyrians and Nabateans.
Fly to the Hail region to see rock inscriptions, the old pilgrimage routes, the crossroads of trade and multiple inscriptions, e.g. Jubba mountain.

In contrast, Flynn (2015) wrote a travel guide for people visiting Saudi Arabia, and it is limited to describing the best places worth visiting from the perspective of the author and giving information about those places, e.g. Mecca, Mada'in Saleh and the National Museum and other places in Riyadh. Unfortunately, this guidebook does not include all the main Saudi Arabian sites; for example, Najran is only mentioned in the context of the Riyadh National Museum, it indicates that this museum 'contains a bronze sculpture of a lion's head and claws dating back to the first century BC' (Flynn, 2015: 19), and some artefacts dating back to the eighth and ninth centuries BC that were found at Najran and in other cities.

Concentrating on the region of Najran as a case study, guide-books (Lippman, 2012: 115) suggest that tourists in Najran should visit the museum, the dam, the historic castle and the old wells straddling the caravan trade route.

Ham et al. (2004), Walker et al. (2007) and Walker et al. (2010) point out that half-day and full-day tours of Najran are offered by some hotels there, such as the Holiday Inn and Najran Hotel. The Holiday Inn can also arrange an excursion on a second day to Bir Hima or offer camping in the Empty Quarter desert to enjoy the wildlife (Ham et al., 2004: 137).

The guidebooks point out sites that are worthy of tourism in the region of Najran, concentrating on the dam, museum, Al-Ukhdud archaeological site and rock engravings, with perhaps the best example being the Bir Hima and surrounding archaeological sites. But those guidebooks do not address the ease of access to those sites, nor their proximity to base services such as fuel stations, restaurants, coffee shops etc., especially those with rock art and inscriptions. These factors will be addressed in this thesis.

3.4.2 Saudi tourist market segmentation

Tourist market segmentation can be defined or interpreted as a process of identifying and dividing the various segments of tourists or consumers into specific groups, in order to determine the characteristics and basic demands of each group (Kuo et al., 2012), which helps to form a heterogeneous market in a homogenous marketplace (Sarin, 2010) and thus develop plans for tourist marketing (Bloom, 2004). Through this definition it can be argued that tourist market segmentation in Saudi Arabia is divided into four segments:

1- Domestic tourists
2- Tourists from Gulf Cooperation Council states and neighbouring countries
3- Tourism related to pilgrimage (Hajj) and Umrah
4- Tourists from the rest of the world.

Through the divisions that have been divided for Saudi tourist segments it can be discussed here, as follows:

1- Domestic tourists:

This segment is the core of any country, as it is usually compatible in terms of culture, demands and behaviours. It occupies the top slot in terms of the number of tourists in Saudi Arabia (see Tables 3.3 and 3.4).

Table 3.3 Target tourist trips (expected track) – millions (SCTNH, 2015: 47)

Provenance of arrivees	**2015/2016**	**2019/2020**	**Average annual growth %**
Total domestic tourists	28.4	40.5	6.4
Travellers from GCC countries	8.5	11.6	6.2
Travellers from other countries	12	17.2	5.4
Total travellers inbound	21.5	28.29	5.4
Total travellers inbound (domestic + inbound)	49.9	69.4	6.0

Table 3.4 Tourism growth forecasts (expected scenario) – millions (SCTNH, 2002: 50)

Tourism trips forecast (expected scenario)					
	Base year estimate 2000AD	2005 AD	2010 AD	2015 AD	2020 AD
Domestic	14.5	16.8	20.6	26.2	34.4
GCC	3.0	3.4	3.7	4.1	4.7
Neighbouring Arab countries	1.7	2.1	2.4	2.8	3.2
Other international	1.5	1.7	2.0	2.5	3.0
Total international	6.3	7.1	8.1	9.4	10.9
Total all tourists	20.8	23.9	28.7	35.6	45.3

2- Tourists from Gulf Cooperation Council States and neighbouring countries:

These occupy the top slot in terms of the number of international tourists to Saudi Arabia, for the Hajj and Umrah, visiting friends or shopping; for example, the majority of the population of Qatar, Bahrain and Kuwait come to Saudi Arabia for shopping, especially during holidays and events. Table 3.5 shows the intra-GCC movements of citizens.

Table 3.5 Intra-GCC movements of citizens in 2012(GCC, 2013)

From	To						
	Total	Kuwait	Qatar	Oman	K.S.A.	Bahrain	U.A.E.
U.A.E	958,916	49,458	116,293	361,228	384,952	46,985	-
Bahraini	2,657,102	163,784	102,657	22,392	2,257,496	-	110,773
Saudi	7,526,282	2,160,300	573,394	73,400	-	4,213,498	505,690
Omani	1,162,976	19,785	100,781	-	232,361	47,301	762,748
Qatari	1,181,755	35,862	-	11,423	879,043	115,829	139,598
Kuwaiti	2,606,832	-	58,327	18,892	2,074,049	282,414	173,150
TOTAL	16,093,863	2,429,189	951,452	487,335	5,827,901	4,706,027	1,691,959*

* Data 2006

In addition, as is evident from table 3.6, in 2000 there were several international market segments in Saudi Arabia (SCTNH, 2002: 21). As well as the main purpose of a trip, significant numbers of arrivals were for the Umrah, the Hajj, business or visiting friends or relatives, whereas the vacation/ leisure segment occupies less than 5% (see Table 3.7). The Gulf Cooperative Council occupies the largest segment of inbound tourist or visitors to Saudi Arabia.

Table 3.6 Tourism market segments: Trips in 2000 AD (SCTNH, 2002: 91)

Purpose of trip	Domestic	GCC	Neighbouring Arab countries	Other international
Hajj	440,000	437,000	709,000	218,000
Umrah	4,000,000	507,000	774,000	989,000
Vacation/leisure	6,400,000	249,000	10,300	3,000
Visiting friends and relatives (VFR)	2,800,000	987,000	66,000	43,000
Business & government	700,000	350,000	84,000	254,000
Health	50,000	379,000	90,000	-
Shopping	50,000	99,000	2,500	-
Other	100,000	41,000	2,600	1,000
Total domestic	14,540,000	3,049,000	1,738,400	1,508,000

Table 3.7 International market segments by purpose of trip during 2000 AD (SCTNH, 2002: 21)

Trip purpose	Estimated numbers of visitors (thousands)	Market %
Hajj	1,364	21.7
Umrah	2,270	36.1
Vacation/leisure	262	4.2
VFR	1,096	17.4
Business & government	688	10.9
Health	101	1.6
Shopping	469	7.4
Other	45	0.7
Total inbound international	6,295	100.0

From the above, it is clear that some sources date back to 2002, in particular with regard to the purpose of the trip, thus SCTNH needs to update their data and carry out new field studies to benefit scientific research, because those who are responsible for these statistic important statistics need them for future planning in tourism.

3- Tourism related to pilgrimage (Hajj) and Umrah:

This segment has received great attention from the government; it includes all Muslims who intend to perform the Hajj or Umrah. However, analytical studies conducted on the national strategy for development of the tourism sector in Saudi Arabia indicate that pilgrimage is a significant purpose for visiting Saudi Arabia (SCTNH, 2002). Nearly 1.4 million Muslim pilgrims came from outside the country to perform the Hajj in 1435 AH (2014 AD), while the total number of pilgrims was 2,085,238 (Central Department of Statistics & Information, 2014). Furthermore, according to the statistics for pilgrimages (2014: 19), Egypt provided the highest proportion of pilgrims (39.5%) to Saudi Arabia, followed by Pakistan (24.7%), while the lowest percentages are from Algeria, Palestine, Tunisia and Guinea (2.0%).

4- Tourists from the rest of the world:

This segment is one of the most important tourist segments that supports GDP, but for many years this segment has not received the attention required by the Saudi government to attract international tourists, despite the clear tourism potential of archaeological sites that are worth investing in in this field. However, from the Saudi government's vision stemming from a meeting held on 25 April 2016, in future years, until 2030, stakeholders plan to give more priority to domestic tourists along with international tourists by facilitating the issuance of tourist visas. This vision will boost the future of Saudi tourism, especially if stakeholders exploit archaeological tourist sites well.

3.4.3 Saudi tourist visas

The Kingdom of Saudi Arabia (KSA) is one of the states in the world which it is not easy to enter without a visa, and the type of visa depends on the purpose of entry, e.g. visiting the holy places of pilgrimage and Umrah, but for those people who want tourism there is no Saudi tourist visa. However, there are several kinds of visa that allow entry into the territory of Saudi Arabia, such as hajj, umrah, visitor, work or business (Walker et al., 2007).

From 2001 to 2006, the Saudi Arabian authorities started to issue temporary tourist visas, but only for people traveling as part of a group (no less than four people) organised by a recognised tour company (Walker et al., 2007: 367). These were issued under Saudi sponsorship, e.g. the 'Discover Saudi Arabia' programme (Walker et al., 2007: 367). However, at the current time, there are no tourist visas and this would be a hindrance to the international market segments. Tourism will remain confined to Saudi citizens and foreigners who are in Saudi Arabia as visitors or resident visitors, i.e. businessmen and diplomats' employees etc.

According to SCTNH (2015: 56), Saudi Arabia has four categories for organizers of tourism trips inside the country, which are:

1- Local trips regulator (entitled to work in a certain area in the Kingdom of Saudi Arabia)
2- Internal trips regulator (entitled to work throughout the Kingdom of Saudi Arabia; this service is only provided for tourists residing inside the kingdom)
3- Regulator of trips for inbound tourism (entitled to provide a service for tourist arrivals and entitled to issue tourist visas), but in 2010 the Saudi Commission for Tourism and National Heritage made a decision to stop tourist visa permissions.
4- Regulator of trips for outbound tourism (entitled to provide a service for tourists travelling outside Saudi Arabia)

In some cases, countries that impose visa restrictions on international travellers damage their own domestic economy (Neumayer, 2010). The world has two types of visa restrictions and Saudi Arabia has the less common type. The first type is the usual or common visa that must be applied for before travelling. The second type is less common and can be applied for on arrival at the state border and the procedure for getting it is quite simple (Neumayer, 2010: 173). For example, a transit visa for Saudi Arabia is valid for three days and is issued to people who prove that they are intending to transit through Saudi Arabia as there is no other way to get to their intended destination (Walker et al., 2007: 367).

Al-Khedeiri (1987) determined the key obstructions to tourism between 1980 and 1987. He noted that the scale of international tourism in Saudi Arabia was small and estimated that it was only a small part of the tourist market in the Middle East. The main causes identified for the minimal international inbound tourism are as follows:

(1) The lack of any obvious coherent and detailed tourism policy with regard to national priorities vis-à-vis the development of international tourism

(2) Visa restrictions

(3) The absence of tourism information and effective promotion

(4) Insufficient accommodation and amenities at tourist sites and inadequate accessibility

To investigate this, Mufeed and Gulzar (2014) carried out a study and the results point out that there is a need for the Saudi government to grant tourist visas as other Arab countries do in order to give foreigners the opportunity to explore and Saudi Arabia and see it as a tourist destination. Also, regarding tourism in Saudi Arabia, Mufeed and Gulzar (2014) note that little tourist information is

available and sometimes nothing at all. Despite its development and growth in Saudi Arabia, it can be argued that archaeological heritage tourism has not yet to reach its potential because more work is still required on tourism, especially in the Najran region.

In general, Saudi Arabia is not the only Middle Eastern state that imposes restrictions on visas (see Fig. 3.1). From Figure 3.1, however, it can be seen the majority of countries have fewer restrictions than the Arab Gulf Cooperation Council (GCC), and some of its neighbouring countries. This might indicate that it is often easier to visit those countries which have fewer visa restrictions, and this can only benefit those countries' GDP.

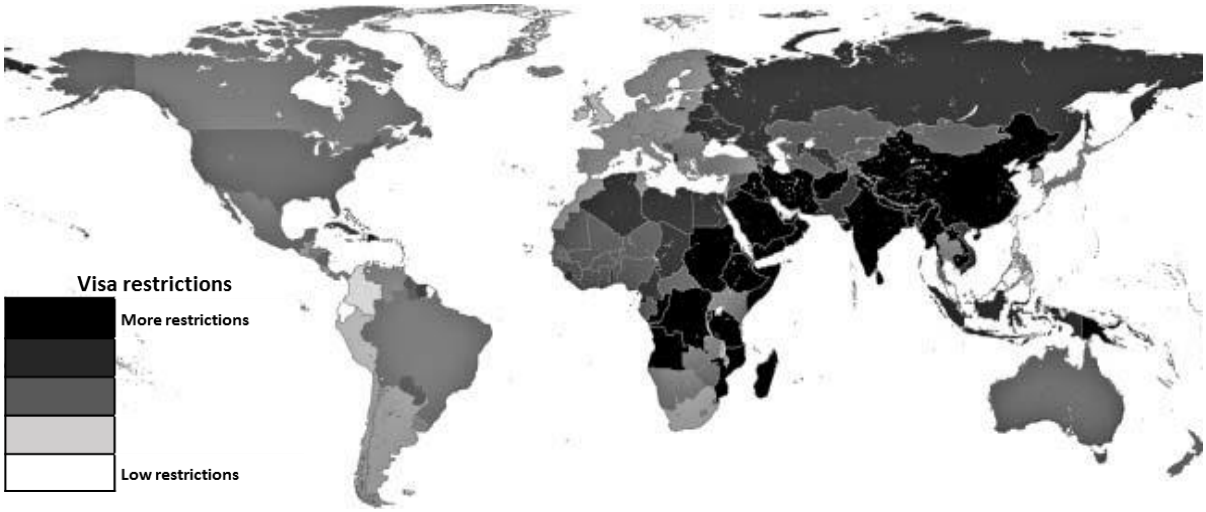


Figure 3.1 Visa restrictions imposed on the nationals of other countries (darker shading means more restrictions) (Neumayer, 2010: 174).

In addition, the majority of travellers who come to Saudi Arabia from around the world come on a pilgrimage or Umrah visa and commonly spend their time in holy places. Figure 3.2 shows the average annual number of inbound tourists to Saudi Arabia, based on 2007 to 2011 tabular data from (WTO, 2012) imported into ArcGIS and mapped..

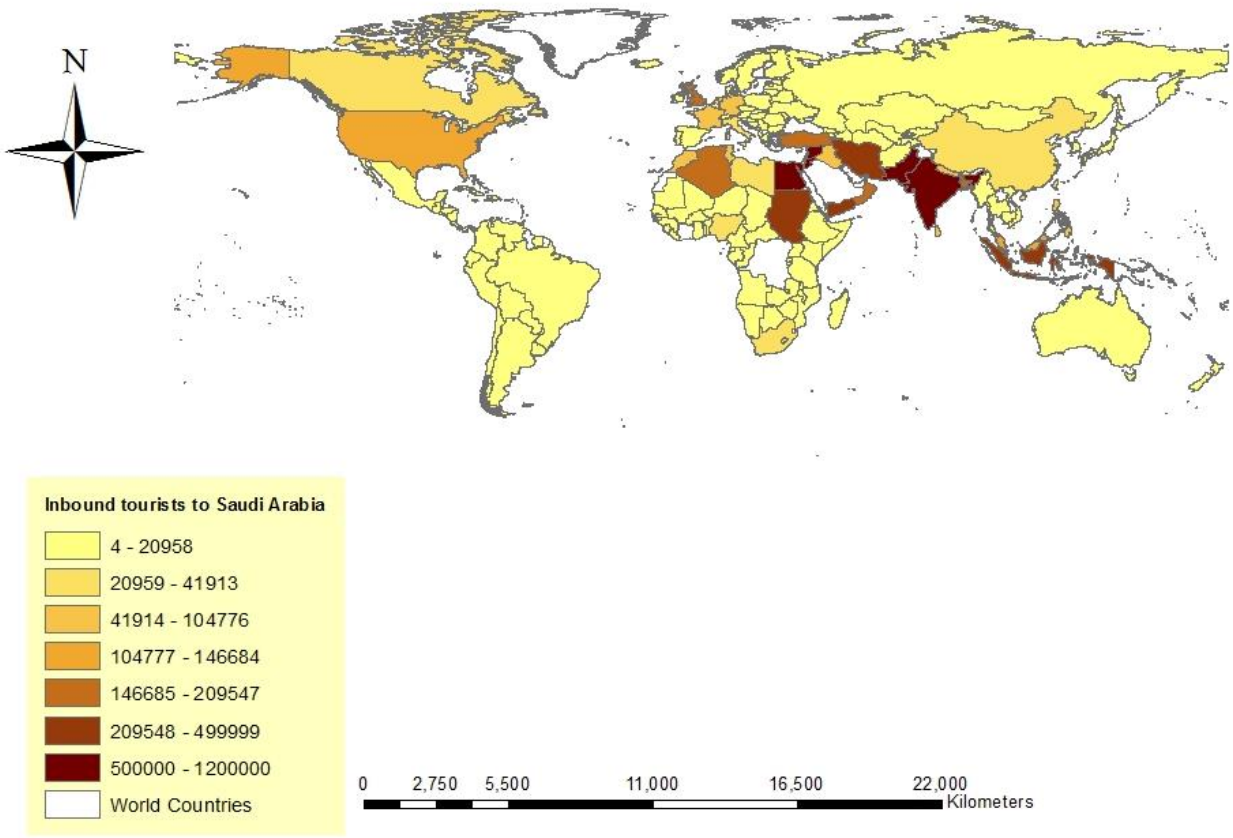


Figure 3.2 Average number of inbound tourists to Saudi Arabia per year, 2007-2011 (source: WTO, 2012).

However, from the categories of Saudi visas, no Saudi tourist visas were issued and so the whole data set from UNWTO might depend on pilgrimage visas.

3.4.4 Factors influencing cultural heritage tourism in Saudi Arabia

There are numerous factors that influence tourism in Saudi Arabia. These factors are mainly determined by the behaviour of tourists and resource attractions for those sites. Perhaps the most prominent factors that impact on cultural tourism are Saudi Arabian Islamic law, physical factors, holiday periods, existing religious sites and other famous sites mentioned in the Quran, such as the Al-Ukhdud site (Aldakhil, 2007).

The most important factor required by members of Saudi society for the development of tourism is a commitment to the Islamic rules and social traditions that prevail in Saudi society (SCTNH, 2010). Saudi society is conservative and adheres to habits and traditions that are compatible with other Muslim countries. There are strong family values; for example, area entries to enjoy the country are

for families, non-families are not permitted. The dress code is also strict. Saudi citizens wearing Saudi dress is prevalent in society, and women wear the Islamic frock and hijab. And generally, men and women are segregated at events and sites such as museums (Zamani-Farahani and Henderson, 2010). In addition, discotheques and bars are banned from selling liquor due to religious requirements and they must commit to stipulations about behaviour, dress, food and prayer (Zamani-Farahani and Henderson, 2010). These restrictions greatly reduce Saudi Arabia's potential for tourism while other Islamic countries do not have such restrictions, e.g. Jordan, Egypt and the UAE benefit from the tourism sector, especially by attracting international tourists who bring economic benefits to the budgets of those countries. In addition, Oman seeks to diversify the current economic activities relating oil and gas by promoting tourism over coming decades (Khan and Krishanamurthy, 2016). But Saudi archaeological heritage tourism is affected by a number of factors, as outlined in the next sections.

1- Presence of holy places

Saudi Arabia has the most sacred places in the Islamic world, which are Makkah and Al-Madinah. The existence of these sites is one of the key factors influencing tourism in Saudi Arabia, as many Muslims come from around the world to visit them. However, the Muslim population worldwide is growing, and a consequence is mass travel to and within Saudi Arabia, which requires careful management of the growing volumes of travellers, including co-operation between the commercial and public sectors for the expansion and modernization of public transport, accommodation and other facilities (Shinde, 2010, Henderson, 2011).

Pilgrimages have become a facet of Islamic tourism, whereby Muslims agreed that a pilgrimage at the present time includes travel for worship and enjoying leisure facilities (Eickelman and Piscatori, 1990; Bhardwaj, 1998; Battour et al., 2010; Ryan, 2015). This supports the exploitation of neighbouring touristic and holy places that have the potential to enhance the economic diversification of the country. Archaeological sites and historical places can offer special economic diversification for the country, especially remote locations which have historical value as acknowledged by the Ministry of Economy and Planning (MOEP, 2005), which acknowledges that oil reserves are limited while tourism has great potential as an economic tool. However, the Saudi Commission for Tourism and National Heritage (SCTNH) concentrates on domestic travel outside the peak pilgrimage period and careful exploitation and development of cultural and natural heritage resources (Zamani-Farahani and Henderson, 2010; Henderson, 2011). In support of this, in 2008 a new strategy was formulated which anticipates slight growth via targeting shorter-stay pilgrims (hajji) and encouraging them to extend their visit in order to enjoy more time in the country (Henderson, 2011). This strategy would allow pilgrims to enjoy their time after Hajj and Umrah,

because their visit will probably not be repeated due to Saudi Arabia having strict quotas for visa numbers for religious visitors in order to have manageable levels and provide satisfactory services.

The presence of the holy places is relevant to all tourist market segments, whether domestic tourists, Gulf tourists or international Muslims due to these places being destinations for all Muslims but with visas being required for international visitors.

However, local residents do not require any permit for Umrah, while for pilgrimage local residents require a permit, as do those from the Gulf Cooperation Council (GCC). Usually, those wishing to perform Hajj can get a permit once every five years; this applies solely to Saudi residents in order to provide an opportunity for others, whether domestic or coming from abroad.

2- Human culture values

Cultural tourism puts emphasis on people who want tourists to visit historical and archaeological landmarks, e.g. Al-Ukhdud in the Najran region of southern Saudi Arabia, Madain Saleh in the north of Saudi Arabia, the province of Dir'iya and Musmak Palace in the Riyadh area, Uhud mountain in Medina, Qara mountain, the Sahod Palace and Caesarea market in the eastern region (SCTNH, 2010). In 2009 the Saudi Commission for Tourism and Antiquities (SCTA) studied the sociocultural influences of tourism development on local Saudi communities and one of the recommendations of they made was to pay more attention to historical and archaeological monuments and provide tourist services at these sites given the proportions and numbers of tourists. The sample size of this study was 415 people, and the percentages of tourists to these sites are shown in Table 3.8, below.

Table 3.8: Tourists percentages for archaeological and historical landmarks in Saudi Arabia (SCTNH, 2010)

Name of place	Region	Percentage
King Abdulaziz historical centre	Riyadh	1%
Traditional houses in Asir	Asir	1%
Tuwaiq Palace	Riyadh	1%
Caesarea market	Al-Ahsa	1%
Al-thumamah	Riyadh	2%
Old Jeddah	Jeddah	2%
Al-janadria	Riyadh	4%
Joatha Mosque	Al-Ahsa	5%
Sahod Palace	Al-Ahsa	5%
Al-Ukhdud	Najran	11%
Ibrahim Palace	Al-Ahsa	6%
Madain Saleh	Al-Ula in Medina	16%
Uhud mountain	Medina	16%
Qara mountain	Al-Ahsa	17%
Dir'iya	Riyadh	22%
Musmak Palace	Riyadh	23%
Quba Mosque	Medina	24%

Archaeological tourism has contributed to raising the cultural level among members of the community and this highlights the importance of some of the archaeological and historical sites. The establishment of traditional cultural festivals at archaeological locations contributes to the process of cultural exchange between local communities, and that may help in providing information to visitors about the cultural heritage of the kingdom (SCTNH, 2010)

This factor might impact on all tourist market segments in Saudi, because it adds a kind of cultural value for those tourists visiting Saudi archaeological heritage sites and other attraction areas. But international tourists do not have a chance to engage in cultural exchange in Saudi as that requires a tourist visa; as mentioned in Section 3.3.3, there are no tourist visas in Saudi Arabia, except for those residing in Saudi Arabia for work or who have other types of visa, who can visit tourist sites and experience the culture of the country.

3- Holiday season

Saudi Arabian holiday periods depend on religious festivals and school holiday seasons, as well as natural and economic factors (Aldakhil, 2007).

Religious factors play an important role in holidays in addition to the seasons. For example it is very hot in summer. In the past there were three holidays, Eid alfitr, Eid al-Adha and the summer vacation, but in 2007 the Eid al-Fitr holiday was included within the summer holiday and this means that the month of Ramadan has become part of the main summer holiday (SCTNH, 2011) for students and some state employees such as teachers. But for the private sector and government agencies, in general, there are holidays of between 12 and 20 days in the religious seasons, such as pilgrimage time and Eid Alfitr, in addition to 36 days during the year, as Table 3.9 illustrates.

Most people prefer to travel with their family; therefore, the majority take annual leave during the school holiday (Aldakhil, 2007; SCTNH, 2010). The length of the school holidays allows people to travel with their family to discover other regions and countries, including archaeological or historical sites (SCTNH, 2010).

Table 3.9: Vacation system in Saudi Arabia

Duration and vacation	Eid Alfitr	Eid Al-adha	National Day	Half-year Vacation	Vacation in the second mid-semester	Summer vacation
Length of government vacation	10 days	10 days	1 day	-	-	The annual vacation is 36 days and employees can take it all at once or spread it across the year
Length of private sector vacation	3–7 days	3–7days	1 day	-	-	The annual vacation is 36 days and employees can take it all at once or spread it across the year
Length of school vacation	9 days within the summer vacation	12 days	1 day	9 days	9 days	15 weeks

The holiday season factor primarily affects the domestic tourist segment, because the majority of residents cannot travel for tourism between regions in Saudi Arabia and cannot enjoy those tourist sites worth visiting unless it is the holiday season; this is because, on weekdays, adults are busy with their work, and children and the young are at university or school until the holiday season.

4- Physical infrastructure

Physical infrastructure is one of the factors affecting archaeological tourism because a lack of infrastructure makes tourists go somewhere else with better services and facilities. Infrastructure includes accommodation, restaurants, markets and forms of transportation, amongst other services (Aldakhil, 2007). Al-Thagafy (1991) concluded that a common reason given by people for travelling outside Saudi Arabia during their vacation is the provision of better services and facilities. Aldakhil (2007) concluded that the number of tourists visiting cultural sites was less than to natural and recreation sites. This was because cultural areas are not served well, whether by infrastructure or services. In contrast, natural sites have better services and attractions within them. Access to some islands or archaeological sites can sometimes be difficult due to the lack of facilities in remote areas

(Aldughaishem, 2013). In Saudi Arabia, tourist services and facilities vary from region to region (Al-Ghamidi, 1996).

This factor influences all Saudi tourist market segments, since it is not possible for to be attracted to visit tourist areas, and spend quality time there, in the event of any weakness or lack of basic vital services at those sites, such as coffee shops, paved roads, hotels and so on. The basic infrastructure at tourist sites is important, especially for tourists who are coming from outside the region.It is considered to be a basic need when planning a trip for tourism.

Archaeological tourism, however, involves not only the archaeological attraction of sites but also services. In this study, it will be seen as a priority to determine where to locate and develop suitable archaeological tourist infrastructure by using multi-criteria GIS. This is in order to provide services at archaeological sites, but also to ensure that sites are not negatively affected by a range of factors that might lead to the destruction of archaeological features, as has happened in Petra (Comer and Willems, 2012).

3.3.5 Domestic tourism in Najran

According to several reports conducted by the Saudi Commission for Tourism and National Heritage (SCTNH) from 2008 to 2014 during the festivals and holiday periods, the majority of people come to the Najran region to visit their families and for holidays, while a minority of people come to Najran in order to work or for conferences. According to the SCTNH (2014), for 39 % of visitors, the purpose of their presence in Najran is to visit friends and family, while 25% of visitors come as to tourists, 20% are there to attend a festival was held in summer, for 13% the purpose is shopping, and those who attend for work are around 2%. The overall average daily spend per person is around 889 riyals (£150), including eating, drinking, accommodation and shopping.

Analytical studies have been conducted in relation to the national strategy for development of the tourism sector in Najran and to expand the number of tourism market segments, with preliminary results as follows (SCTNH, 2007):

(A) Priorities of market segments in the national strategy for development of the tourism sector:

These priorities can be split into three groups, which are as follows:

- **Market segment priorities (A):**

- Domestic tourists
- Tourists from Gulf states and neighbouring countries

- Tourism related to pilgrimage (Hajj) and Umrah

❖ **Market segment priorities (B):**

- Local market segments, such as married couples on honeymoon
- Shoppers from neighbouring countries

❖ **Market segments priority (C):**

- Residents of Saudi Arabia and the Gulf states who have a higher income
- Global market segments in industrialized nations that have desires for cultural, historical, natural, environmental and marine trips
- Specific market segments, such as tourism meetings, incentives, conventions and exhibitions
- Citizens and visitors from neighbouring countries who are interested in cultural sessions, medical treatment and sports events

(B) Current market segments and visitors expected in the Najran region:

❖ **Local market**

More than half of the visitors to Najran region are from Najran but they are often living in other regions of Saudi Arabia and come to visit their friends and family at holiday times. However, the majority of visitors meeting family and friends prefer to visit archaeological and historical sites, but further studies are required to confirm this point (SCTNH, 2007).

Sometimes visitors include transit passengers arriving from neighbouring regions who spend a night or two in Najran region, while others go unnoticed. In addition, employees in Sharurah province are an important segment in Najran, where they come for recreation and entertainment, and stay in hotels or furnished apartments in order to enjoy Najran city (SCTNH, 2007).

❖ **Foreign markets**

The foreign market consists of two kinds of market (SCTNH, 2007):

- **Markets of the Gulf Cooperation Council (GCC), Arab countries, Hajj and Umrah:**

Najran probably benefits from people who intend to go to Makkah for pilgrimage or Umrah, from countries such as Yemen or from a nearby region called Abha; especially when they do not fly from Abha. But this segment cannot give significance to Najran as Yemen visitors may come from other regions to Saudi Arabia, such as Jazan as it is located on the main road to Makkah. However, the markets of the Gulf Cooperation Council (GCC), Arab countries, Hajj and Umrah could be

considerable for the Najran region, especially if the SCTNH uses advertising and promotes the archaeological sites in Najran, particularly sites such as Al- Ukhdud that are mentioned in the Quran.

- **Market for those residing in Saudi Arabia**

In this aspect, there some hotels that offer day tours for guests who stay in a hotel, such as the Holiday Inn or the Hyatt Najran hotel. They go on trip in Najran region to visit the Emirate's old palace, the People's Market, Najran Dam, the Museum Of Najran and the Al-Ukhdud site. This market targets inhabitants who live in other regions, come to Najran as guests and stay at a hotel for a few days.

- **International markets**

International markets host people who attend Najran for meetings, incentives, conventions and exhibitions. According to SCTNH (2007), this kind of market is not expected to be a tourist attraction for the business market. However, after Najran University was established it was argues that there would be an incentive for this market, due to the presence of interested scientists attending scientific conferences.

3.4.6 Status of the local population , and their attitudes towards tourism

Community acceptance of tourism is an important factor in stimulating tourism (Lazrak, et al., 2009; Maskey et al., 2007).It is essential that local communities collaborate and participate in development of the tourism sector to ensure tourism's sustainability (Landorf, 2009, Abuamoud et al., 2014), so local communities need to learn vital necessary skills which will help them to run their tourism businesses and deal with tourists well (Hayes and MacLeod, 2007; Mbaiwa, 2005).The positive attitudes of some local people in Najran towards tourism clearly show through their work in traditional markets, such as the popular market, and the daggers market, where visitors buy artefacts and keepsakes from Najran or neighbouring areas. But the number of workers in the artefacts industry is finite in Najran, as they are mainly elderly, based on the author's fieldwork on 2016, so stakeholders involved in Saudi Arabia's tourism sector should encourage young people and train them in these crafts so they can transfer skills to future generations and save them from extinction.

According to Sadi (2016: 776), although the SCTNH is working to train those working in hospitality and tourism to meet the expected rapid growth of 5-star hotels by 2020, there is still a shortage of manpower and local citizens working in the tourism industry, so he suggests training local citizens in the field of tourism and encouraging them to participate more in tourist handicrafts, in addition to other tourist professions, to show the heritage of their ancestors to coming generations. In the meantime, it is important to ensure good relations with tourists and visitors and make a good impression on them, especially international tourists, so that they will return or post good reports. Therefore, awareness of the local community is one of the factors considered to be more important for tourist destinations (Alqahtani and Saba, 2014); this can be improved by encouraging local communities to contribute to the development of tourism (Cater, 1993; Nunkoo et al., 2013), as they are affected by any negative consequences for national development (Nunkoo et al., 2013). For example, Jordan and other countries have attractions based on the tourism sector, and their local communities have adequate awareness of the importance of tourism (Maisel and Shoup, 2009) as they have good cooperation with their governments that seek to encourage tourists to visit tourist attractions. However, Mustafa and Tayeh (2011) note that the marketing of nomadic culture in Petra is prominent and has become a source of income, by using a traditional Bedouin camp, while young people have begun trying to emulate Western culture, whether in manners or dress. But from the perspective of Hijazeen (2007), this change could be positive, especially if the purpose is to learn a foreign language and make it easier to deal with international tourists.

According to Mustafa and Tayeh (2011: 90–91), there are many negative effects that can affect tourist sites and their relics, e.g. the site at Petra. An influx of tourists to such sites, such as random climbing and inappropriate clambering over rock inscriptions, leads to damage to archaeological features, especially from the sweaty hands of tourists and visitors resting on site walls, as they leave fat deposits causing the disappearance of rock characteristics, such as inscriptions. This has happened in some sites at Petra in less than ten years (Lubick 2004). Furthermore, the random distribution of kiosks which used to sell refreshments and souvenirs had a negative impact on the site at Petra due to waste and rubbish being dropped and thrown at the site, e.g. empty cans (Mustafa and Tayeh, 2011). This could be addressed in Najran through educating the local community and via the provision of banners at potential archaeological tourist sites stating the importance of preserving those places and the development of paths dedicated to visitors between the features of archaeological sites to make it easier for visitors to see those without affecting them negatively. In addition, visits to archaeological sites by local communities could help to raise their awareness of sites (Nyaupane and Timothy, 2010) and encourage them to respond positively to tourists who visit those areas.

3.5 Tourism planning for archaeological heritage sites

Archaeological heritage sites are one of the most important resources for supporting tourism, but they need appropriate tourism planning. Comer and Willems (2012) show that archaeological tourist sites are of value in terms of both scientific and original material content. Tourism planning is a first step that can benefit archaeological heritage resources, it is enacted through the development of archaeological sites and configured for tourists without changing the archaeological character of a place. Specific work includes the prevention of any negative consequences resulting from over-exploitation and striking a balance between tourism supply and demand (Qissema, 2010). Murphy (1985) defines tourism planning as the organization of touristic areas for economic, social and environmental benefit through development. Others (see Al-Jallad, 2002) point out that this is a special form of economic and social planning. The author raises the issue of the nature and motives of tourists and their activities, and he indicates that tourist planning is of primary importance when thinking about places to visit, with good accommodation and transport facilities being extra incentives for visitors. Tourism planning is mainly based on maintaining the value of tourist sites, which depends on the attractiveness of natural and/or cultural resources.

Archaeological heritage sites that lack planning and organisation for visitors may be subject to destruction and vandalism due to their fragility though they are an irreplaceable resource (Wager, 1981). Accordingly, appropriate planning for the development and improvement of such sites will help to sustain them for future generations. In addition, proper assessment of archaeological sites by stakeholders can help to identify appropriate sites for investment, attract tourists and thus stimulate economic development. Planning also contributes to the sustainability of all tourism sites (Jamieson, 1998; Helmy and Cooper, 2002).

As noted by Dutton and Hall (1989), there are some preconditions and strategies that must be taken into consideration in order to achieve a sustainable approach to developing tourism planning. This is in line with Hall (2000: 241) and Al-Tai (2001: 347–379) who discuss the aims of tourism planning, which should include:

• Co-operation between various tourism-related sectors

• Striking a balance between economic benefits to stakeholders in the host community and preservation of the environment (natural and cultural resources), so as not to deter mass tourism or destroy archaeological heritage sites and natural resources;

• The conservation of tourism resource's value through the establishment of a tourism development strategy in line with the social and cultural conditions of the host community;

• The development of infrastructure and the provision of recreational facilities for visitors, tourists and locals equally;

• Satisfying tourists' desires.

In addition, there is now a consensus that effective tourism planning reduces any negative impact on archaeological heritage resources (Hall and McArthur, 1998). According to Qissema (2010: 144–145), the advantages of tourism development planning for archaeological and environmental sites are as follows:

• Preserve archaeological and historical sites and protect them from destruction and degradation;

• Improve the aesthetic image of the environment;

• Align the capacity of archaeological heritage sites with the numbers of tourists wanting to visit;

• Develop tourism infrastructure.

Tourism planning for archaeological heritage sites results in sustainable tourism with economic, social and environmental benefits for the host community (Qissema, 2010).

Due to the importance of tourism planning for archaeological heritage sites, the next subsection concentrates on tourism planning in Saudi Arabia.

3.5.1 Saudi Tourism Planning

The significance of tourism to Saudi Arabia was mentioned for first time in the Fourth National Development Plan for the period 1990–1995 (Aldakhil, 2007). In 2000, the Supreme Commission for Tourism (SCT) was established, whose core objective was to take responsibility for developing a foundational framework and structure for the tourism sector and improving its efficiency in order to boost investment opportunities, develop human resources and create new job opportunities for young Saudi citizens (SCTNH, 2015a). In 2003, the SCT became responsible for everything related to the antiquities sector, alongside its responsibility for the tourism sector which was merged with the Antiquities Agency by SCT due to the significance of antiquities as a main component of tourism (SCTNH, 2015). According to a resolution of the Saudi Cabinet in 2008, the SCT was renamed the Saudi Commission for Tourism and Antiquities (SCTA) (SCTNH, 2015a). In June 2015, the Saudi Cabinet agreed to change the name of the Saudi Commission for Tourism and Antiquities (SCTA) to the Saudi Commission for Tourism and National Heritage (SCTNH) (SCTNH, 2015a).

Saudi's tourism potential could be beneficial to the nation's economy via optimal exploitation of the benefits of the country's natural resources and archaeological and historical sites. This requires the SCTNH to boost the role of the tourism sector through the development of sites and their preservation, the development and maintenance of antiquities and promoting the contribution of antiquities to cultural and economic development.

Since it was established, the Saudi Commission for Tourism and Natural Heritage (SCTNH) has worked to develop tourism for internal tourists but still needs to do more work to develop many sites, e.g. archaeological and historical sites which lack many services to attract tourists. In addition, inbound tourism has until now been excluded from the tourism plan because there are no tourist visas for Saudi Arabia see section 3.4.2.

In general, tourism in Saudi Arabia has developed somewhat. But it still faces some hurdles, such as the lack of services, especially at archaeological heritage sites, and no clear strategies for this type of tourism development which require many of data to construct a database (see Table 3.7 below).

Table 3.10: SCTNH strategies for tourism planning in Saudi Arabia, that supports archaeological tourism in this thesis (SCTNH, 2002; SCTNH, 2015)

Strategies
* Encourage investment to upgrade existing tourist facilities and convert and adapt the uses of antique heritage buildings
* Give priority to the protection and sustainable use of natural, built and cultural heritage resources in tourism planning and general product development.
* Inventory of archaeological, historical sites and architectural heritage in coordination with the authorities concerned in order to protect them
* Development of elements of tourist attractions
* Provide technical and financial support to the organizers of events and tours
* Provide all necessary information and data about potential tourism sites for investors to enable them to engage in effective investment planning
* Improvement and development of the tourist destination database – for internal and external users
* Inventory of tourism resources

The strategic plan of the SCTNH is to develop the tourism industry through collaborative work with the private sector in order to promote investment in tourism. This objective, along with the other strategic objectives set out in Table 3.10, endeavours to promote sustainable tourism in Saudi Arabia and to attract more tourists.

According to the (SCTNH, 2002: 21), the private sector partners with the government in the development of tourism and plays a key role in establishing tourist facilities in order to boost investment in this sector. Tourism in the government's ninth plan, 2010-2014, in Saudi Arabia presents obvious progress in tourist infrastructure and services to support the country's development, which in turn benefits the tourism sector. In spite of that, from 2010 to 2011 the progress was slow with regard to improving and developing the antiquities and museums sector in terms of both services and investment (SCTNH, 2012). However, cooperation between the government and the private sector contributed to developing the tourism industry in various

projects in many areas of Saudi Arabia during the period of 2010–2014. At the present time, there is increasing demand for tourism activities, and that has prompted business people to invest in various fields of tourism (Aldakhil, 2007).

Despite this tourist attention and development, it can be argued that Saudi tourism has not yet reached its potential (Aldakhil, 2007). There is still weak investment in diverse historical and archaeological heritage sites which are considered important to attract tourists, particularly as reminders and narratives for visitors of the life of former peoples in the area. Nevertheless, in the national operation plan for 2015-2019, planners recognize that the Saudi economy in general depends on oil, and this is perhaps a most important reason for the establishment of the Saudi Commission for Tourism and National Heritage (SCTNH) in order to promote diversification within the Saudi national economy, and thus reduce the monetary and physical dependence on oil exports.

Since the incorporation of the SCTNH, there is abundant evidence of attempts to push for development in the tourism sector in Saudi Arabia (Aldakhil, 2007). GIS techniques are one of the main factors that SCTNH uses on the preparation of tourist surveys and specialized tourism studies, as well as endeavouring to build an information base for tourism, antiquities and urban heritage in the 2015–2019 operation plan (SCTNH, 2015).

A field visit by the author confirmed that there is a GIS centre at SCTNH in Riyadh, but not in Najran. Currently, much information provided by SCTNH is in tabular format and not mapped. Hence, this thesis will act as an initial base to build and launch a database that contains the characteristics of archaeological sites.

3.6. Archaeological tourism with GIS

GIS has been widely used to support archaeology. Examples include the use of GIS to understand the association between archaeological features and landscape characteristics (predictive archaeology), the use of GIS for understanding spatial pattern in archaeological data, and site territories and travel between sites. However, there is a much smaller literature on the use of GIS to support archaeological tourism. The following section reviews this literature, seeking to identify current gaps, focussing on four key strands of work: spatial database development, multiple criteria evaluation, landscape character assessment, and geospatial use of social media.

3.6.1 Archaeological tourism database:

Geographical information systems and spatial databases are great tools for archiving and representing data with essential links to geographical locations (Gregory and Healey, 2007; Carrion et al., 2016). However, there are no specific studies that concentrate on or show spatial database development for archaeological tourism and contain different layers of archaeological tourist characteristics, with the exception of some studies that show the archaeological application of GIS, such as Wheatley and Gilling (2002) who try to illustrate the role of using GIS to build an archaeological database rather than traditional records. Furthermore, Jennings et al. (2013) carried out a study using GIS to build a database for the site at Jubbah in northern Saudi Arabia. In their study they did a survey of the study area; then, data were entered into a GIS database containing various information, such as geographic coordinates, site conditions, type of site depicted, Thamudic inscriptions and visibility. They built this database to help to show site features on maps and in order to examine spatial relations between rock-art sites and paleo-lakes in the study area. In addition, Al-Belushi (2014: 105) summarises the value of an archaeological tourist databases as follows:

(A)- They are a fundamental source of information, particularly when determining the characteristics of archaeological sites for selection and utilization;

(B)- They can be useful for a country's infrastructure planning, especially when combining archaeological sources with infrastructure plans to help in the development of archaeological tourism;

(C)- They can supply stakeholders, planners and investors with useful information about appropriate sites to invest in for archaeological tourist projects, they can also help to predict the implications of projects and manage them properly;

(D)- They can help to identify places that have suffered as a result of a negative impact of tourism on archaeological sites and thus help to manage them properly;

(E)- They can encourage and help users to identify new archaeological tourist attractions in order to reduce the pressure on well-known sites;

(F)- They can assist tourism planners to create new tours and routes for archaeologically attractive sites.

(G)- They can assist commercial investors and marketers to present and boost tourist sites as they have advantageous tools for determining which sites should be used;

(H)- They contain archaeological records than can assist in enriching the presentation of archaeological sites to tourists;

(I)- They are helpful to managers in the tourism sector, particularly by providing tourists with new information which relates to archaeological discoveries.

Although Al-Belushi (2014) highlights the major advantages of GIS's use in archaeological tourism, as noted above, unfortunately, the case study which is used in Oman is not supported by the implementation of any GIS tools to show how archaeological databases can be used with the output from maps, it only lists the benefits of applying GIS to archaeological and cultural tourism.

In addition, some studies have been conducted that use GIS but only for predictive management such as Uphus et al. (2006) carried out a study using GIS to build a database model that could help to determine and manage the influence of recreational activities on archaeological sites in order to be able to manage them and protect them from risk. Moreover, Hadjimitsis et al. (2013)and Agapiou et al. (2015) used remote sensing and GIS to help in the conservation of archaeological heritage sites and in protection from natural and human risks that can affect the long-term sustainability of these monuments. Meanwhile, Delaney et al. (2015) carried out a study using GIS to build a database of cultural-heritage resources of Qatar so as to be able manage and protect archaeological and historical sites for future generations.

These case studies and other studies that have used GIS in the field of archaeological-site monitoring, and for predictive management, represent an important step but, unfortunately, those studies did not use GIS for optimum tourism planning in order to develop and exploit those archaeological sites for tourism. However, the difference in this thesis is that GIS is used to create a database containing the characteristics of all archaeological sites in the study area, from the Palaeolithic to the Islamic period, and this helps to show the distribution of archaeological

characteristics and determine the most appropriate sites that are, or can be made, accessible for tourists. Furthermore, this study is the first to apply GIS in Saudi Arabia in order to development of a spatial database for archaeological tourism planning. Then, this method can be generalised for use in other Saudi regions and other countries around the world.

3.6.2 Site-suitability assessment and evaluation using multiple criteria

The identification of suitable places is one of the most advanced implementations of GIS. Archaeological sites can benefit from the use of GIS. For instance, archaeological tourism data often comprise such factors as inscriptions, structures, landscapes and natural locations. Singh (2015) reviews the studies that have applied GIS to tourism, and from this study it is obvious that no previous studies have concentrated on site-suitability assessment and evaluation using multiple criteria for archaeological tourism, with the exception of studies using multiple-criteria evaluation (MCE) for ecotourism and nature tourism. There are some studies in the tourism field such as Al-Sheikh (2008) that examine the geographical distribution and typical patterns of public parks in the city of Jeddah, Saudi Arabia. The study mainly uses a multi-criteria approach to select public parks. The results of the study show that parks in the city of Jeddah are distributed across 123 districts of the city within the urban boundary, with the exception of some neighbourhoods. The main distribution is, however, in the northwest of Jeddah, with only a sparse distribution in the south. A weakness of this study is that it does not show or indicate the weight of conditions used to determine and identify typical parks in Jeddah, the author only tries to determine the direction of parks' distribution without mentioning typical parks. In addition, Al-Sheikh (2010) conducted another study using spatial analysis of archaeological and tourist sites in Medina. The study focuses on detecting the spatial relationship between the Prophet Mosque, archaeological sites and tourists in Medina. The results of this study show that the Prophet Mosque is a strong factor influencing archaeological tourism in the Medina region. The study does not, however, distinguish between types of archaeological sites, and it does not show any archaeological sites' characteristics. Furthermore, Dawod (2013) conducted a study to identify suitable geographic sites for a tourist infrastructure in the Al-Hada tourist area in southwest Saudi Arabia. The study used a multi-criteria approach. The main aims were to identify sites that are safe from floods, achieve a spatial and homogeneous allocation across the city, reduce construction costs by identifying sites near to existing roads and on flat or slightly sloping sites, and lastly choose suitable locations with areas appropriate for tourist infrastructure. This approach identified considered spatial locations for resources management with 124 candidate sites being identified for the establishment and development of a future tourist infrastructure in Al-Hada city in southwest Saudi Arabia. Although

not in the field of archaeological tourism, this study demonstrates the use of MCE based on the weight of conditions to find suitable tourist sites.

By reading relevant and suitable site studies, some of which are described here, the author of this study find that all of them concentrate on establishing appropriate criteria to find suitable locations, but no studies concentrate on identifying suitable archaeological sites for tourism, especially those with valuable characteristics, such as inscriptions, rock art, pottery and so on. However, this thesis will use multiple criteria to identify appropriate archaeological tourist sites to be developed for tourism and economic benefits.

3.6.3 GIS and landscape characteristics assessment

Landscape characteristics assessment (LCA) can be defined as a set of tools and procedures that are used for determining, classifying, describing and understanding what is distinctive about landscapes (Symons et al., 2013). Moreover, LCA is a landscape mapping process that concentrates on the existing and essential features of a landscape (Swanwick, 2002). The main features of a landscape are aesthetic attributes, such as topography, soil, land use, settlements, surface geology and the distribution of hedgerows and trees (Jellema et al., 2009; Jaber et al., 2015). Landscape as a term is said not to exist in Arabic and is thus little known in Arab countries, although it is well known in English and Greek (Jaber et al., 2015), it being known in Greek as τοπίο. It seems, however, that authors making this claim are unaware that there is a term in Arabic, *المناظر الطبيعية*, which means natural views. It may be that researchers in Arabic countries do not use this Arabic term, though some Arabic researchers have used its English equivalent in their studies. The Saudi Geological Survey conducted a study in 2006 to explore Rub' al Khali (Empty Quarter) and issued a booklet, but they did not use this term although their booklet contains a summary of the main features, such as dwellings, valleys, water resources and roads.

Lothian (1999) separates the methodologies for landscape assessment into two main types: physical and psychological. In the physical approach, it is supposed that an aesthetic is an essential of landscape and is based on fundamental characteristics, whereas in the psychological approach, it depends on the visual receptor to assess the characteristics of a landscape. According to Butler and Berglund (2014: 226), the procedure of landscape character assessment has two phases: desk study and fieldwork. A desk study is commonly used to get an initial understanding of data from various sources, such as maps, satellite images and so on; thereafter, the characteristics of a landscape can be prepared and extracted and made available as a resource. In contrast, landscape characterisation through desk study demands experience in digital maps analysis via GIS integrated with an understanding of a landscape's components that illustrate its character (Symons et al., 2013). This is

followed by fieldwork, which can confirm the information collated in a desk study but also add extra elements (Butler and Berglund, 2014: 226).

Some studies have applied GIS in landscape character assessment, such as Vogiatzakis et al. (2004), who carried out study on the cultural and physical characteristics of landscapes utilizing GIS as a decision support instrument to observe and develop the distribution of cork-oak habitats on the Island of Sardinia. Symons et al. (2013) conducted a study that depended on the use of GIS tools for remote sensing and landscape character assessment in Cyprus. The study used an approach that involved merging cultural, ecological and physiographic information about Cypriot landscapes to help with their management and planning decisions. This supports Butler and Berglund (2014) who hold that landscape character assessment helps to identify landscape resources as well as plan for the future. Brown and Brabyn (2012: 317-331) carried out a study in New Zealand in which they attempted to concentrate on a regional scale to see the relationships between various values and physical landscapes using landscape character classification and public participation GIS. However, the incentive in this study stems from previous landscape research which has concentrated on the relationships between single values, e.g. the aesthetics of a landscape, and single physical components of a landscape, such as flora or water. The results of their study refer to public participation GIS data, where the association with the classification of landscapes is greater than in psychophysical landscape assessments which use photographs.

What is more, using landscapes in this thesis along with archaeological sites might offer a more comprehensive vision of a place in terms of natural and archaeological features that can attract tourists.

3.6.4 Use of social and online media within GIS and tourism

Social and online media have become a valuable source for many recent studies, particularly those involving human dynamics, especially after adding available geotagging information (Frias-Martinez et al., 2012). For instance, Twitter offers the potential to record the geographical coordinates of a user each time a tweet is sent (Frias-Martinez et al., 2012: 239). According to Memon et al. (2015: 1347), more than one million geotagged photographs exist and are available on Internet network services, such as Panoramio and Flickr; these are geotagged photographs contributed by people who have visited places or countries and want to share their travel experiences via social media; each photograph uploading to these media contains information such as location, title, time, weather and tags. Recent years have witnessed significant developments in digital cameras and camera mobile phones which have resulted in huge numbers of spatial photographs taken by users and widely shared on social media (Frias-Martinez et al., 2012; Memon et al., 2015).

Tourists endeavour to find other analogous users who have useful information about other attractive locations (Clements et al., 2010). According to Clements et al. (2010) and Sun et al. (2013), tourists or trippers prefer systems that can recommend tourist attraction sites to suit tourists' interests as time is an essential element of journey planning. This is consistent with modern tourism; usually, before traveling somewhere for recreation, whether within or beyond their own country, would-be tourists prefer to search on the Internet and social networks to find some information about a destination, such photographs can give an initial impression, given the availability of geotagged photographs and other data which help tourists to manage their time during a recreational trip (Buhalis and Law, 2008; Xiang and Gretzel, 2010). Moreover, Welsh et al. (2012) point out some advantages of social media sources, especially those using geotagged photographs, such as Evernote, Panoramio and Flickr, which are simple and uncomplicated in use, especially Panoramio which has the flexibility to download geotagged points as a file and then upload it to Google Earth, as well as Panoramio's integration with Google Maps to facilitate displaying them in a map.

Recent sources of geolocated information provide abundant opportunities (Kitchin, 2013). For example, Twitter and Facebook offer extensive possibilities for the analysis of places, social media networks and spatial traces (García-Palomares et al., 2015). At the present time, the vast majority of data are generated routinely and automatically through several sorts of sensors (Batty, 2013). In addition, information that has been created on social networks can be considered within those sources (García-Palomares et al., 2015). Kisilevich et al., (2013) conducted a study of movement data depending on geotagged photos to analyse attraction areas. They visualised these areas through the use of density maps, comparing and analysing spatial events based on different temporal distributions, describing analyses of clusters, arranging sightseeing trips and comparing various attraction areas. This use of geographical information systems to predict and identify archaeological sites allows users to determine the precise locations of landscapes sources which can be exploited in the development of tourist potential along with archaeological tourist sites in an area (Olukole, 2007). The use of GIS with multi-media instruments can provide abundant tourist information, and that can be of enormous benefit to the world (Longmatey et al., 2005). Nonetheless, the GIS database can provide sufficient information about a destination area as well as various tourist attractions and sources of natural and cultural artefacts (Olukole, 2007). Archaeological heritage sites are particularly attractive, especially if they take advantage of and optimally exploit the promotion of economic development (Pacifico and Vogel, 2012).

The existence of social mediacan help researchers to collect data that can give an idea about a site to be studied, e.g. photographs of a place can give the researcher an initial perception of the landscape or amenities that are available in the study area before implementing a study. Furthermore, such information can be used to predict the density of tourists from the density of images and information uploaded to social media sites by their users. This use of social media can save time, money and effort, especially in the field of scientific research. In addition, social media can be used by stakeholders to disseminate photographs and information that might attract tourists to visit those sites, and thus bring financial benefits to them from influxes of tourists as social media are generally beyond government control, which gives users of these tools the freedom to share their photographs with others.

3.7 Conclusion

This chapter has discussed archaeological tourism and geographic information systems (GIS). It began by determining an appropriate tourist term for use throughout this thesis, which is archaeological tourism. In the second section, there was a discussion of regional trends in archaeological tourism, where it is clear that most Middle East countries are working to take advantage of the tourism sector, especially since most countries issue tourist visas, with the notable exception of Saudi Arabia, which it does not issue such visas. It can be argued that the Saudi government should change its policy with regard to tourist visas. Otherwise, this sector will not achieve tourism gains that can contribute to the state budget, given that this sector is one on which some countries depend, such as Egypt, Jordan and UAE. Furthermore, the section on guidebooks shows that all regions of Saudi Arabia could benefit from tourism.

Section four discussed the establishment of the SCTNH and their strategies to develop Saudi tourism; The author recommend the establishment of a new management structure for GIS to cover all aspects of tourism, and the creation of databases for all tourist sites, in order to facilitate and manage their development, especially archaeological sites which suffer significantly from a lack of services. In addition, such databases would also help to identify tourist resource attractions in each region.

This chapter has also discussed archaeological tourism with GIS, including the benefits of constructing a database for archaeological tourism, and site suitability assessments and evaluations using multiple criteria to identify suitable sites for tourism, which might encourage developing less suitable tourist sites for the future. In addition, this chapter includes GIS and landscape character assessment, where a set of tools and procedures are used for determining, classifying, describing and understanding what is distinctive about landscapes (Symons, et al. 2013). That can help to integrate archaeological sites' characteristics and determine which sites are most suitable sites for tourism, which will be implemented in Chapter 5.

This chapter has discussed the use of social and online media, such as Twitter, Flickr, Panoramio, Facebook and others, within GIS and tourism, which can help researchers to collect data to give an idea about a site to be studied; for example, photographs associated with a place can help to give the researcher initial perceptions of the landscapes and amenities in the study area before the implementation of a study. In addition, their ease of use is an advantage, e.g. it is easy to share information and photographs with other users. In any case, the success of any analysis using GIS tools is based on the availability of information about the study area and the quality of such data.

Arguably, despite the role of GIS in archaeological tourism, there is still a gap in the literature which requires further studies to address it. For instance, in the area of GIS for archaeological heritage management, more studies are still needed, especially in Saudi Arabia, as there are no GIS databases for archaeological characteristics, only lists of site coordinates. This thesis may be the first study to concentrate on using GIS for archaeological tourism through the development of an archaeological database along with an infrastructure database. Hence this study may help other researchers to follow the same approach in order to enrich archaeological tourism using geographical information systems, especially there is an absence of studies using MCE in the archaeological tourism field, even given their application in ecotourism.

Chapter 4

Development of a spatial database for archaeological tourism planning

4.1 Introduction

The purpose of this chapter is to develop a spatial database for archaeological tourism planning. This was done using ArcGIS. The first task is to construct a comprehensive spatial database of archaeological sites in Najran region by drawing on existing archaeological information in the literature, and also from the government and the fieldwork (see Fig. 4.1) and to show the processes used in the development of this database in order to help archaeological tourism planning. The second task is to build and develop a spatial database of the infrastructure and amenities used by different archaeological tourism market segments (see Fig. 4.4). The methodology will use a cost surface as a tool for measuring trip times, which will be of particular help for those sites that can only be accessed using a 4x4 vehicle, due to their location and topography, e.g. sites with a steep slope or that are accessed via desert tracks. Lastly, recommendations based on these databases will be developed.

4.2 Methodology

4.2.1 Development of an archaeological heritage database

The first aim is achieved by assembling all the available spatial data for archaeological sites from a literature review and from the Saudi Commission for Tourism and National Heritage (SCTNH). Figures 4.1 and 4.2 show the data processing steps undertaken and three main sources of data, namely a data file from the SCTNH, a literature review, and fieldwork.

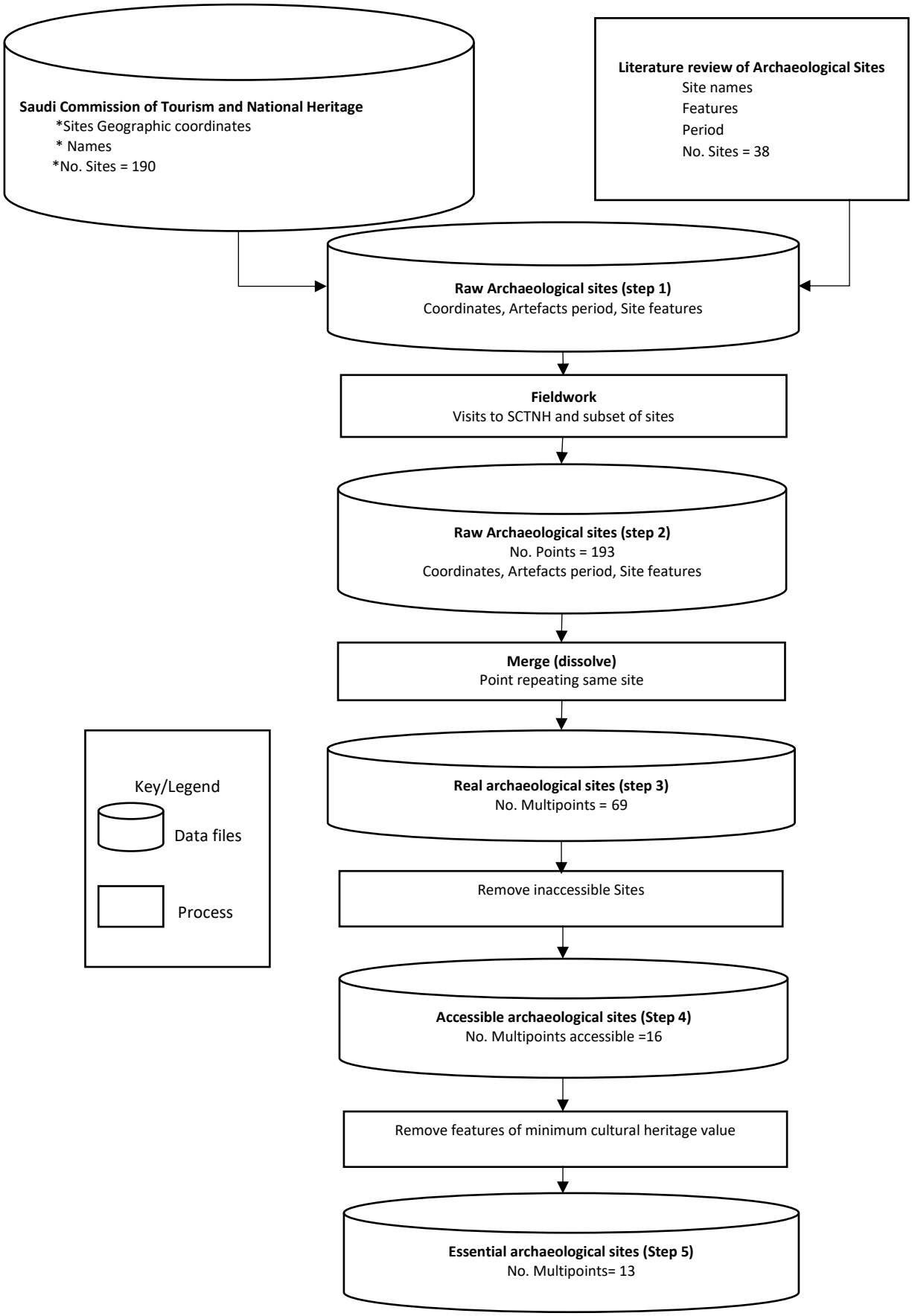


Figure 4.1: Process to build a database of archaeological heritage sites

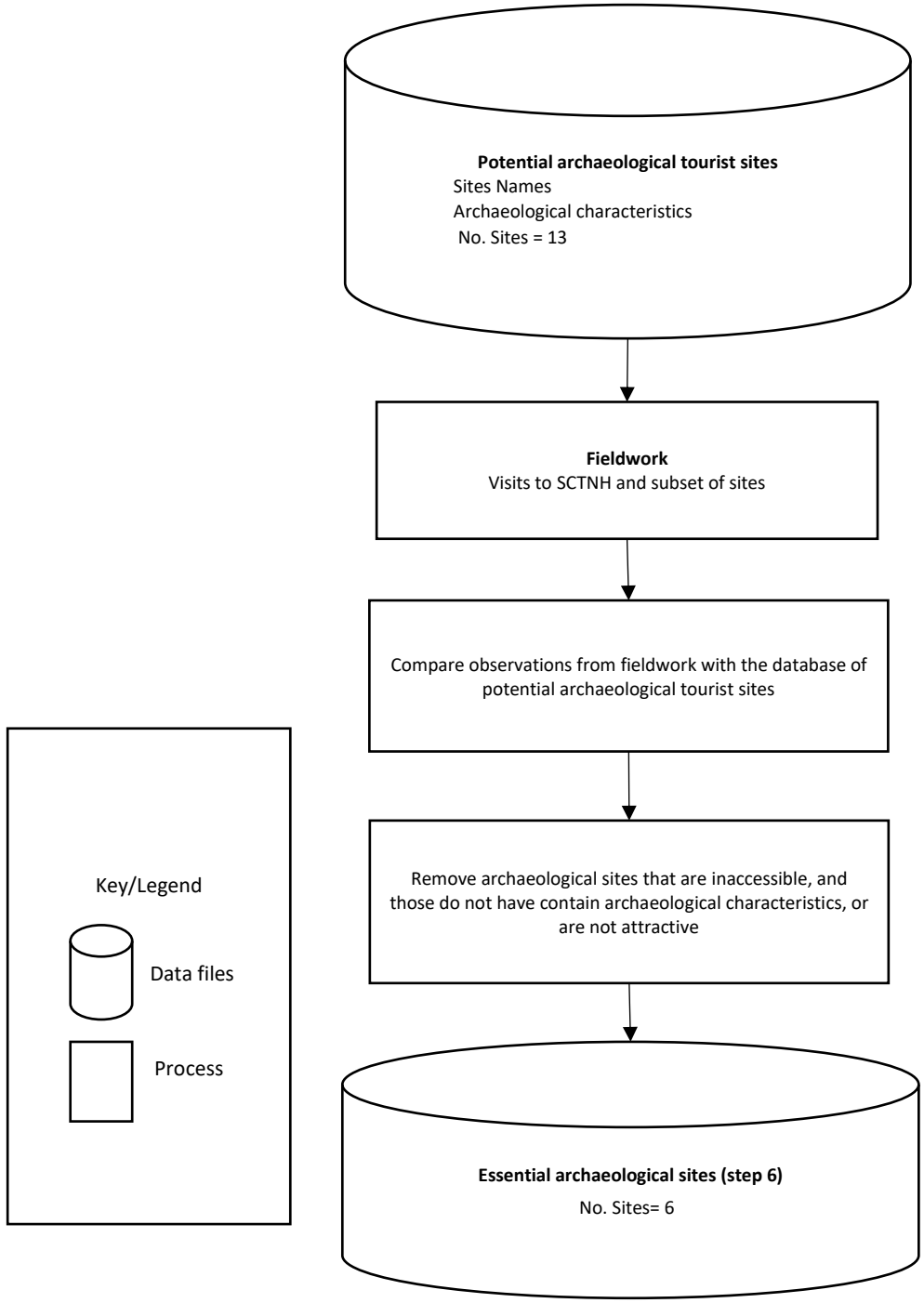


Figure 4.2: continues process to build a database of archaeological heritage sites

It is evident from Figure 4.1 that the research data are mainly obtained from two sources. The first is the Saudi Commission for Tourism and National Heritage (SCTNH). They only provide an Excel spreadsheet, received in August 2013, which includes the geographic coordinates of 190 archaeological sites and their names written in Arabic. A problem with this table is that multiple entries may represent the same site and share the same name, such as at Bir Hima. This was an initial database of archaeological sites but it does not contain any site characteristics.

The second source is the literature review, shown in Figure 4.1, which aims to determine the archaeological characteristics of sites listed by the Saudi Commission for Tourism and National Heritage. Literature sources include the *Journal of Saudi Arabian Archaeology*, also known as *Atlal*. This journal consists of 22 volumes to date, which include details of excavations, studies and surveys of Saudi archaeological sites. This journal is written in both Arabic and English but, unfortunately, some Arabic texts do not exist in English; therefore, here the author of this study depend on Arabic.

The contents pages and abstracts of all articles published in *Atlal*, from Vol. 1 (1977) to Vol. 22 (2012), were systematically searched to identify descriptions of sites in Najran. In the end, the information that helped to extract a number of characteristics of some of the archaeological sites in the study area was taken from Vols 3, 4, 5, 6, 7, 14, 16, 17, 18, 19 and 22 of *Atlal*, as these contain reports relevant to Najran. This is in addition to other literature written in Arabic, such as the Encyclopaedia of Saudi Arabia Vol. 15 (2007), Najran region, to extract the characteristics of archaeological sites. In addition, between November 2014 and January 2015, to identify further reports describing sites in Najran, the following search terms were entered into Web of Science: 'Najran' and ('archaeology' or 'archaeological'). Article titles and abstracts were scanned for relevance. For each article, the name of the site, the nature of any artefacts found there and archaeological period(s) for the site were recorded. The description of a site's location was then used to relate this information to data obtained from the SCTNH. Some sites not found in the literature were identified later, during subsequent fieldwork, while there are three additional archaeological sites found in the literature review which have been added to the database to make the total number of sites 193.

The next process involved doing fieldwork to record the characteristics of archaeological sites not found through the literature review. This fieldwork was done between 13 December 2014 and 9 January 2015, after the granting of ethical approval No. 12762 by the University of Southampton. It included visiting the Najran branch of the Saudi Commission for Tourism and National Heritage via an SCTNH guide who was approached to gain access to the Bir Hima site, where access is controlled by a perimeter fence (see Fig. 4.2). The guide was also interviewed to obtain information about

additional sites not shown in the SCTNH database and to verify the characteristics of the sites included in the database, in addition to obtaining information about archaeological sites which have controlled access (see Fig. 4.1, step 2). Then, several archaeological sites in the Najran region, i.e. Al-Ukhdud, Bir Hima, the old palace and a popular market, were visited to obtain information about them. But before visiting these archaeological sites the author of this dissertation created a table with site names, characteristics and infrastructure. This was done to compare what the author of this dissertation found at archaeological sites with what he compiled from a literature review to form a database. In addition, during the fieldwork, a camera equipped with GPS was used to take geotagged photographs of each site, which were then uploaded to ArcGIS along with geographical coordinates.

After collecting data from various sources, the next step (see Fig. 4.1, steps 1 & 2) was to describe the attributes of each archaeological site listed by the SCTNH, including time period, inscriptions, building, walls, rock art, wells, pottery, the effects of buildings, stone tools and tumuli/ graves (see Table 4.1). The construction of this table facilitates subsequent record selection and the merging of features when they share common attributes.

Table 4.1: Attributes of archaeological sites created for a database of Najran, Saudi Arabia

Field name	Data type	Source of information	Description of field
Site name	Text	SCTNH (step 1) / literature review (step 2)	Definition of all sites
Inscription	Yes/no	Literature review (step 2)	Presence of inscriptions at site
Time period	Yes/no	Literature review (step 2)	separate fields for Palaeolithic, Neolithic/Chalcolithic, Bronze, Iron, Roman, Byzantine/Sassanid and Islamic age
Walls	Yes/no	Literature review (step2)	Presence of remains of ancient walls
Tumuli/Graves	Yes/no	Literature review (step2)	Presence of tumuli or graves at site
Rock art	Yes/no	Literature review (step2)	Presence of aesthetic engravings paintings on the rocks at site
Wells	Yes/no	Literature review (step2)	Presence of ancient well(s) at site
Pottery	Yes/no	Literature review (step2)	Presence of pottery at site
Construction/Buildings	Yes/no	Literature review (step2)	Presence of buildings
Trace of buildings	Yes/no	Literature review (step2)	Presence of foundations of ancient buildings
Stone tools	Yes/no	Literature review (step2)	Presence of tools such as scrapers, primitive bifacial instruments, blades, hammer stones, choppers, and bifacial knives at site
Access Control	Yes/no	Fieldwork (step 3)	Presence of perimeter fence

After including some additional characteristics of archaeological sites, records sharing the same place name were then merged using the ArcGIS *dissolve* tool. This resulted in another database (see Fig. 4.1, step 3) containing multipoint features representing 69 different archaeological sites, rather than multiple separate points representing the same site. Before doing so, Ripley's K-function was calculated for the archaeological sites point map layer to assess whether statistical patterns of spatial clustering could be used as a basis for merging neighbouring points relating to the same site . Data sets of archaeological sites are mostly heterogeneous (Bevan and Conolly, 2006), so Ripley's K-function is an appropriate tool to measure the distribution of points, regardless of the shape or size of the study area (Conolly and Lake, 2006: 166). This was undertaken in ArcGIS after projecting latitudes and longitudes into Universal Transverse Mercator coordinates. However, Ripley's K suggested that the archaeological site points were similarly clustered across all distances considered (see Figure in the Appendix 4.1), so the size of spatial clusters could not be used as a basis for merging together neighbouring points. Instead, site names for each point were recorded in an attribute field and this field was used as the basis for merging neighbouring points via 'dissolve'.

The accessibility of archaeological tourist sites is a significant element in determining their tourist potential as this helps to attract tourists to visit them and thus encourages sustainable tourism development (BĂNICĂ and CAMARĂ, 2011). Based on the accessibility, archaeological sites can be classified into two subsections: those with high potential as archaeological tourist sites, and those with low potential. Therefore, the next step in the database development is to remove inaccessible sites. Inaccessible sites were defined as those that were more than 3 hours' drive from Najran's hotels or completely inaccessible by 4x4 vehicle. To measure drive-times, a cost surface approach was used (reference), which involved developing an impedance raster grid, where each grid cell depicted the time in minutes taken to drive across it. This approach was used in preference to drive-times calculated using the Google Maps Application Programming Interface (API), because the API typically does not estimate drive-times to locations such as archaeological sites that do not lie on the road network. Difficulty of movement across the landscape was expressed in relative terms. The impedance grid incorporated the effect of topography on driving. Slopes were computed from a 31m resolution to 10m Digital Elevation Model, downloaded from ASTER GDEM website (http://gdem.ersdac.jspacesystems.or.jp/). Slopes were then reclassified to reflect typical 4 by 4 off-road driving speeds, as shown in Figure 4.3. The resultant grid was then combined with road network data, to reflect on-road versus off-road driving speeds. Vector road data were downloaded from OpenStreetMap website (http://extract.bbbike.org/) and rasterised to the same resolution as the DEM. On-road driving was assumed to be ten times faster than off-road driving, based on the national speed limit of 120km/hr on road and an assumed speed of 12km/hr off-road. Roads were

thus reclassified as '1' and off-road grid cells as '10' and this grid multiplied with the slope-derived drive-time grid to produce a final composite impedance raster grid. Cumulative travel times from Najran's hotels to archaeological sites were computed from this surface using ArcGIS's *cost distance* tool. This calculates the minimum cumulative impedance between a set of origins (hotels in this instance) and all other cells in a raster grid. The full procedure for creating the impedance grid and calculating travel times from it is shown in Fig 4.4. To calibrate the output cost surface to minutes and evaluate the approach, drive-times from the cost surface and Google Maps were compared for a sample of 5 accessible sites on-road journeys. Archaeological sites more than 180 minutes' drive from the nearest hotel are considered inaccessible, as are those located in areas with steep slopes or desert areas which would be difficult to cross without a 4x4 vehicle.

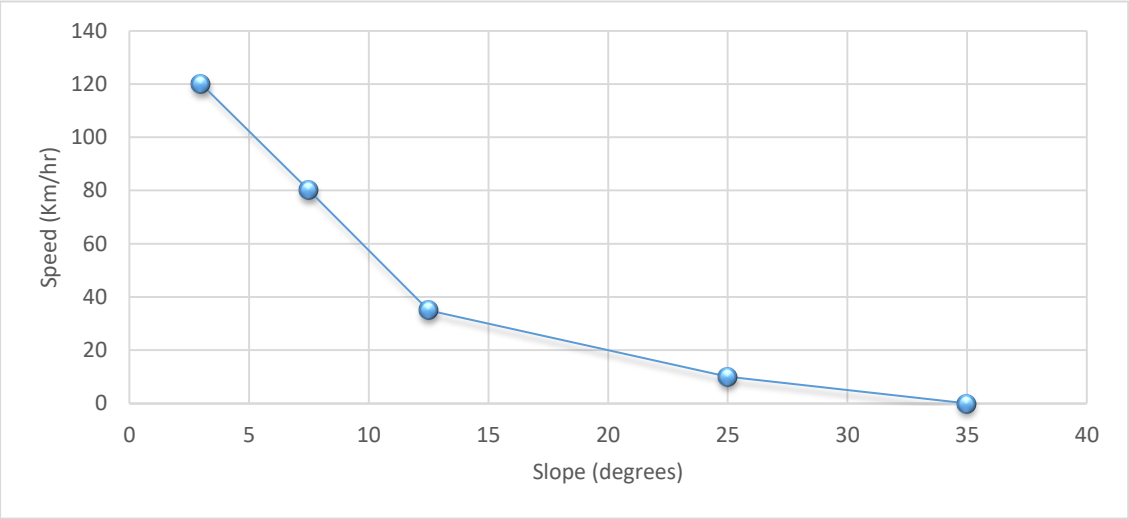


Figure 4.3: Recorded speeds while driving a 4x4 vehicle over various degrees of slope, based on Pingel (2010: 6).

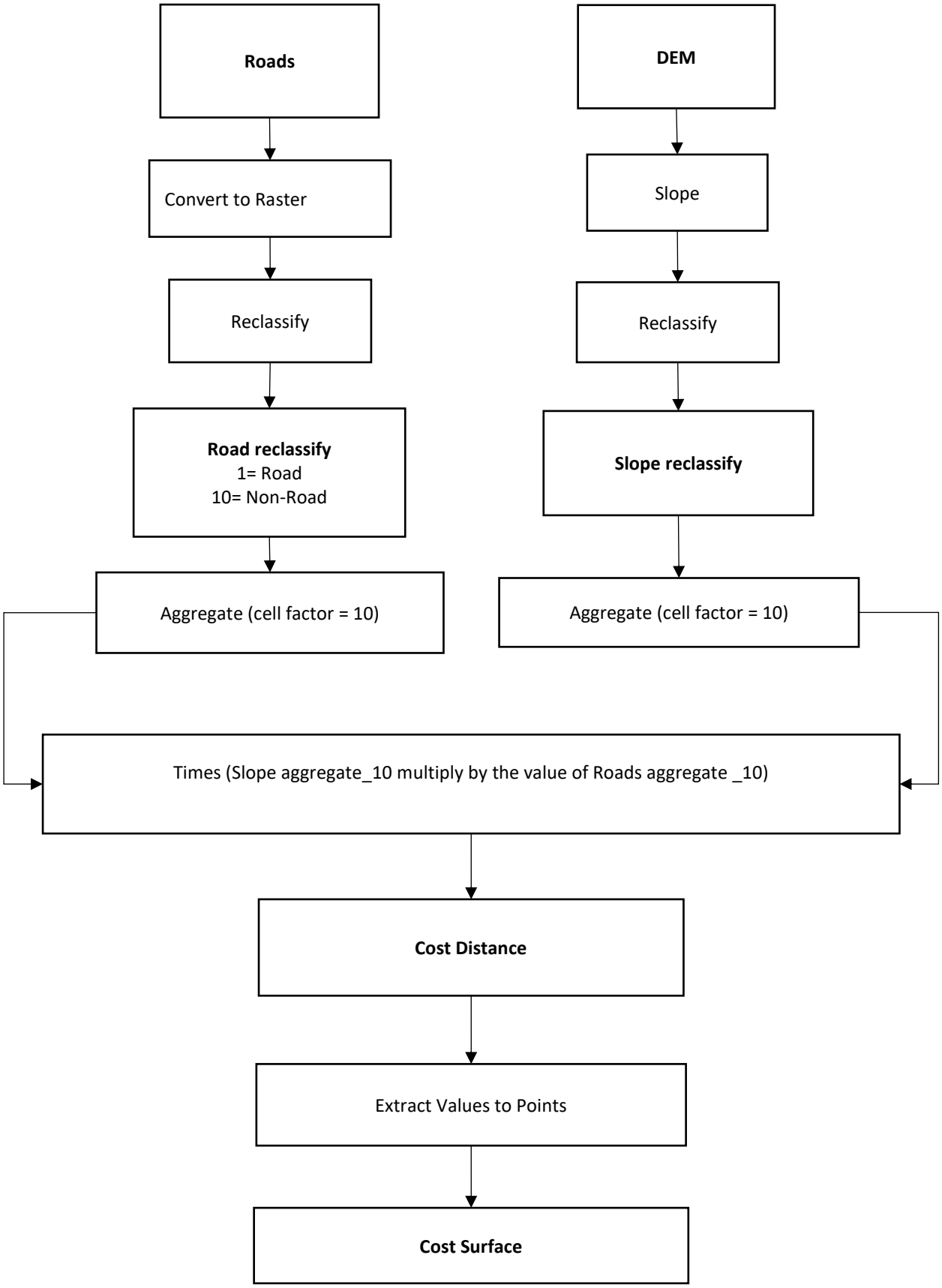


Figure 4.4: Process of using cost surface

The next process after removing inaccessible archaeological sites is to remove those with features of minimal cultural heritage value. These include archaeological sites that have only a single characteristic, such as wells, just the foundations of buildings or where nothing remains, having been either destroyed or buried by sand. This results in 13 archaeological sites (see Fig. 4.1, step 5) appropriate for tourism development. The criteria that were used to identify those potential shortlisted archaeological tourist sites are based on their accessibility as well the availability of archaeological features, e.g. inscriptions, rock art, buildings, ruins of buildings and pottery remains, which were all confirmed by the author of this dissertation during a second fieldwork trip in 2016.

The next process involved doing a second period of fieldwork between 13 July and 1 October 2016, after the granting of ethical approval (Ref: 20790) by the University of Southampton. It included examining the characteristics of each potential archaeological tourism site (see Fig 4.2). Alongside field notes, a camera equipped with GPS was used to take geotagged photographs of each site, which were then uploaded to ArcGIS along with geographical coordinates. Short-listed sites that were inaccessible or lacking in archaeological features attractive to tourists were dropped from the short-list. One archaeological site lay beyond a military checkpoint and could not be visited for security reasons, and was therefore removed from the list of potential archaeological tourist sites. Based on this experience, travel advice from several governments was reviewed and the advice from the UK Foreign and Commonwealth Office (FCO) was used to refine the GIS analysis described previously. 10 km and 8 km buffer zones were drawn adjacent to the Yemeni border and overlaid on shortlisted archaeological sites.

The results comparing characteristics of archaeological sites observed during fieldwork versus those existing in a previously created database indicate that these sites are reduced to six potential archaeological tourist sites (see Fig. 4.1, step 6).

During this fieldwork on 15th August 2016 the researcher met with the Director of the Al-Ukhdud site, who provided the numbers of previous visitors to it.

However, based on the accessibility, archaeological sites can be classified into two subsections: those with high potential as archaeological tourist sites, and those with low potential.

4.2.2 Development of tourism infrastructure and an amenities database

The second task of this chapter is to develop a spatial database of the infrastructure and amenities used by different segments of the archaeological tourism market.

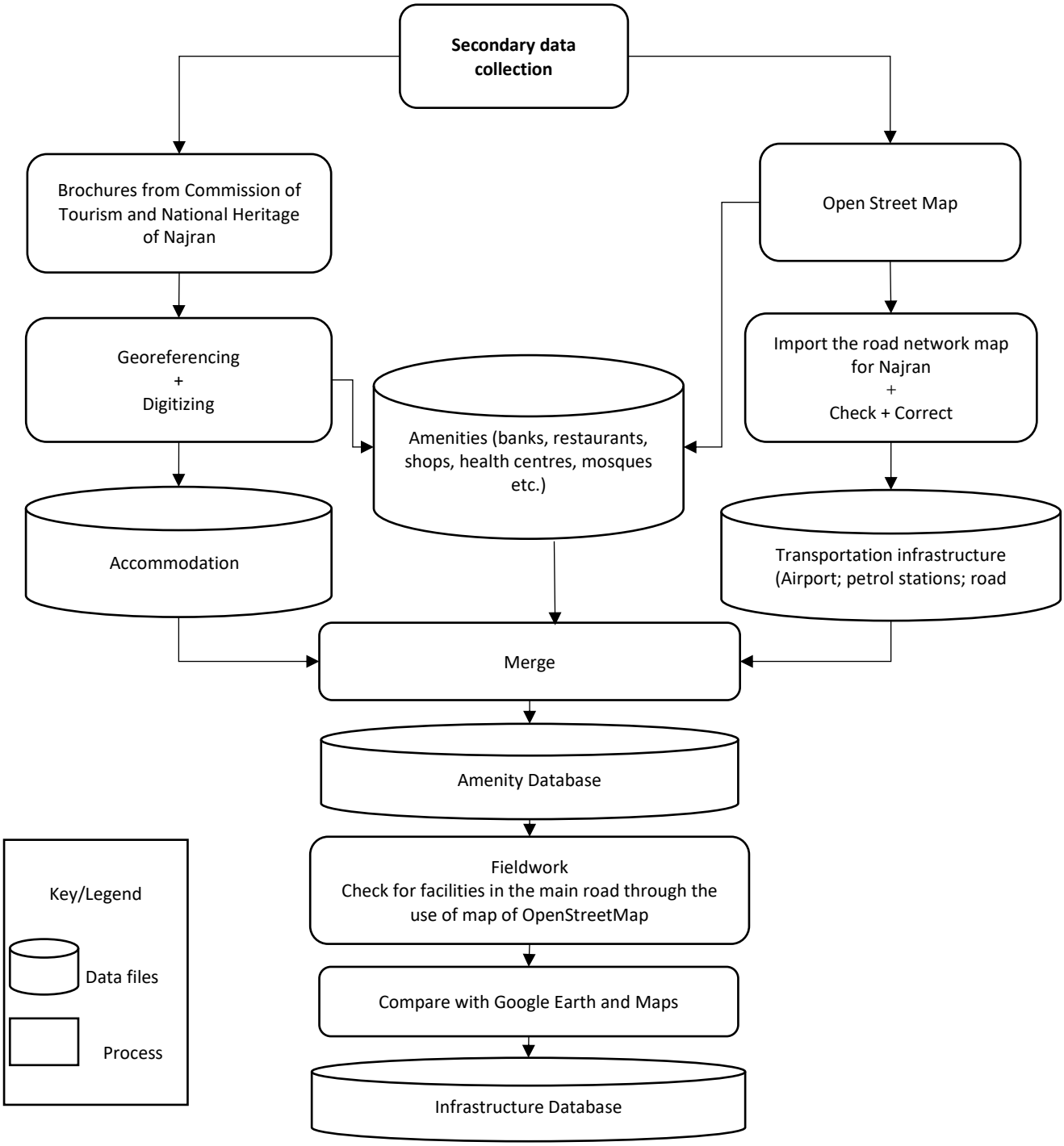


Figure 4.5: Diagram of the facilities database

Figure 4.5 shows the processes and data underpinning the development of this database. Data were downloaded in shapefile format from OpenStreetMap via an online service (http://extract.bbbike.org/) on 2 February 2015. The shapefile extracted from OpenStreetMap includes some of the transportation infrastructure of Najran, e.g. petrol stations, roads and the airport, as well as some amenities, such as banks and restaurants.

In addition, further data were obtained in December 2014 from the Saudi Commission for Tourism and National Heritage (SCTNH), from its branch in Najran region. A hard-copy map was obtained that includes the Najran boundary, roads, transport networks and tourist amenities, such as hotels and restaurants. There is no issue date on this 1:1000 map, but it was produced by the Farsi Geotech Company in cooperation with the Saudi Commission for Tourism and National Heritage (SCTNH).

This brochure shows that the SCTNH has been building various databases for accommodation and amenities infrastructure. It was scanned and imported into ArcMap in order to digitize the infrastructure and include accommodation, transportation and amenities. Eight control points with known locations were digitised and the brochure was georeferenced to give unprojected latitudes and longitudes using an affine transformation with a root mean square (RMS) error of 0.00116 degrees, which is approximately 0.129 km. After digitizing all the accommodation, amenities and transportation infrastructure information, this was merged with the facilities shown in OpenStreetMap. That resulted in a more complete accommodation, transportation and amenities database, as shown in Figure 4.5.

In follow-up fieldwork carried out in Najran between 13 December 2014 and 9 January 2015, a transect along the principal road in Najran, King Abdul Aziz Road was surveyed to cross-check the presence of tourism infrastructure from OpenStreetMap and the SCTNH brochure. This transect ran from the historic Palace of the Emirate to Najran Airport. During this fieldwork, the vehicle drive-time via King Abdul Aziz Road from the Holiday Inn to Najran Airport was about 19 minutes, while from the Hyatt Najran to Najran Airport it was approximately 26 minutes. These journeys were timed to take account of the time it takes for tourists arriving at an airport to hire a car there and go to either of these two hotels that offer tourist excursions in Najran.

However, the maps obtained from the Najran branch of the Saudi Commission for Tourism and National Heritage (SCTNH) only cover the central part of the Najran region. The rest of the region is omitted. This becomes obvious when comparing SCTNH maps with Google Maps and Google Earth, and it is clear that there are many more services that need to be digitized and included in the database. To digitise infrastructure sites not present in the SCTNH brochure map, the researcher

depended on the Google Web browser, using such search words as ‘Najran hotels’ and ‘apartments’, followed by the word ‘Gdaleel’ (which means a guide in Arabic), in order to identify their locations online and then digitize them via ArcMap. In addition, road network data for the study area obtained from OpenStreetMap were compared with a basemap in ArcMap for completeness; it was found that some roads were omitted, and some were found to be slightly displaced from their true route. These anomalies were corrected while digitizing them. Figure 4.6 shows (a) a sample of roads that are missing or incomplete, and (b) the same sample of roads after their digitization.

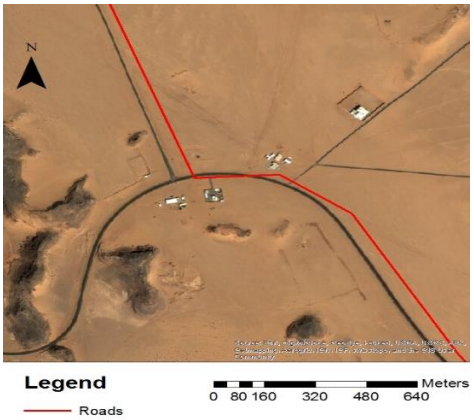
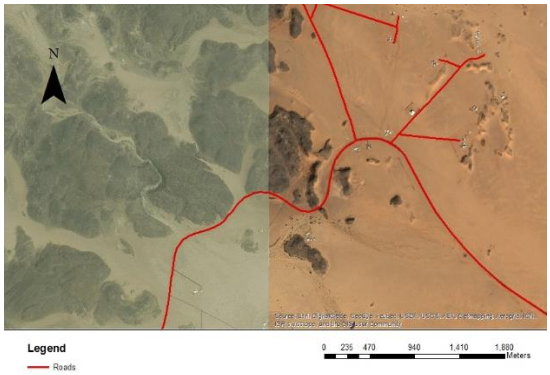
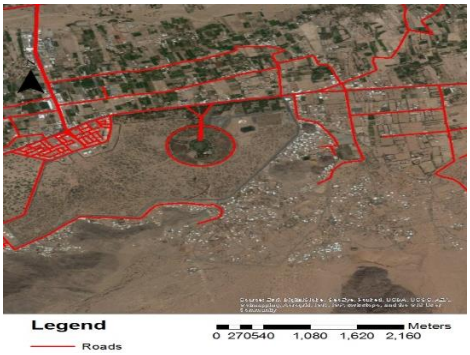
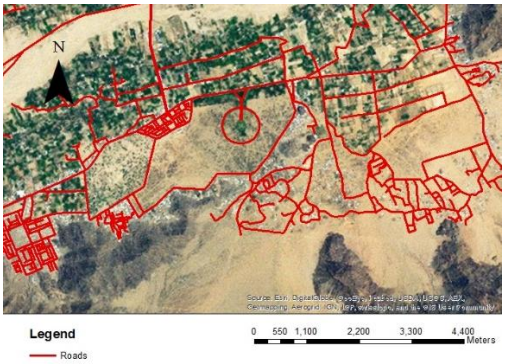
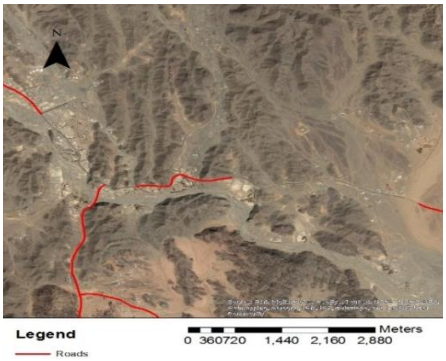
(A) Displaced roads	(B) After correction
	
(a) omitted roads	(b) after correction
	
(a) Omitted roads	(b) After correction
	

Figure 4.6: A sample of three road network sections from Najran Province, Saudi Arabia, showing (a) the road network downloaded from OpenStreetMap in relation to ESRI background imagery and (b) the same road network sections following manual digitising of omitted road segments from ESRI imagery (The date of the basemap DigitalGlobe imagery used in ArcMap is 31 December 2012).

4.3 Results

4.3.1 Archaeological sites attributes in database

The database of archaeological sites in Najran, as shown in Tables 4.2 and 4.3, contains the characteristics of different archaeological sites after merging sites with the same name, as well as the numbers of sites based on period. These periods range from the Palaeolithic to the Islamic. Note that some sites such as Bir Hima were occupied in more than one period.

Table 4.2: Numbers of sites with different archaeological characteristics and by period

Archaeological Characteristics	**Number of Sites (%)**
Buildings	3 (4%)
Inscription	41 (59%)
Tumuli/Graves	5 (7%)
Petroglyph/ Rock arts	19 (28%)
Wells	8 (12%)
Pottery	5 (7%)
Trace of buildings	6 (9%)
Stone tools	6 (9%)
Access Control	16 (23%)
Period	**Number of Sites (%)**
Palaeolithic	3 (4%)
Neolithic/Chalcolithic	19 (28%)
Bronze Period	10 (14%)
Iron period	2 (3%)
Roman Period	4(6%)
Byzantine period	16 (23%)
Islamic Period	30 (43%)

Table 4.3: Characteristics of 69 archaeological sites in Najran Region, Saudi Arabia, by period

Type of Feature	**Period (no of sites; % of row)**							**Total**
	Palaeolithic	Neolithic/Chalcolithic	Bronze	Iron	Roman	Byzantine/Sassanid	Islamic	
Buildings	0	0	0	0	0	0	3 (100%)	3
Inscription	0	0	4 (10%)	0	4 (10%)	11 (27%)	22 (53%)	41
Tumuli/Graves	0	3 (60%)	1(20%)	0	0	1 (20%)	0	5
Petroglyph	0	8 (42%)	7 (37%)	0	1 (5%)	3 (16%)	0	19
Wells	0	4 (50%)	0	0	0	0	4 (50%)	8
Pottery	0	3 (34%)	1 (11%)	2 (22%)	1 (11%)	1 (11%)	1 (11%)	9*
Trace of buildings	1 (17%)	2 (33%)	0	0	1 (17%)	0	2 (33%)	6
Stone tools	3 (50%)	3 (50%)	0	0	0	0	0	6
Total	**(4 sites), but actual archaeological sites number just 3, as** one of these sites contains traces of buildings and stone tools.	**(23 sites), though only 19 sites are actual archaeological ones**, as one of these sites includes tumuli, a petroglyph, wells and stone tools.	**(13 sites), of which actual archaeological sites number 10,** as one of these sites includes inscriptions, a petroglyph and pottery, and another site has inscriptions and a petroglyph**.**	**2 sites**	**(7 sites), of which actual archaeological sites number 4**; all of these have inscriptions, one has a petroglyph and another has pottery and traces of buildings.	**16 sites**	**(32 sites), but actual sites number 30**, because one has an inscription and pottery, and another site has an inscription and a well.	-------

* Actual sites number 5 as one of the Iron sites belongs to the Bronze, Roman, Byzantine and Islamic periods.

The results comparing characteristics of archaeological sites observed during fieldwork versus those existing in a previously created database indicate that these sites are reduced to six potential archaeological tourist sites (see Table 4.4). Figure 4.7 shows the distribution of these six essential archaeological sites in Najran region, along with travel advice based on the UK FCO). The result of the field investigation was as follows:

1 – It was found that two potential archaeological tourist sites viewed during fieldwork unfortunately did not contain archaeological characteristics, the sites at Shu'aib Dahda and Alkhqlh/Al-ajma, though it had been expected to find some traces of buildings, pottery remnants and stone tools at the first site (Shu'aib Dahda). At the second site (Alkhqlh/Al-ajma), it was expected to see stone tools, but the author did not find any such characteristics at this site, they might have been removed by the stakeholders to be displayed in Najran museum. The author has include this on a shortlist of sites for which it is believed tourists would appreciate some information about the past, especially if a sign is placed at the site containing some historical information about its stone tools.

2 - At another site, called Wadi Arqan, it was expected to see at this site some inscriptions and graves. Unfortunately, inscriptions at this site were not found, though some graves were seen there. This site (Wadi Arqan) is surrounded by mountains and has some trees which would make it an appropriate site for wilderness trips, especially in spring.

3- The site at Qarn al-safaran or Al-duraib was classified as two sites, but during fieldwork the author of this thesis met a tourist guide in Najran and was advised that this site has two names (Qarn al-safaran or Al-duraib). This site is surrounded by a fence and was expected to contain traces of stone buildings and pottery remains. But only the remains of a stone building dating back to the first century BC (SCTNH) were found. It has noted at this site that some modern removal work by a tractor had been done, which may have carried away the remains of pottery that were on the ground at this site.

4. The site at Aldrwh or Al-naslh Al-Janobiyah was visited by the author and did have inscriptions in Kufic script, but it does not have any amenities.

5. There is a site called Almarkab that contains inscriptions and rock art, as confirmed by a tourist guide in Najran, but due to security conditions near the site the author was unable to access this site, so it will be excluded for now.

Table 4.4: Numbers of sites with different archaeological characteristics and by period

Site name	Archaeological Characteristics in database	Number of sites	Number of remaining sites after second fieldwork
The historic Emirate's Palace, Ann or Saadane Palace, and Rah'om Castle	Building	3	3
Bir Hima, Al-Ukhdud, Jabal Al-husainia, Aldrwh or Al-naslh Al-Janobiyah, Wadi Arqan, and Almarkab	Inscription	6	4 The last two sites were removed.
Bir Hima, and Wadi Arqan	Tumuli/Graves	1	2 (Added Bir Hima)
Bir Hima, Al-Ukhdud, Jabal Al-husainia,Wadi Arqan, and Almarkab	Petroglyph/ Rock arts	5	3 The last two sites were removed.
Bir Hima, and the historic Emirate's Palace	Wells	2	2
Al-Ukhdud , Shu'aib Dahda, Alkhqlh or Al-ajma, and Qarn al-safaran	Pottery	4	1 The last three sites were removed.
Al-Ukhdud, Shu'aib Dahda , and Qarn al-safaran or Al-duraib,	Trace of buildings	4	1 The Shu'aib Dahda site was removed, and also the last site, as it was counted as two sites.

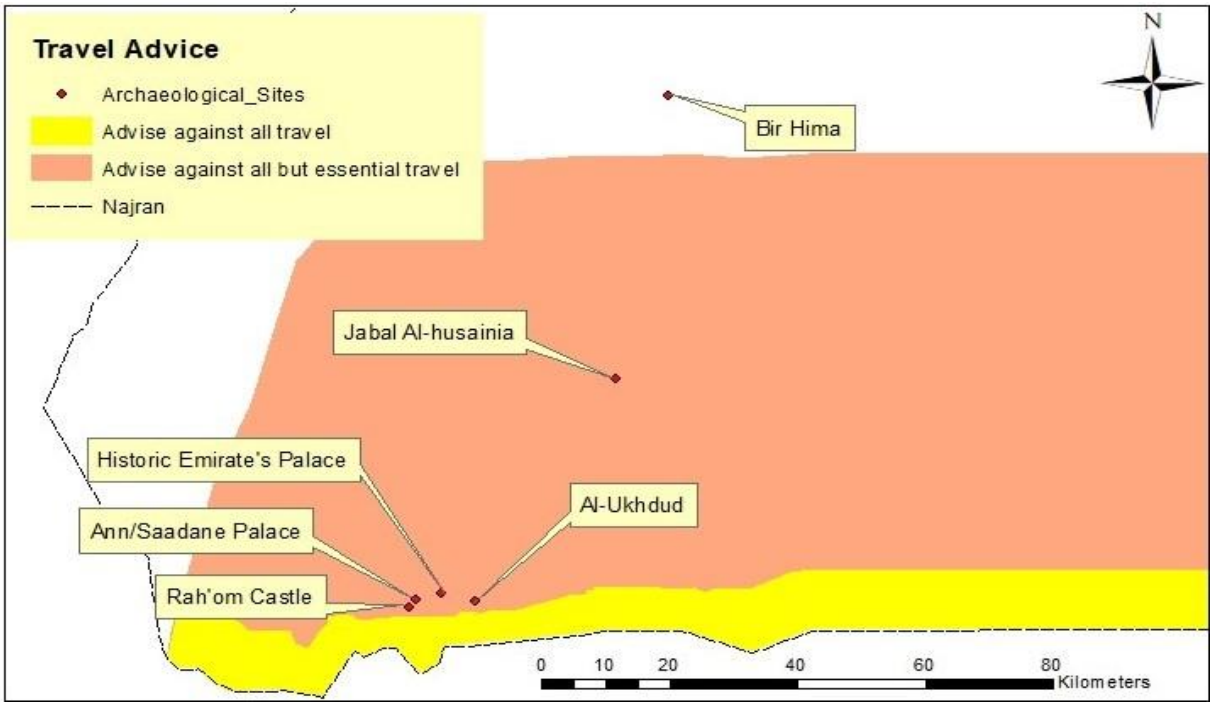


Figure 4.7: Essential archaeological tourist sites in Najran with travel advice based on the UK FCO, issued on Jun 2015 (https://www.gov.uk/foreign-travel-advice/saudi-arabia). Accessed on 2017.

Based on the process for creating an archaeological tourism database explained in Section 4.1.1, the first database contains 193 raw archaeological sites (see Fig. 4.8) and shows their distribution in Najran region. This archaeological database, as discussed above, contains multiple points representing the same site; duplicated sites were merged, resulting in 69 different archaeological sites.

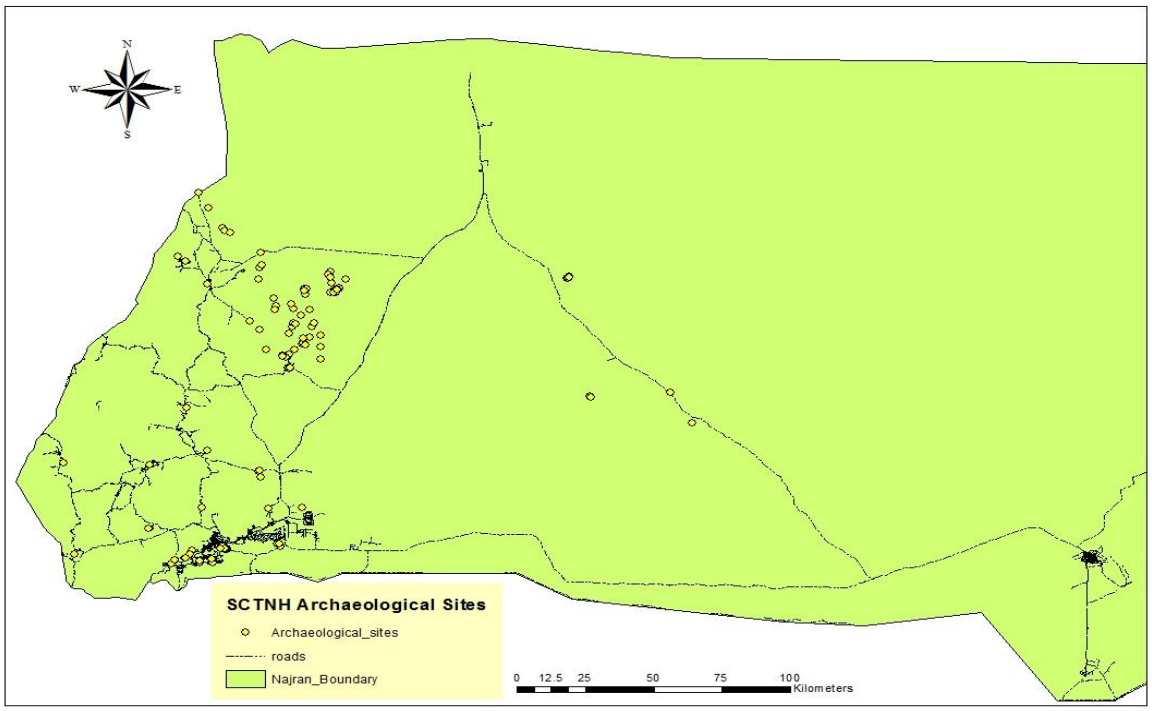


Figure 4.8: Distribution of 193 archaeological sites in Najran region including duplicates

The distribution of these 69 archaeological sites is shown in Figure 4.9. Many (30 sites; 34%) of these 69 archaeological sites belong to the Islamic period, while 19 sites (28%) are from the Neolithic period, 16 sites (23%) belong to the Byzantine period, and the Bronze period has 10 sites (14%). In contrast, only two archaeological sites in Najran region are from the Iron period (3%), the Palaeolithic period has three sites (4%), and the Roman period four (6%). Based on time periods, the apparent number of archaeological sites exceeds the actual number of archaeological sites, 69, as some archaeological sites belong to more than one period.

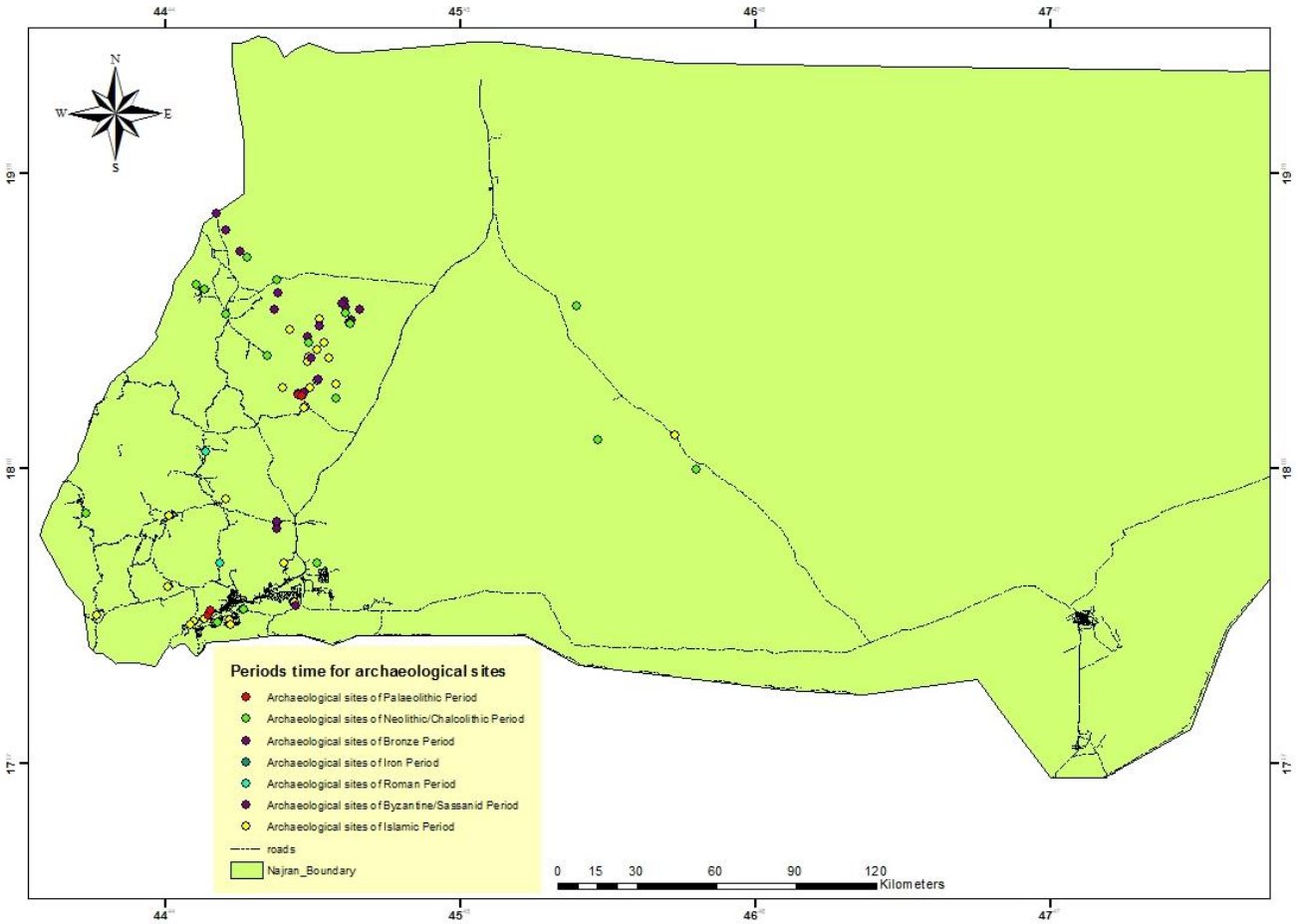


Figure 4.9: Archaeological sites based on historical period.

The results of the cost-surface analysis are shown in Figure 4.10 and Table 4.5, where the average ratio of Google Maps-derived drive-times (in minutes) and cost surface impedance (in dimensionless units) is 0.00106 impedance units per minute. This ratio was used to convert impedance units to minutes. Figure 4.10 shows the relationship between cost surface and Google Maps drive-times with $R^2 = 0.879$. Arguably, most archaeological sites in the southwest are located close to Najran, and so these should take less time to reach than sites located in the north, such as Bir hima, which would take around 90 minutes from hotels in Najran, while from a hotel in Najran city to Al-Ukhdud site it would take about 18 minutes.

Table 4.5: Trips in the Najran region, travel time by car in minutes from Google Maps and cost surface from ArcMap.

Trip	Google Maps (A)	Cost Surface (B)	A/B	Distance
Najran to Hima	90	107824	0.000834694	145 km
Najran to Abar Yadamah	125	135517	0.000922394	122 km
Holiday Inn Hotel to Al-Ukadud	18	7997	0.002250844	19 km
Najran to Al Mundfin	139	232909	0.0005968	234 km
Yadama to Hima	74	106381	0.000695613	83 km

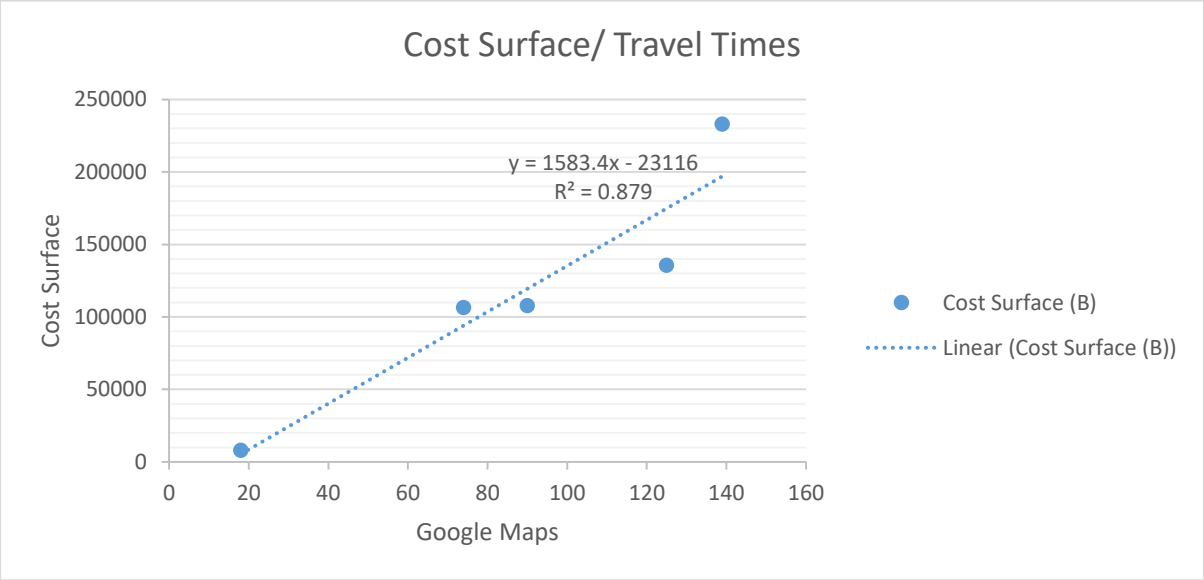


Figure 4.10: Relationship between drive-times from Google Maps and impedance values from a cost surface for 5 case study journeys in Najran.

The travel time from Najran city to those potential archaeological sites was confirmed by the author of this study, who visited those sites in 2016 during the second fieldwork trip.

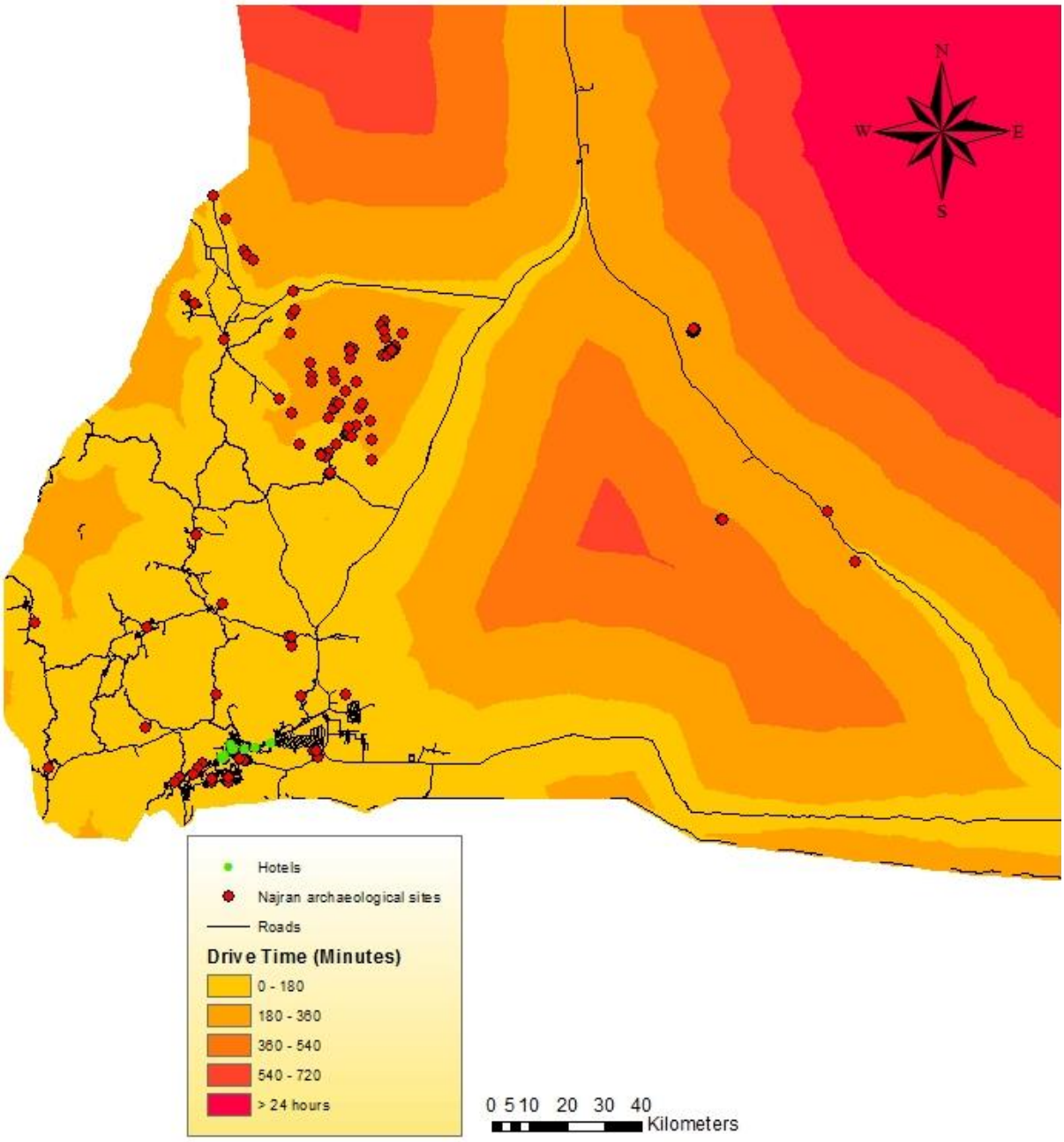


Figure 4.11: Map of cost surface showing travel times from Najran hotels to archaeological sites

In addition to what is mentioned above, archaeological sites to the north of Hima and to the west (see Fig. 4.11) are located away from roads, and tracks to those sites require a 4x4 vehicle, which takes more time than going to other sites located by a road. The speed in such cases may not exceed 10 km/h, due to the effect of sand, and so it would take between 70 and 130 minutes driving off-road to reach them. From Najran city to those sites would probably take around 220 minutes.

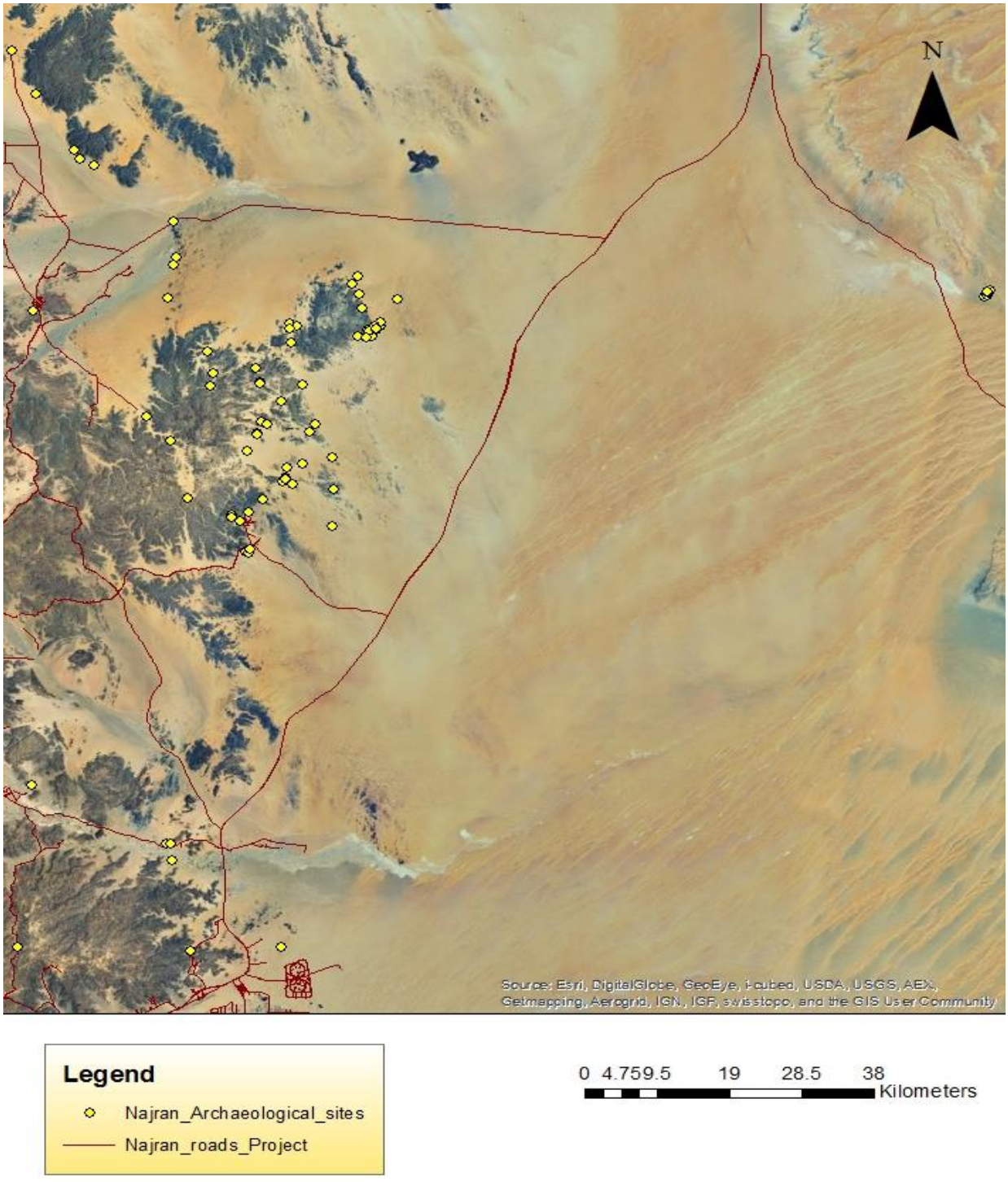


Figure 4.12: Archaeological sites located away from roads.

Figure 4.12 shows the accessibility of archaeological tourist sites according to travel times; there are 16 archaeological sites which are or can be made accessible.

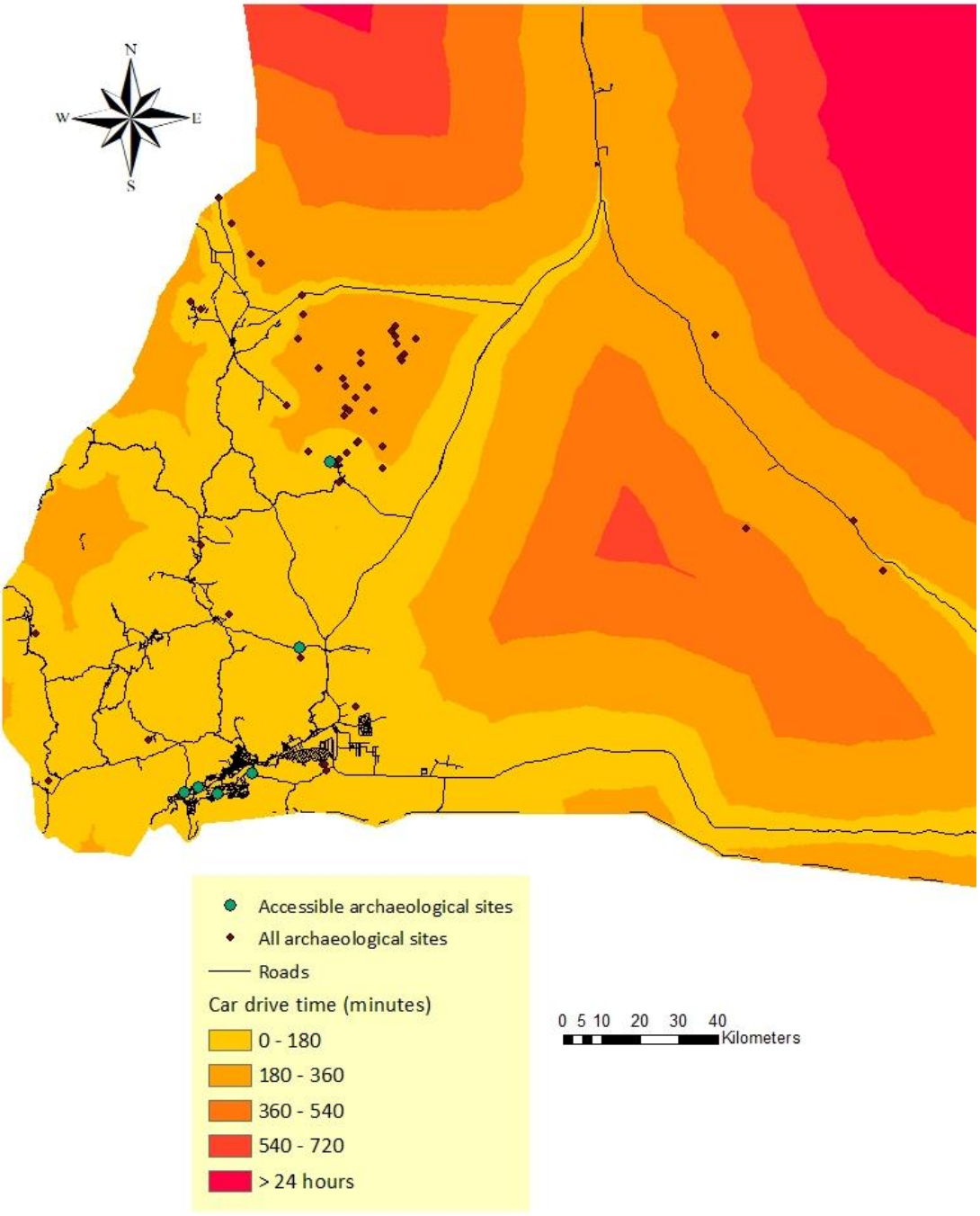


Figure 4.13: Accessible and inaccessible archaeological sites with car driving times

The result that there are six archaeological sites with high value to tourists (see Fig. 4.13). These archaeological attractions are distributed across the Najran region. Southeast of Najran region there is a concentration of archaeological tourist sites; those with tourist potential are located in three provinces: Thar province includes Bir Hima site; Hobona province has Jabal Al-husainia; and Najran

province encompasses, Al-Ukhdud, the Emirates' or Bin Madhi Palace, Rah'om Castle, and Ann or Saadane.

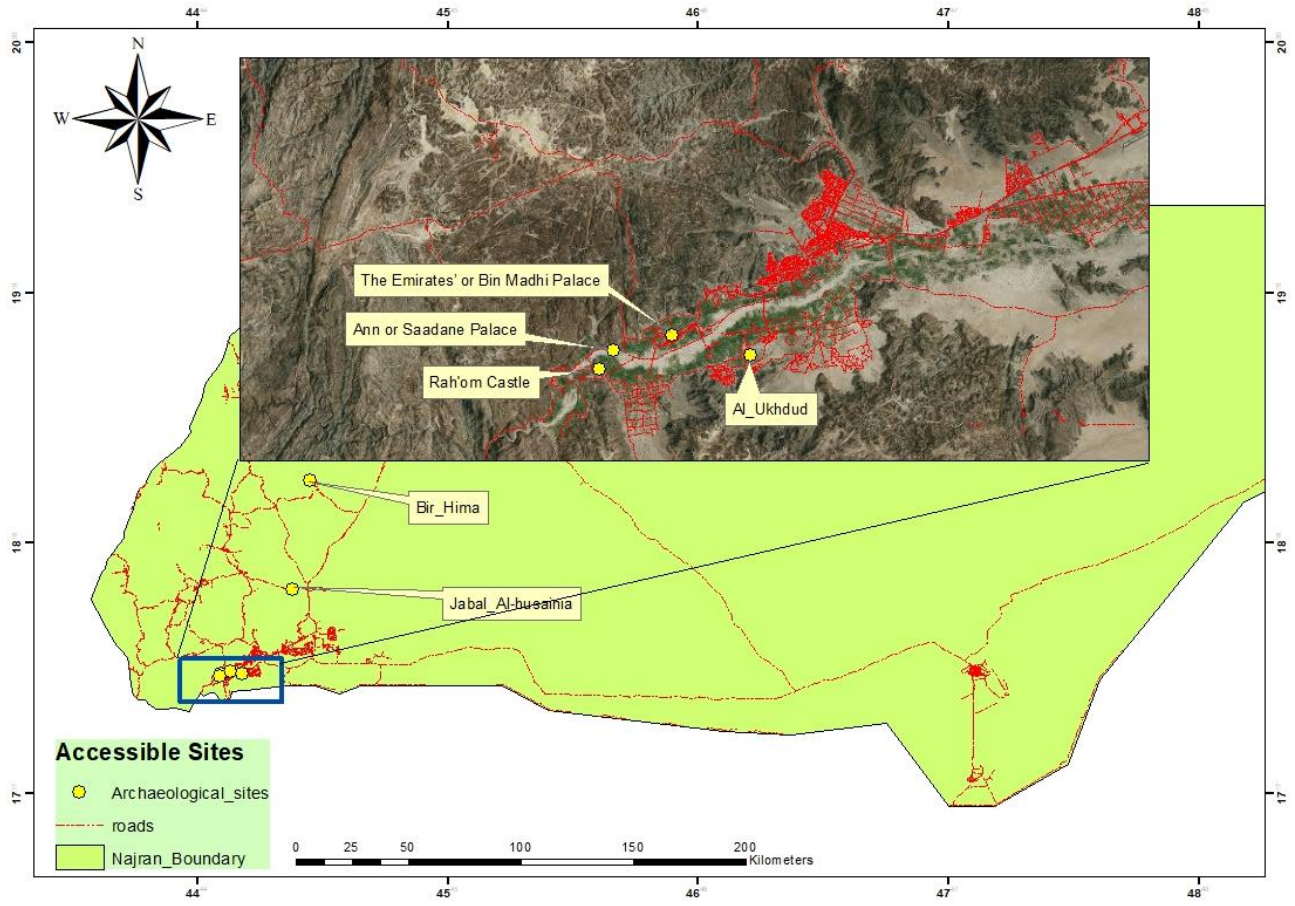


Figure 4.14: Accessible archaeological tourist sites of significant cultural heritage value

Of those 6 essential archaeological sites, three have historical buildings believed to be from the Islamic period (see Fig. 4.15); these Islamic buildings are as follows:

(A) The Ann or Saadane Palace is an ancient building located on the highest peak of Al-Ann mountain, overlooking Najran valley. It was built in 1688 AD (1100 AH) (Alshaban, 2007). This palace was built of mud, with stone foundations, and is surrounded by a mud wall with four towers.

(B) Rah'om Castle, built of stone, is located at the top of Rah'om Mountain, to the south of Najran valley. Tourists can reached this castle via some stone steps.

(C) The Emirates' or Bin Madhi Palace is located in the city centre, in the historical district of Aba Al-Saud. This building is renowned in Najran as was used as a residence for princes, but also as government offices, such as a police station, a telegraph office and a courthouse. This building dates back to 1942 AD (1361 AH) (Alansary and Almareeh, 2007), it was built of mud, on stone

foundations, and is surrounded by mud walls. There are four watchtowers located at the corners of this building, in addition to a mud mosque, and an ancient well dating back to the pre-Islamic era.

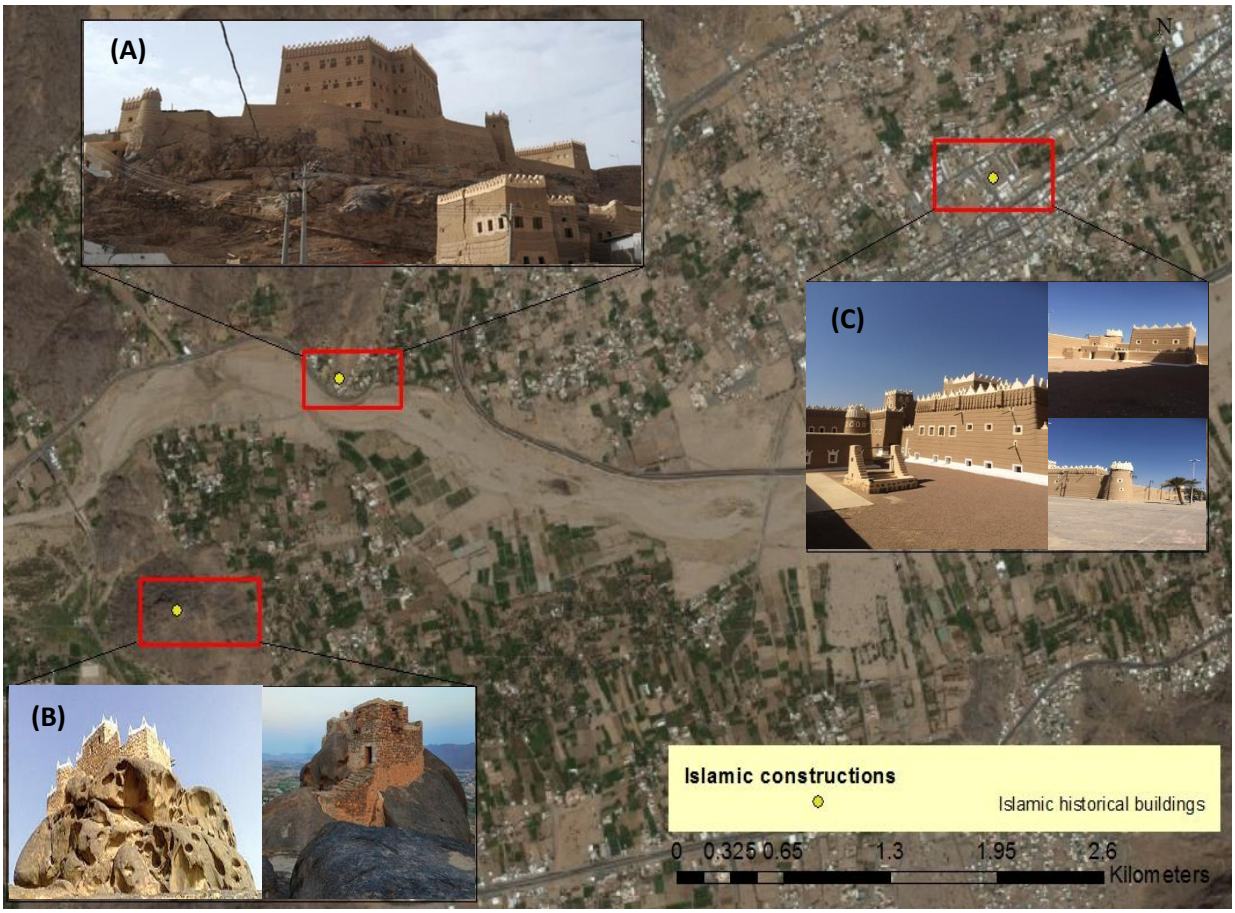


Figure 4.15: Three famous ancient Islamic buildings in Najran region: (a) Aan or Saadane Palace, (b) Rah'om Castle, (c) Emirate or Bin Madhi Palace.

With regard to the details of the rest of those accessible archaeological sites, one belongs to the Palaeolithic period, which is Bir Hima. In addition, there are two potentially accessible sites which belong to the Neolithic period; they are Al-Ukhdud, and Bir Hima. Of these, Al-Ukhdud site contains some pieces of pottery from this period, while Bir Hima site has some stone tools belonging to this period. Furthermore, three potentially accessible sites date back to the Bronze period, they are Jabal Alhusainia, Al-Ukhdud and Bir Hima. Jabal Alhusainia has inscriptions and rock art belonging to this period, while Al-Ukhdud has some inscriptions and the head of a lion made of bronze and a separate paw, also from this period. Bir Hima has tumuli from that era. Also, there is one site of potential archaeological interest that belong to the Roman period, which is Al-Ukhdud as it has some pieces of pottery that belong to this period. And two sites, Al-Ukhdud and Bir Hima, belong to the Byzantine/ Sassanid period, they include inscriptions that belong to the Islamic period; also, Al-Ukhdud site

contains traces of a mosque's foundations dating back to 622 AD (1st century). In addition, Figure 4.16 shows the site at Al-Ukhdud which has a millstone, traces of buildings and inscriptions, plus a museum that is currently under development. Figure 4.17 shows the Bir Heima site which includes wells, rock art and inscriptions. The longest and most important of these inscriptions is the one located at Bir Hima, which dates back to 518 AD; it contains twelve lines of Sabaean text and tells the story of the invasion of Najran by a Himyarite king, Yusuf Assar Yathar, and his army; it includes the numbers of people killed and prisoners taken, as well as the spoils of war in the form of animals that were taken after that battle, see chapter 2.

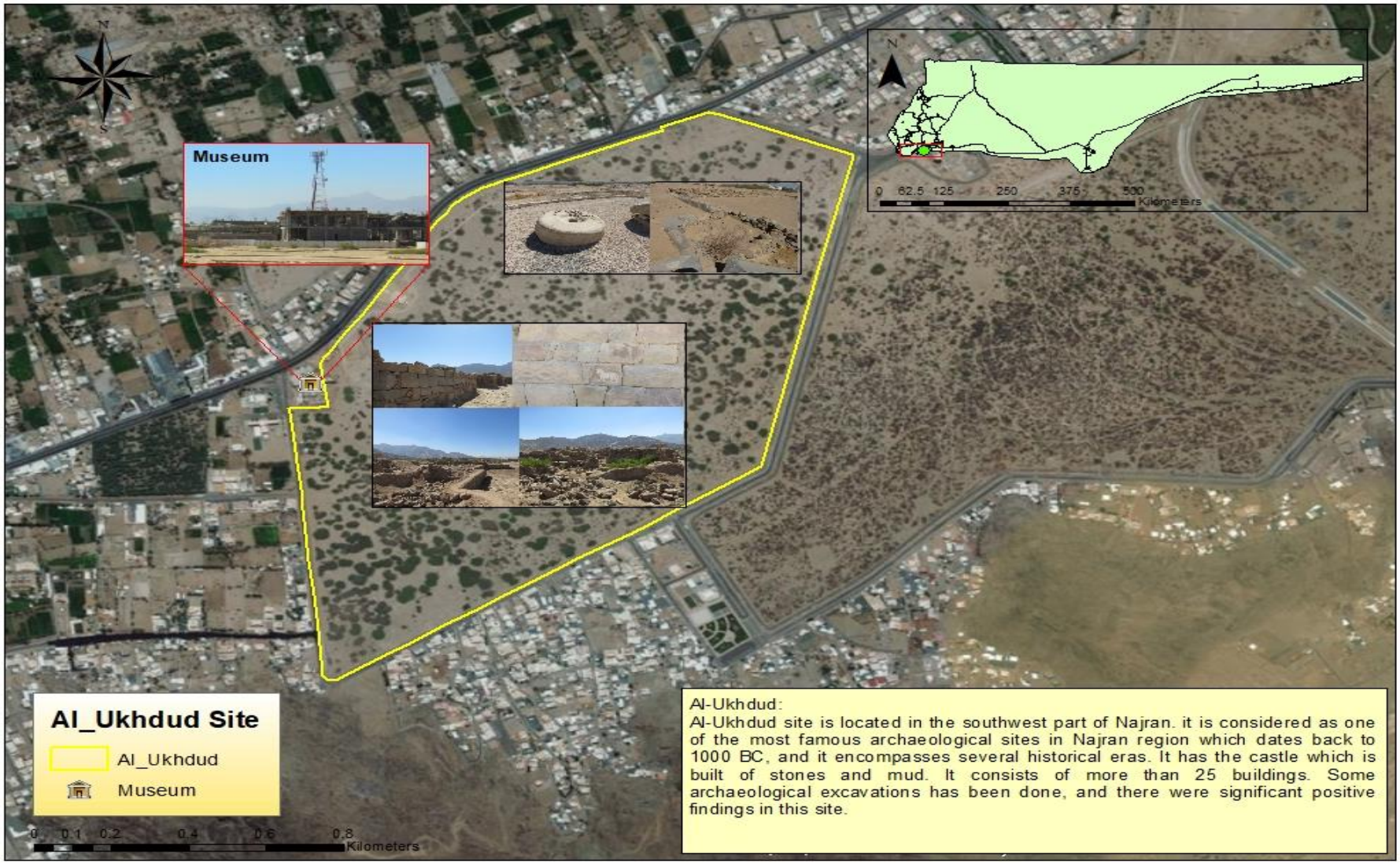


Figure 4.16: Al-Ukhdud archaeological site with some features

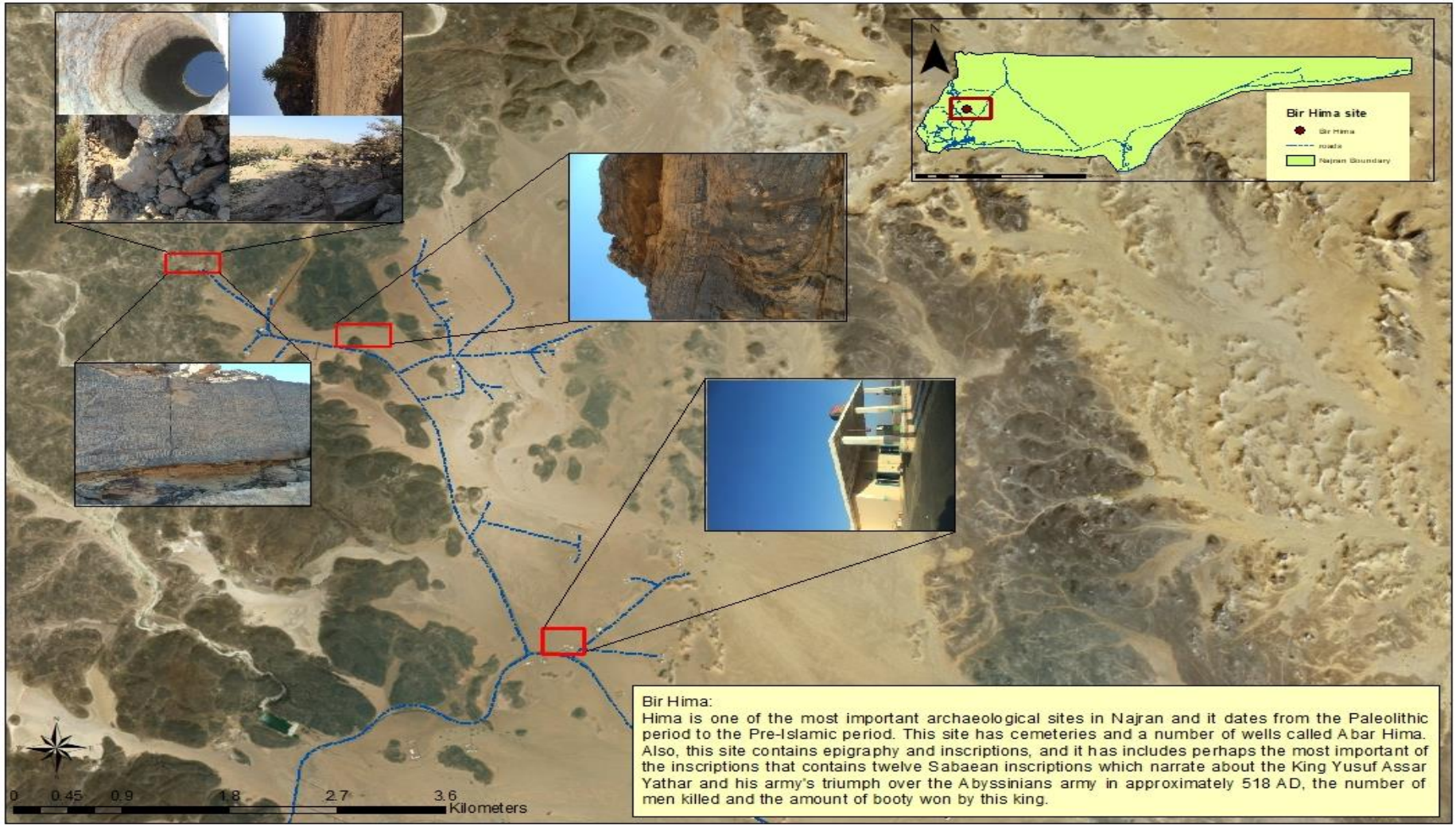


Figure 4.17: Bir Hima site with some inscriptions, destruction at the top of the wellhead and a filling station with poor service

4.3.2 Infrastructure database

The content of this database can be shown on three maps: (a) transportation infrastructure, (b) accommodation and (c) amenities.

(A)- Transportation infrastructure

The provision of transportation is of course very important for all tourist market segments, whether it is international tourists, Saudis coming from outside Najran or local residents. Fig. 4.17 shows a map of transportation in Najran. Also, there are two airports in Najran. The main one is located in Najran governorate and the other is located in Sharurah governorate. From these two airports there are flights to various regions of Saudi Arabia; in addition, Najran Airport offers international flights to and from the United Arab Emirates as well as to Egypt (Al- Yami, 2013). It can be said that Najran Airport that serves the domestic-tourist segment and some international tourists, such as those who wish to travel or from Dubai or Cairo. The rest of the tourism-market segments, such as tourists from Gulf Cooperation Council states or neighbouring countries, or those arriving for pilgrimage, can go to Najran after their arrival at an airport in a major Saudi city, such as Riyadh, Jeddah or Dammam. Furthermore, the Najran region has only one bus station, served by the country's sole bus company, Saptco. According to the Saptco website (www.saptco.com.sa), this company offers direct international transport for passengers to or from Gulf Cooperation Council states, Egypt and Jordan.

The distribution of fuel stations is satisfactory and there are four car-hire agencies in Najran.

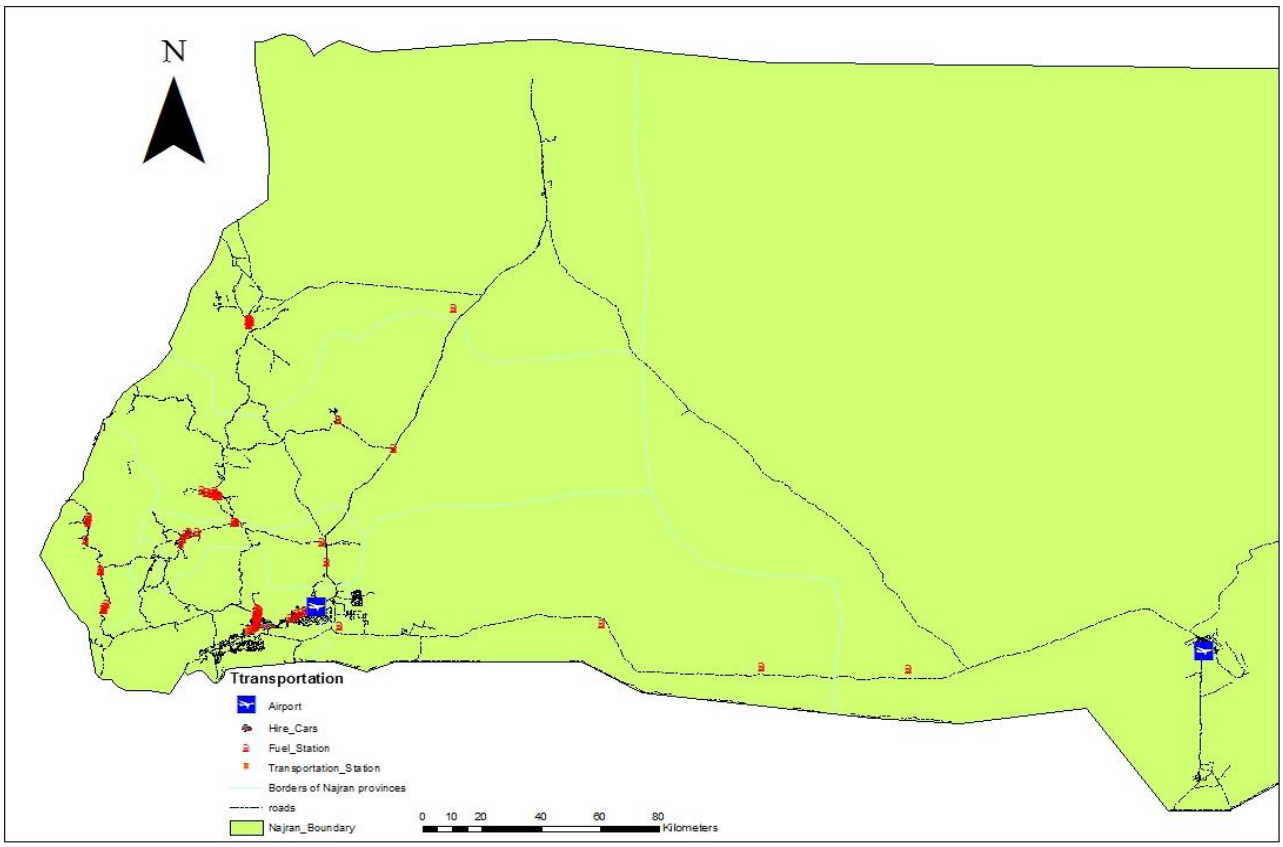


Figure 4.18: Najran transportation map

(B) Accommodation

Accommodation in Najran is composed of two types: hotels and furnished apartments. There are 13 hotels in Najran, and 57 furnished apartments. The furnished apartments are more spread out in Najran than the hotels (see Fig. 4.19). The hotels are concentrated in Najran province except one which is located in Sharurah province, about 340 kilometres from the centre of Najran. The furnished apartments are distributed as follows: 67 per cent of them are in Najran province, 3 per cent in Bader_AlJanoub province, 9 per cent in Hobona province, 7 per cent in Yedema province and 14 per cent in Sharurah province. Figure 4.20 shows potential archaeological tourist sites with nearby accommodation.

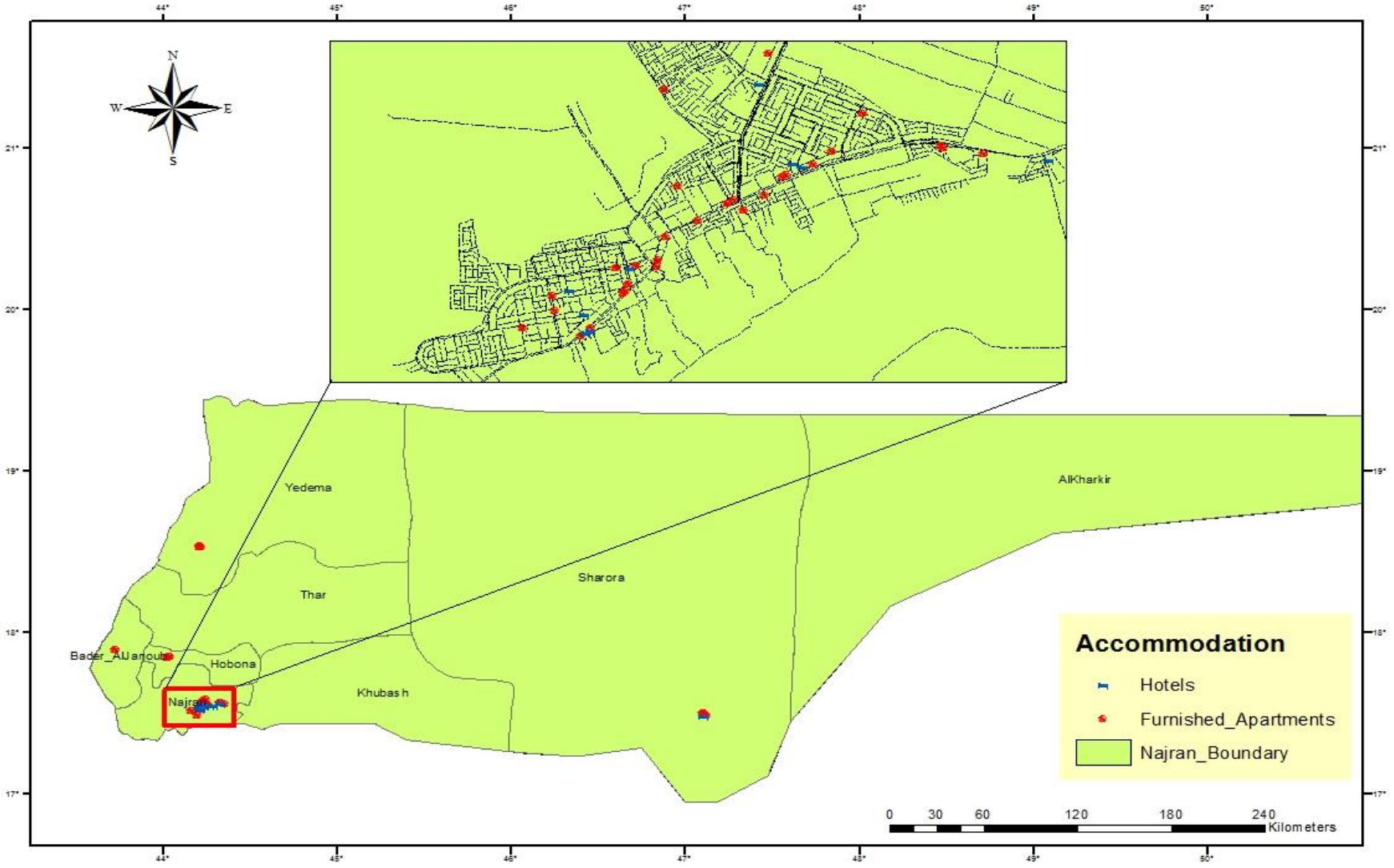


Figure 4.19: Accommodation in Najran.

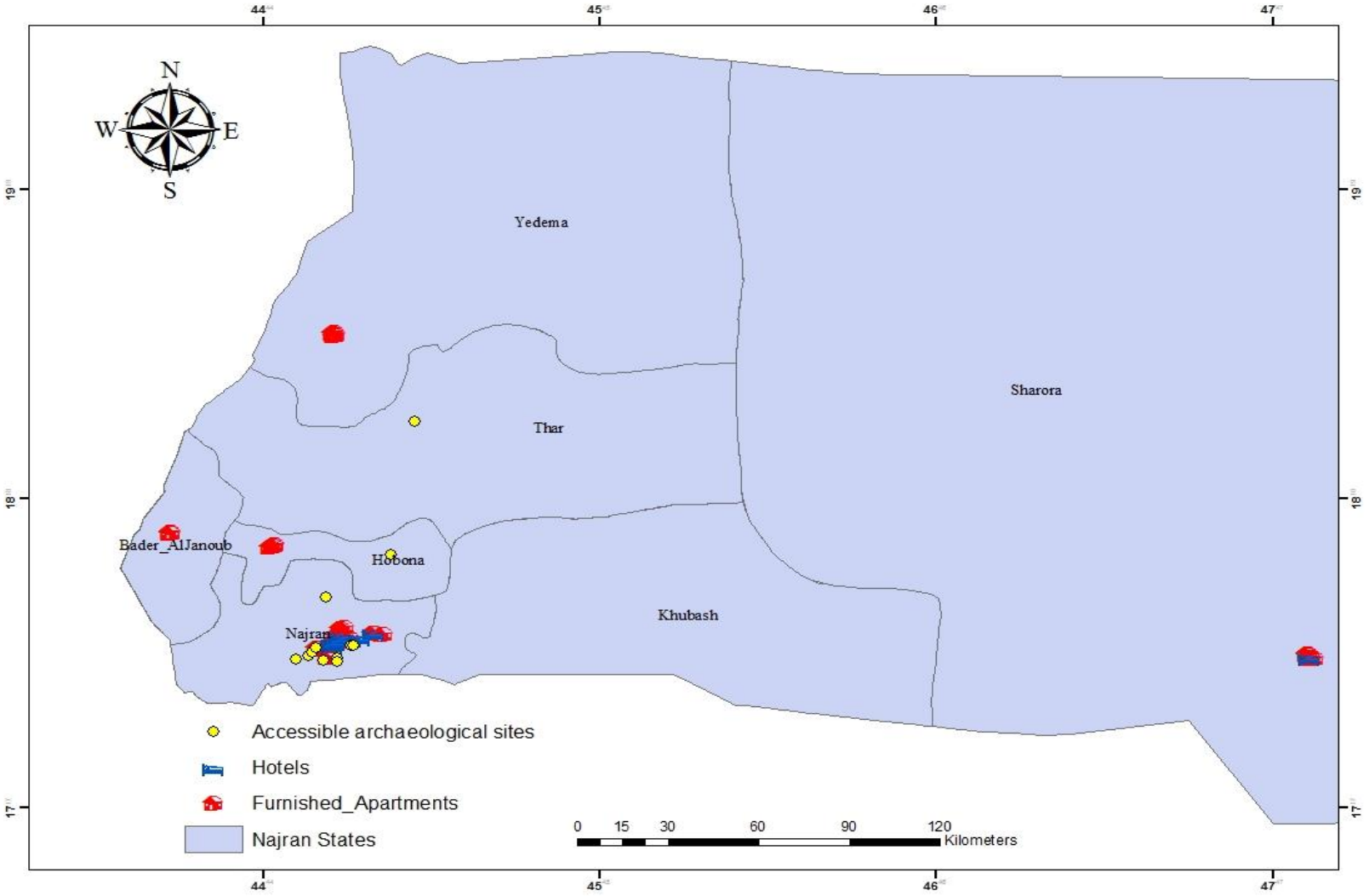


Figure 4.20: Potential archaeological tourist sites with accommodation

(**C) Amenities**

Providing suitable amenities helps to attract tourists is key, as people are generally looking for places with all the necessary tourism infrastructure in situ. Many amenities are essential and required by all tourist-market segments. Figure 4.21 shows a map of Najran's amenities. These include hospitals, restaurants, coffee shops, shopping centres and malls, banks and popular markets. The majority of these are concentrated in Najran centre, which was confirmed by the author, while doing fieldwork, by cross-checking the presence of tourism infrastructure as shown on OpenStreetMap and in the SCTNH brochure for King Abdul-Aziz road. All government services are located on this street, as well as other amenities needed by the visitor to Najran, but these start to diminish when moving away from the city centre towards the north-east, where Bir Him is located.

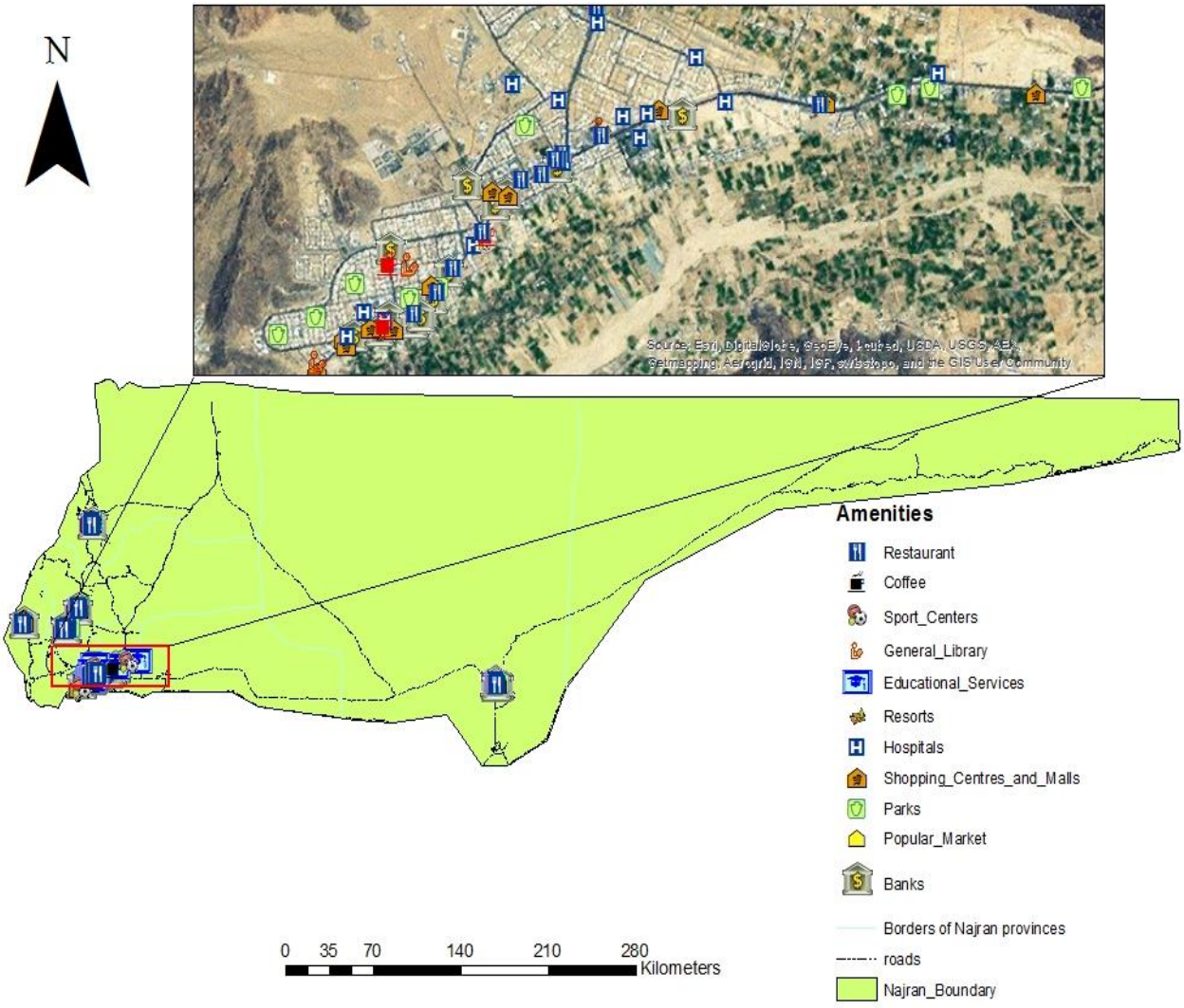


Figure 4.21: Najran amenities map.

Based on the infrastructure database results, tourists arriving at Najran airport can take a taxi or go to a car-hire agency located inside the airport, and then it takes about 19 minutes to reach the Holiday Inn hotel, driving at a speed of 60 km/h within the city limits, or about 26 minutes to the Hyatt Najran hotel. These two hotels can offer greeting and pick up to their customers going from the airport to the hotel, they run a shuttle service that attracts a surcharge. In addition, these two hotels can offer their tourist customers a tour of the city. As mentioned in Section 3.1.1, some guidebooks refer to tourist sites in Najran, e.g.Ham (2004), Walker et al. (2007) and Walker et al. (2010); they mention that half-day and full-day tours of Najran are offered by some of the hotels there, including the Holiday Inn and Hyatt Najran Hotel. The Holiday Inn can also arrange excursions to Bir Hima or offer camping in the Empty Quarter desert to enjoy the wildlife there (Ham et al., 2004: 137). When visiting during fieldwork in 2014, the Hyatt Najran Hotel explained that they frequently organise two-day tours for guests staying there that include the Emirates Old Palace, the People's Market and Najran Dam on the first day, and the Al-Ukhdud archaeological site and museum on the second. If guests are staying there for more than two days, the hotel can arrange a trip to the site at Bir Hima. Figure 4.22 shows the tourist itineraries offered by the hotels. Smaller hotels and furnished apartments cannot offer this service. Figure 4.23 shows Najran region amenities, with those at Bir Hima archaeological site.

Figure 4.22: Tours arranged by the Holiday Inn and Hyatt Najran Hotel in Najran region

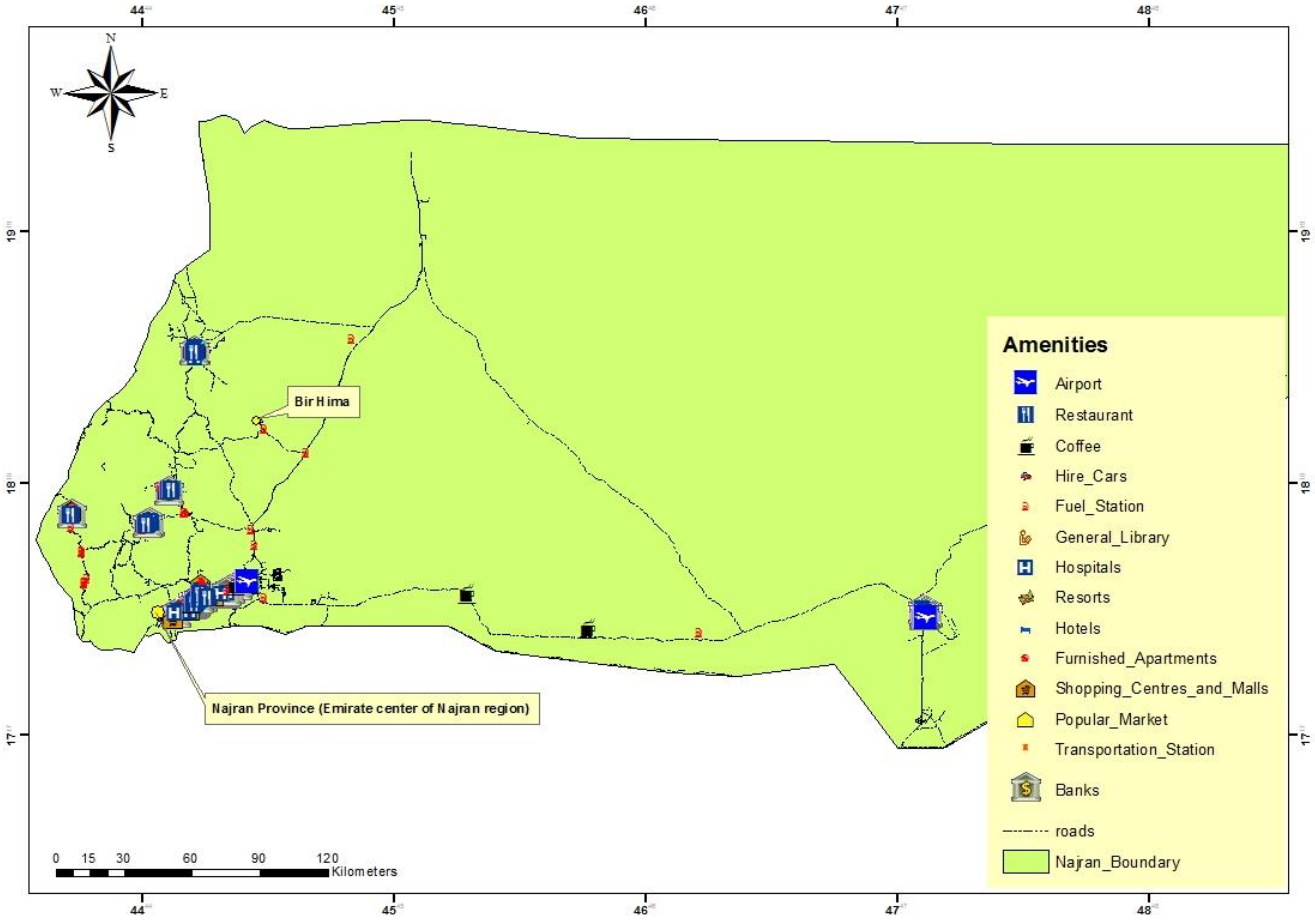


Figure 4.23: Najran region amenities, with those at Bir Hima highlighted

4.4 Discussion

In this thesis, an archaeological tourism database is developed for Najran region, Saudi Arabia, using a GIS tool. It begins with archaeological characteristics gathered from a literature review and fieldwork, along with the coordinates of archaeological sites obtained from the SCTNH which are not available for spatial queries. The actual number of sites included in the archaeological tourism database is about 69, but on examining these archaeological sites in conjunction with the road network, and the characteristics of sites with sufficient archaeological value, it is found that about 13 archaeological sites are easily accessible, being located in the travel-time zone of 0–180 minutes.

The existence of actual archaeological sites held in a database, along with their characteristics, achieves the first objective of this thesis, which is "to review the distribution and characteristics of archaeological sites in Najran region and build a spatial database suitable for archaeological tourism planning". This database will be useful to determine which of those archaeological sites are accessible and can be exploited for tourism. Also, it will help researchers to deal with any requests for special data relating to particular archaeological sites.

Furthermore, part of the first objective of this thesis is to create a database of infrastructure for the study area, Najran, this to include accommodation, transportation and other amenities. This helps to determine the availability of tourist infrastructure and services for archaeological tourist sites, along with fieldwork that was done in 2014 and 2016, especially at two archaeological sites: Al-Ukhdud and Bir Hima. This objective requires both an archaeological database and an infrastructure one, which have now been built, and these are used with the amenities database to implement a cost surface and thus help to identify potential archaeological sites for tourism, depending on their accessibility and archaeological characteristics. The final outcome is six potential archaeological tourist sites which satisfy the second objective of this study "to conduct short list archaeological sites of high potential tourism value based on this database and tourism", which has now been achieved.

Although studies have been conducted using GIS to build databases, none of these have done so with tourism development as their primary objective. This is consistent with Palumbo (2012) who mentions that the majority of governments, especially in Middle East countries, are using GIS as a tool to build inventories of archaeological sites in order to be able to manage them and protect them from risk, but they have not as yet used GIS for other purposes such as planning in relation to archaeological sites. For example, Jennings et al. (2013) carried out a study using GIS to build a database for the site at Jubbah in northern Saudi Arabia. In their study they did a survey of the study area; then, data were entered into a GIS database containing various information, such as

geographic coordinates, site conditions, type of site depicted, Thamudic inscriptions and visibility. They built this database to help to show site features on maps and in order to examine spatial relations between rock-art sites and paleo-lakes in the study area. Prior to that, Uphus et al. (2006) carried out a study using GIS to build a database model that could help to determine and manage the influence of recreational activities on archaeological sites in order to be able to manage them and protect them from risk. Furthermore, Hadjimitsis et al. (2013)and Agapiou et al. (2015) used remote sensing and GIS to help in the conservation of archaeological heritage sites and in protection from natural and human risks that can affect the long-term sustainability of these monuments. Meanwhile, Delaney et al. (2015) carried out a study using GIS to build a database of cultural-heritage resources of Qatar so as to be able manage and protect archaeological and historical sites for future generations.

These case studies and other studies that have used GIS in the field of archaeological-site monitoring, and for predictive management, represent an important step but, unfortunately, those studies did not use GIS for optimum tourism planning in order to develop and exploit those archaeological sites for tourism, whereby, for example, entry-ticket fees to those sites can contribute to their maintenance and development and thus to the sustainability of archaeological tourism. The difference in this study is that GIS has been used to create a database containing the characteristics of all archaeological sites in the study area, Najran, from the Palaeolithic to the Islamic period, and this method has helped to show the distribution of archaeological characteristics and determine the most appropriate sites that are, or can be made, accessible for tourists. Furthermore, this study is the first to apply GIS in Saudi Arabia to build a database of archaeological characteristics along with an infrastructure database. Accordingly, based on the database that was built for Najran's archaeological sites, the same methodology could be useful for other regions in Saudi Arabia, so as to establish a comprehensive database for all Saudi archaeological sites. Such an archaeological tourism database could be a support tool for the management and development of archaeological sites and also help to identify the most appropriate archaeological sites for tourism. But since archaeologists and archaeological tourists like to link geographical sites to the time periods they belong to, the archaeological-database methodology used in this thesis is suitable for generalisation and application to any country in the world, both for future archaeological studies and for the development of archaeological tourism, especially in those countries that have the most rural territory, adequate accommodation and sufficient amenities near archaeological sites, which will helps to access archaeological sites relatively quickly. In contrast, Najran, still suffers from a shortage of accommodation outside the city centre and near its archaeological sites, which means

that visits to some archaeological sites can involve up to three hours' travelling, while other sites are even less accessible and require a 4x4 vehicle.

The advantage of using GIS for archaeological tourism is that it helps the user, as it shows the spatial distribution of sites according to their characteristics as entered in the database, such as time period, stone tools, inscriptions, historical buildings and so on.

Those researchers who use this method in the future should examine data downloaded from the OpenStreetMap to build an infrastructure database, while ensuring that such data have identical locations to those shown on a basemap, because this study found that the roads network downloaded from OpenStreetMap was not identical when comparing it with a basemap – some roads were omitted or displaced, though this has now been corrected in this study. That is consistent with some researchers who have used OpenStreetMap, e.g. Haklay (2010), who carried out a study in order to compare Ordnance Survey datasets with OpenStreetMap for same sites in London and the UK; the study concluded that there were errors in OpenStreetMap, but the results could be considered reasonable in terms of accuracy. Sehra et al. (2016) did a study on the topology of India using OpenStreetMap data, and their results demonstrate considerable numbers of topological errors in the study-area map data extracted from OpenStreetMap, and so they recommend using such data with caution. However, errors in OpenStreetMap data might be due to contributors not having received any training or having had any practice in surveying, geometry or geography, which might impact on data entry to OpenStreetMap and result in inaccuracies (Basiri et al., 2016:56).

The justification for utilising OpenStreetMap data in this dissertation is that these data are easy to access and download, and they are free (Pánek, 2013; Boularouk, 2017). In addition, a GIS cost-surface approach was used to measure accessibility rather than network analysis, due to insufficient data being available on road networks, nodes, traffic lights and restrictions etc.

By using the databases created for the study area along with cost surface, archaeological tourist sites can be divided into two groups based on their accessibility: archaeological tourist sites with high potential and archaeological tourist sites with low potential.

4.4.1 High potential archaeological tourist sites

These archaeological tourist sites can be visited relatively easily by tourists, by driving in a car for around 0–180 minutes. It is noted that there is easy access to potential archaeological tourist sites located near to Najran city centre, and these are close to the services and facilities needed by tourists.

During fieldwork, three of these six short-listed sites were visited and it was observed that there was a shortage of the services needed by tourists at the Al-Ukhdud archaeological site, which is still under development; the SCTNH is rebuilding and developing the museum, but in terms of amenities such as toilets, a mosque, a coffee shop and places to sit, these are totally absent. Clearly, the lack of key services at some archaeological tourist sites is an obstacle to promoting tourism. Further sites were visited near Bin Madhi Palace, which is located in the heart of Najran City, close to a popular market and with amenities including banks, shops and restaurants surrounding this palace, which could be advantageous for it. Bir Hima is the farthest of these archaeological sites, it takes about 90 minutes from Najran city. During the fieldwork it was noted that Bir Hima has aesthetic scenery, with its mountainous location and seven historical wells, in addition to some trees. But it was also noted there that two fences had been installed by the SCTNH; these surround two locations with inscriptions, but the rest of the site is open and might be vulnerable to vandalism if not exploited for tourism. It was also noted that the wells had been vandalised. This site combines natural aesthetic and archaeological features that could be exploited for tourism and which should be maintained for sustainability. However, despite the wells having had some repairs done, it seems they still require some maintenance. Furthermore, the site at Bir Hima is accessible but does not have any basic services, e.g. a coffee shop, restaurant, mosque, toilets or a site guard. A room that serves as a mosque does exist on the road to Hima, but that is far from the Najran branch of the SCTNH and devoid of any signs; and before that there is a fuel station, but it is very old and has poor services. It takes about 15 minutes to drive from this fuel station to Bir Hima archaeological site.

In the SCTNH strategy for Najran (2007), there are some of 13 sites short-listed for future tourism planning, including Al-Ukhdud, Bir Hima, Ann Palace and Bin Madhi Palace, though some other sites are excluded from the strategy so far, so it seems that it is possible to open more sites geared to tourism in Najran Region.

With regard to tourist segments, these include domestic tourists and tourists coming from outside of Saudi Arabia. Tourists coming from outside the country, such as from the Gulf Cooperation Council States, might come to visit Najran, as it has many archaeological sites which are close to Yemen. The archaeological sites in this region are an attraction and offer a good opportunity to be exploited for tourism, especially international tourists looking for tourism in Yemen. For them, Najran region might be a more suitable destination due to the conflict in Yemen.

From the database created for Najran region's infrastructure, it can be seen that there are only a few restaurants that serve fast food, such as Herfy, McDonalds and Pizza Hut. There is only one restaurant from each of these chains in Najran province, and other provinces do not have these at

all, though they do have other restaurants. This might be an obstacle for those tourists who prefer to go to Bir Hima, where there is also no amenities, which makes tourist feels they are in a remote area with only basic services. Also, with regard to accommodation, there are just two hotels in Najran which do offer a service to take tourists around the area. Therefore, tourists coming from outside Najran generally have no choice other than these two hotels, except for those who are familiar with tourist sites and know where other accommodation is available.

Despite the attention paid to the development of tourism in Najran, it can be argued that tourism has not yet reached its full potential there, as there is still weak investment in all of the archaeological sites that are considered important to attract tourists, particularly as reminders and narratives for visitors interested in the lives of those living in former times in the area. Notwithstanding the above, the SCTNH seeks strategies to increase the community awareness of the economic and social gains to be had from tourism, antiquities and architectural heritage, as well as the development and commercialisation of products to target the tourist market, though those might be concentrated in the heart of Najran city, as basic amenities are fewer once past Najran airport and going towards Bir Hima.

4.4.2 Low potential of archaeological tourist sites

Appropriate infrastructure plays a critical role in access to various archaeological tourist sites, thus stakeholders should develop suitable infrastructure for the main potential tourist sites in order to attract tourists; then, archaeological tourist sites can play an effective role as an economic resource if exploited optimally. According to Mukherjee (2016), tourist sites commonly require various amenities, such as easy access, good accommodation, restaurants, coffee shops, recreation facilities and services, and so on, in order to attract tourists.

However, after using GIS in this study, it is clear that there are a number of archaeological sites that suffer from a lack of services, such as a long distance from a paved road. Tourists are looking for easy access to tourist sites, by car, with a reasonable driving time, as shown in Figure 4.10, where the majority of archaeological tourist sites are located within a 180–360 minute drive from a hotel. Though some sites are classified in this thesis as having low potential for archaeological tourism, based on accessibility, that does not mean that they should be neglected and starved of investment. Al-theeb (2012) recommends taking advantage of archaeological sites within the field of tourism and using them as open-air museums. On that point the author of this dissertation agree with him, since the author of this dissertation consider that all sites north of Bir Hima are promising for tourism in the future. Although these sites are located in one area, they cannot be merged into one site, since Ripley's K function analysis, as applied in Section 5.1.1, indicates that these sites are too spaced out.

Ripley's K is used for archaeological studies to examine the distance between archaeological sites and consider their distribution, i.e. if sites are clustered together, scattered or regularly spaced, which suggests that archaeologists can use it a as a tool to predict socio-political relations (Harrower and D'Andrea, 2014), though it cannot characterize the shape of human activities (Jayalath et al., 2015), since the main objective of this tool to measure the distribution of points, regardless of the shape or size of the study area (Conolly and Lake, 2006; Sayer and Wienhold, 2012).

Below are some suggestions for how to take advantage of those archaeological tourist sites with low potential because of access issues:

1- Archaeological sites located far from the noise of the city may encourage tourists to go there to enjoy a quiet atmosphere, so the author of this dissertation suggest having museums out in the open, in the fresh air, which might be attractive to tourists, especially during the holiday season, provided that basic amenities are available.
2- Create new roads to connect these archaeological sites in a logical order to help tourists to access them, as currently they require a 4x4 vehicle and a drive that takes 180–360 minutes.
3- Encourage investors to provide vehicles to drive tourists between all archaeological sites located in the same zone so that they can enjoy inscriptions and drawings dating back to different periods.
4- In zones where archaeological sites have low potential because of difficult access and an absence of amenities, the author of this dissertation propose that stakeholders provide mobile buffets with a traditional character that is commensurate with the old way of life, as well as tents which can be rented to tourists to let them enjoy both the wildlife and archaeological sites. In addition, let tourists who so desire stays in these tents for two to three days under the supervision of the Najran branch of the SCTNH.
5- Provide sufficient tourist guides and observers to maintain the sustainability of these places, because they are a non-renewable resource.
6- Provide mosques, toilets and shaded seating areas close to archaeological sites.
7- Organise access to a group of archaeological sites via a single gate in order to facilitate the observation and registration of visitors.

The idea here is to have a cluster of remote archaeological sites, with camping, which highlights that archaeological tourism need not be narrow but may encompass other ideas in the future, e.g. ecotourism.

There is something basic that the Najran branch of the SCTNH needs to do, which is to create a unit for the administration of geographic information systems for tourist sites, such a service to be

manned continuously. The databases created in this thesis are something that Najran branch could use and develop for the management of tourist sites. This would help decision-makers and stakeholders to implement their strategies and develop and exploit the full potential of archaeological tourist sites.

The advantages of using GIS for archaeological tourism accord with (Al-Belushi (2014:105)

1- It helps the user as it shows the spatial distribution of sites according to their characteristics as entered in the database, such as time period, stone tools, inscriptions, historical buildings and so on.

2- It can assist archaeologists to analyse data through digital maps.

3- It can help stakeholders to exploit archaeological sites for tourism based on the characteristics of archaeological sites which have been assimilated into the design of the database.

4- It can help stakeholders to manage archaeological sites and to deal any queries relating to these sites.

5- It can give the user an initial impression of a place and how to access it.

6- It can help stakeholders to forge links between archaeological sites and their amenities in order to promote their development.

7- It can help stakeholders by tracking and monitoring archaeological tourist sites in order to do maintenance and thus preserve those places.

8- It can help decision-makers to create and design tourist routes.

In general, it can be said that there are certain limitations that might affect the results, e.g. there is a lack of information in the literature review and from the SCTNH, which became obvious as the author worked to extract the characteristics of archaeological sites; some sites were not found in the literature review but were found in the SCTNH, and vice versa. Hence the researcher endeavoured to overcome this issue of the absence of site features by doing fieldwork, but time was limited and the gathering of sufficient data could not rely on a single respondent to assess the tourism-related features of short-listed archaeological sites without visiting them. This could affect assessing the value of archaeological sites, e.g. whether the contents of a site still exist or not, especially those with inscriptions, plus the effect on buildings of other factors such as the weather. The researcher did not visit all archaeological sites of interest due to their large number. It would need a great deal

of time and money to visit them all. Furthermore, it is important to know when thinking about promotion tourism which archaeological sites are fragile and need appropriate planning for their maintenance and development in order to conserve them for future generations; archaeological sites are a limited resource and there is a lack of sufficient information to demonstrate their fragility. Also, there is a lack of knowledge and willingness about how to point tourists towards archaeological sites. In addition, the landscape features that accompany archaeological sites are not exploited, though tourists should be encouraged to profit from both those too. The road network is insufficient if tourists are to be able to reach certain archaeological sites that have some valuable archaeological characteristics, which could encourage investment in the field of tourism.

This methodology will be developed during the next phase by conducting a survey of tourists to estimate potential domestic demand for archaeological heritage tourism at short-listed sites in Najran. Three selected archaeological tourist sites in Najran will be assessed for tourism via a questionnaire. The reason for investigating only three sites at this stage is to make the questionnaire easy for and attractive to respondents, as if respondents feel that a questionnaire will take too long to complete they may refuse to participate. The aim will be to get as many tourist respondents as possible in order to measure the orientation of tourists towards archaeological sites based on this sample. What is more, connections will be made between archaeological tourist sites and nearby landscapes, which may help in the design of a tourist route for Najran that includes potential archaeological tourist sites. However, visitors' experiences of sites (e.g. landscape and biodiversity) may give an initial impression of sites to be visited, and those captured in photographs by visitors and tourists could be an important resource, especially regarding the characteristics of tourists' chosen destinations.

4.5 Conclusion

This chapter is fundamental for the construction of a database of possible Najran archaeological tourist sites and infrastructure that can support tourism activities. The existence of an archaeological database as well as one for infrastructure (transportation, accommodation and amenities) allows the integration necessary for archaeological tourism development.

This is illustrated by making a comparison between Google Maps and cost surface to calculate cost distances in ArcGIS, which are closely linked to travel times, as there is a strong relationship between them.

It has been shown that a road network covers the majority of the Najran region, but that archaeological sites located to the north of Najran, behind the mountain at the Bir Him site, are located away from roads. Thus these sites can only be accessed using a 4x4 vehicle, as the area is covered by sand; also, because vehicles cannot be driven at speed there, as they can on straight roads, as discussed, it would take up to 130 minutes to arrive, driving off-road. The absence of roads near such sites might be an obstacle to their development for archaeological tourism.

In addition, accommodation is a key factor for those visiting Najran, especially tourists or visitors coming from outside the region. In general, furnished apartments are better distributed than hotels as they cover more places in Najran. What is more, amenities tend to be concentrated in Najran city, with not much in other governorates, as noted when visiting Bir Him site during the fieldwork – this site does not have any amenities, i.e. a coffee shop, restaurant, bank and so on.

Arguably, the SCTNH in Najran needs to invest in archaeological sites and do work to maintain them; for example, in the vicinity of archaeological sites, desert places could open centres offering 4x4 vehicles for rental to tourists and thus bring some money to archaeological sites, and they could supervise sites directly to avoid their destruction by tourists during unorganized tourism, as these sites cannot be replaced. In addition, the SCTNH at Najran could offer amenities such as carts selling coffee and snacks to tourists. Stakeholders could also provide motorcycles for hire near archaeological sites to take advantage of those sites in a more diverse way.

Chapter 5

Consumer survey to evaluate selected destinations

5.1 Introduction

Despite the existence of many archaeological sites in Najran, no study has been conducted to gauge the tourist demand for archaeological site visits or how many tourists are likely to visit archaeological sites based on appropriate information, especially if tours are offered to them. Therefore, the purpose of this chapter is to evaluate selected destinations in the study area. As mentioned in Chapter 1, the third aim of this dissertation is to estimate potential demand, whether from Saudis or international visitors, for archaeological heritage tourism at shortlisted sites in Najran by utilising a questionnaire. The use of a questionnaire here is used to assess the demand for contrasting destinations with different characteristics, in addition to determining or understanding the basic socio-demographic characteristics that affect the likelihood of these three shortlisted archaeological sites being visited.

As discussed in Section 3.4.2, there are four tourist-market segments in Saudi Arabia: domestic tourists, tourists from Gulf Cooperation Council states and neighbouring countries, tourism related to pilgrimage (Hajj) and Umrah, and tourists from the rest of the world. At present, no tourist visas are issued and this is a hindrance to growing international market segments, except for the Gulf Cooperation Council states (GCC) whose citizens do not require a tourist visa. Therefore, domestic tourism in Najran will remain confined to Saudi citizens, GCC citizens and foreigners who are in Saudi Arabia as visitors or residents until Saudi Arabia issues tourist visas, which the Saudi government is proposing in its vision 2030, (http://ftalphaville.ft.com/files/2016/04/Saudi_Vision2030_EN.pdf). This chapter therefore focuses on this group of domestic tourists and those from GCC states.

The questionnaire used in this study employs Likert scales to gauge the likelihood of tourists visiting three archaeological sites listed in it. The reliability of this questionnaire has been tested via a pilot study, while the method used to analyse the results is logistic regression that helps to predict which of these three shortlisted archaeological sites are more likely to be visited in the future, based on both socio-demographic characteristics, as well as previously visited archaeological sites associated with the likelihood of visiting these three shortlisted ones.

5.2 Methodology

5.2.1 Data collection

Figure 5.1 summarises the stages in implementing a questionnaire survey to evaluate the demand for selected archaeological destinations.

A literature review, government archaeological records and fieldwork by the author were used to develop an archaeological heritage database, as explained in Section 4.2.1, and generate a short-list of three archaeological sites suitable for the tourism market segments.

As discussed in Chapter 4, 13 sites with high potential tourism value were short-listed, based on their archaeological characteristics and their accessibility. Of these, three archaeological sites were then short-listed and are used here to measure the demand in the domestic tourism market segment for visits to archaeological sites. Those sites are Al-Ukhdud, Bir Hima and the historic Emirate's Palace. The reason for focussing on three sites only is to make the questionnaire shorter and thereby maximise response rates. These three sites were also selected because of their archaeological characteristics, which might attract tourists to visit them. The reasons for selecting the Al-Ukhdud site included its location on the outskirts of Najran (as a contrast to the other two sites), and its archaeological significance in Najran region as a site dating back to 1,000 BC (Zarins et al., 1983). Furthermore, this archaeological site has the remains of more than 25 ruined historic buildings, some Musnad inscriptions with some religious indications (Alansary and Almareeh, 2007) and other depictions, e.g. camels, snakes and horses, plus some pottery shards, in addition to some stone tools including millstones in the form of two circular stones, placed on top of each other and used for grinding grain. The characteristics of the site mentioned here are still there for tourists to see when visiting it.

The inclusion of the Bir Hima site on this shortlist is because this site is one of the most important archaeological areas in Najran as it has attractive archaeological characteristics, such as epigraphs and inscriptions, and perhaps the most important of the petroglyphs, containing twelve Sabaean inscriptions dating back to 518 AD (Beeston, 1985; Alansary and Almareeh, 2007). In contrast to Al-Ukhdud, this site is located in a remote area away from the city, and surrounded by mountains. It is also located on an ancient caravan route that can offer tourists opportunities to view ancient wildlife, with water wells of archaeological interest still in existence at the Bir Hima site, which might have been utilized by historic trading caravans from Yemen, passing through Bir Hima on their way to the north of the Arabian Peninsula, and to the countries of the Levant. According to the UNESCO website (http://whc.unesco.org/en/tentativelists/6033/), the Bir Hima site is currently on a tentative

list to become a UNESCO World Heritage Site, and 'this site has universal appeal due to its archaeological characteristics, the most prominent of which are as follows:

1- This site has an impressive array of inscriptions and rock art, some of which represent human figures and evoke possible trade and religious practices some 7,000 years ago, while the representations of animals depict daily and social life as prehistoric parietal art, which has an aesthetic naturalistic realism.
2- The rock inscriptions bear exceptional witness to an approach to life that has disappeared. This is evident in the way they graphically represent activities connected with trade, hunting and travel at a time when the climate and vegetation of the area were more amenable to daily living.
3- The existing diversity of landforms at Bir Hima site played an essential role in fostering human settlement. In addition to the rock art, inscriptions document the settlements of successive communities, which engaged in nomadic livestock herding and agriculture and form part of the wider context of human interaction with the semi-arid southern desert environment of the Empty Quarter, illustrating the adaptability and ingenuity of human communities to make the most of scarce resources to sustain a continuous presence.'

The reason for choosing to include the historic Emirate's Palace is due to its location in the central part of Najran (in contrast to Bir Hima), which offers tourists an opportunity to view the ancient architectural styles of Najran, with buildings of mud on stone foundations, and the opportunity to explore traditional products of Najran, such as in the popular market and the daggers market located by the Palace. Furthermore, this palace dates back to 1932 AD (1353 AH), was built of mud, on stone foundations, and is surrounded by mud walls. There are four watchtowers located at the corners of this building, in addition to a mud mosque, and an ancient well dating back to the pre-Islamic era (Alansary and Almareeh, 2007). In addition, this Palace was used as a residence for princes, also as government offices, such as a police station, a telegraph office and a courthouse (Alshaban, 2007).

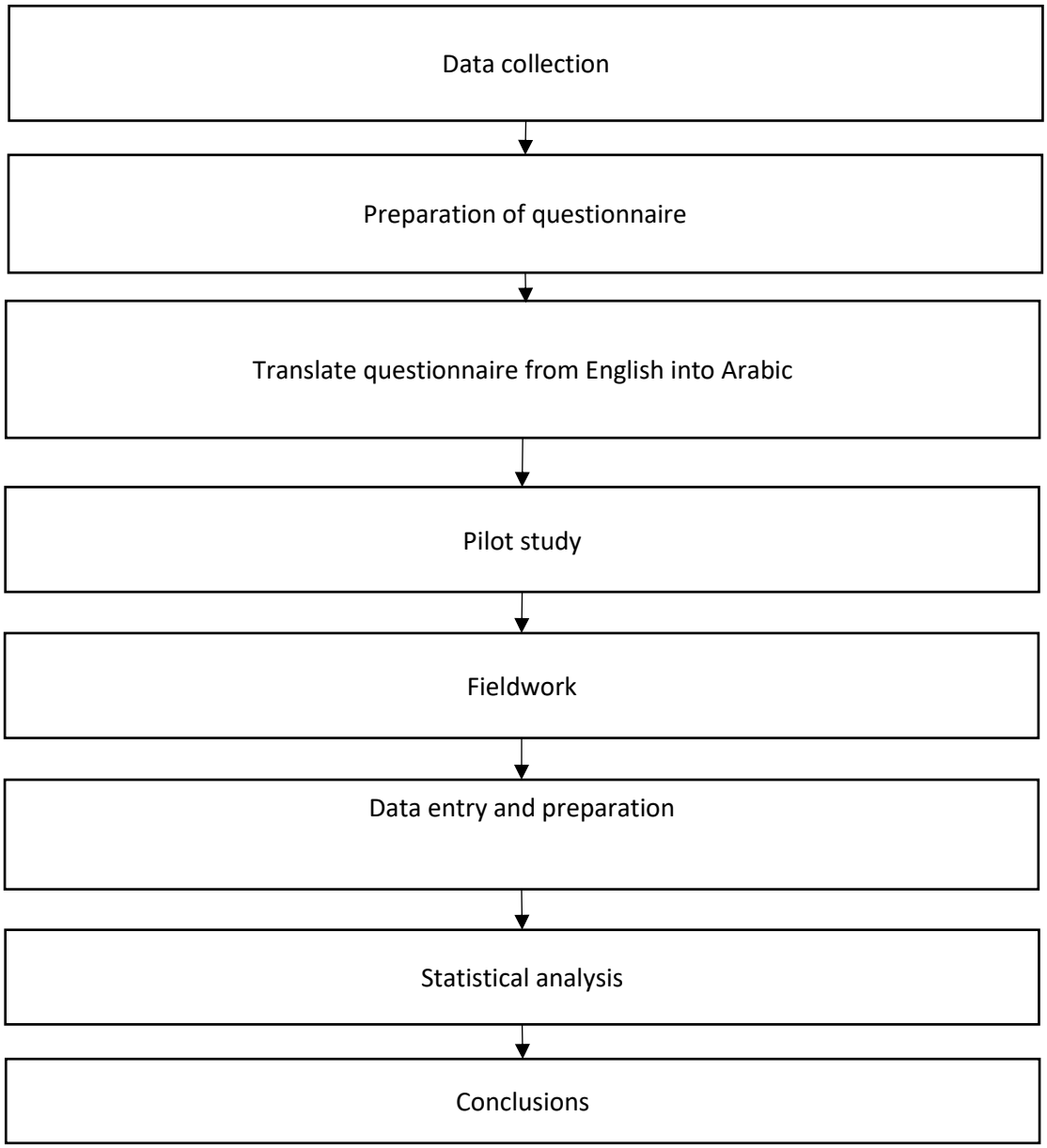


Figure 5.1: Process to evaluate the demand for selected destinations via a questionnaire

The sample size was chosen so as to detect a significant difference in the proportion of respondents expressing a desire to visit one of the short-listed sites versus the proportion wishing to visit the remaining two short-listed sites. Following (SCTNH, 2007), it was assumed for the purposes of sample size calculation that 75% would wish to visit Bir Hima, compared with only 61% wishing to visit the Palace or Al Ukhdud. Based on these anticipated proportions, an online statistical calculator (https://select-statistics.co.uk/calculators/sample-size-calculator-two-proportions/) suggested a minimum sample size for this study of 171, which would enable such a difference to be detected at a 95% confidence level and with 80% statistical power (Dell, et al., 2002).

5.2.2 Questionnaire survey

The protocol for this study was granted ethical approval by the University of Southampton (Ref: 20790). Adults visiting public sites for recreation aged approximately 20 years and above were the target group for the survey, while children are excluded from this study.

Demographic data collected in the first part of the questionnaire (provided in Appendix 5.1) included gender, age, nationality and place of residence. The second part of the questionnaire examined previous visits by tourists to archaeological tourist sites. This could help to determine how a past history of visiting archaeological sites influences the likelihood of someone expressing a desire to visit similar sites in the future. The third part of the questionnaire examined the likely level of tourist interest in each of the three short-listed archaeological listed sites in Najran via the following question: 'I am now going to show you some information about three sites in Najran [SEE 3 SEPARATE INFORMATION CARDS]. Based on the information, how likely would you be to visit each site if a tour was offered to you?' When asked to answer these questions, respondents were given time to read the information on three separate cards, one for each site (see Appendix 5.2). Each card contained information with photographs of each of the three archaeological sites, Al-Ukhdud, Bir Hima, and the historic Emirate's Palace. Each card presented text and photographs describing the era that the site dated back to, the most prominent structures and artefacts at each site, examples of any inscriptions, and also the wider landscape or settlement in which each site is located. The Al-Ukhdud site card includes photos of some ruins of stone buildings which were used as housing until they were destroyed in 25–24 BC (Alansary and Almareeh, 2007); it also has some Musnad inscriptions that still exist on stone bases in some buildings at this site; the card also presents the remains of pottery on the site surface and a millstone, as well as the mountainous scenery surrounding this site. As for Bir Hima, the photos on the card show water wells, various depictions (e.g. a drawing of a palm tree, a man riding a horse, carrying spears in his hand, and a lunate pommel dagger in a belt around his waist), inscriptions (e.g. Sabaean inscriptions dating back to 518 AD) and surrounding mountainous scenery and natural woodland (acacia trees and palm trees). The third card for the historic Emirates' Palace included photos of the main entrance to the palace, a sitting room, an inner palace ceiling, an inner courtyard, a water well, towers, the mountainous scenery and the urban area that form the background to this palace.

As the study's objective was to gauge respondents' likelihood of visiting these three sites based on their archaeological characteristics, the author deliberately avoided making any reference to prices, or the existing tourism infrastructure (e.g. shops, cafés, signage, tour guides etc.) at each site in order to gauge the underlying demand for the archaeological features present.

The questionnaire and information cards were translated from English into Arabic and then pre-tested on 27 Arabic-speaking PhD students at the University of Southampton on 24 June 2016. This exercise suggested that both the translated cards and questionnaire were clear to this respondent group.

5.2.3 Fieldwork

In this phase, the questionnaire was administered in the study area, the city of Najran, from 13 July to 1 October 2016, usually in the morning and the evening when public sites for recreation were busiest. Interviews were conducted in shopping malls such as Najran Royal Centre (one of the largest shopping centres in Najran with clothes stores, an amusement centre and restaurants), the daggers market (which sells daggers and goatskin water bags), the popular market (dedicated to women's products, especially traditional items) and parks (Aba-Al-reshash Park and King Fahd Park); Figure 5.2 shows the places where respondents were recruited. These sites were chosen because they are popular public places frequented by both locals and visitors to Najran, especially at the time when the survey was conducted, which was a holiday in Saudi Arabia. A sample was randomly selected at these sites, i.e. the first respondent was selected randomly and thereafter every third individual or group was selected.

In accordance with Saudi social values, female respondents were only approached if they had a paterfamilias with them, such as an adult man. Before each interview, informed consent was sought from all respondents for their participation in the study.

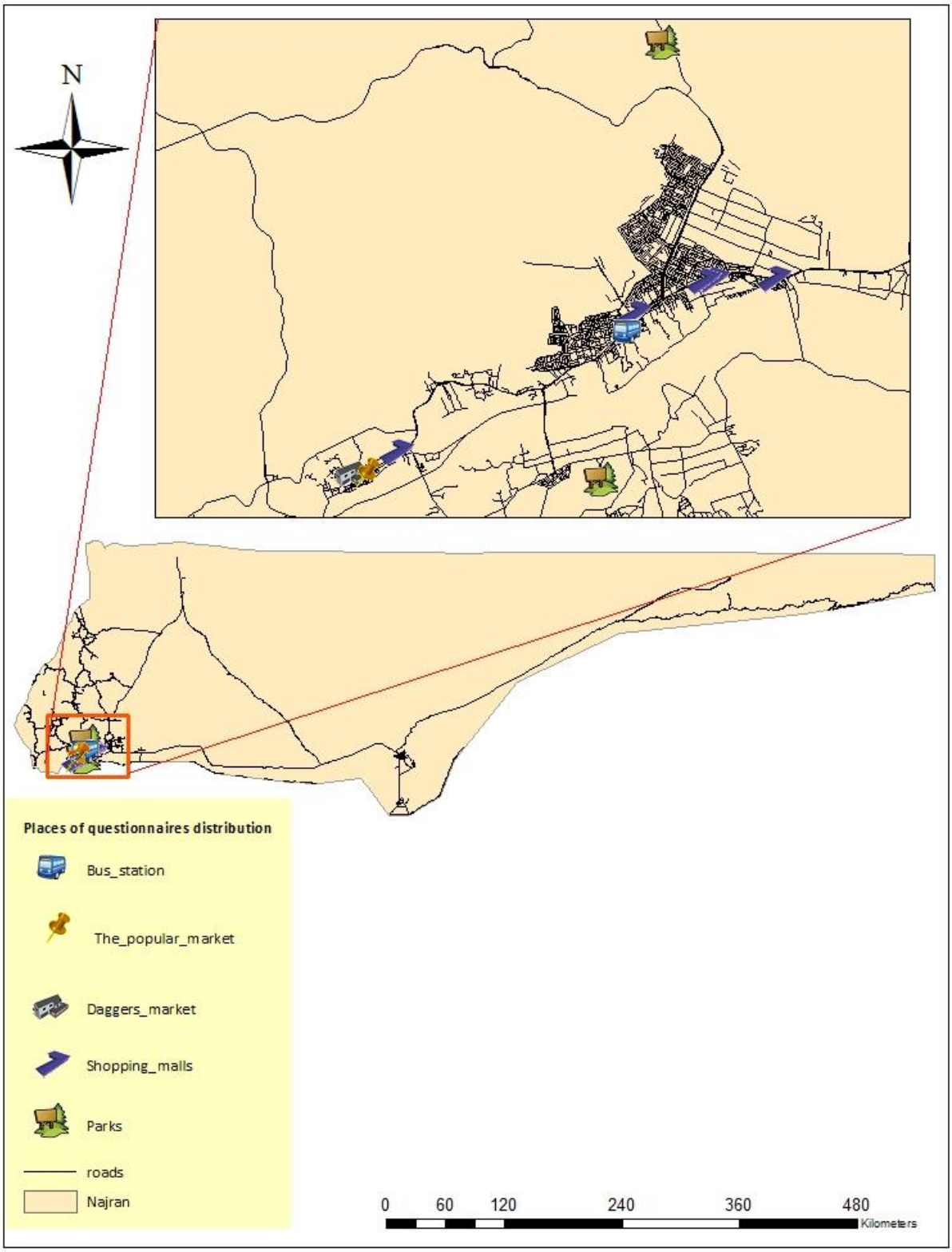


Figure 5.2: Locations where questionnaire interviews took place

5.2.4 Data entry and preparation for statistical analysis

All completed questionnaires were reviewed and checked to ensure all questions had been answered. Then, all the questionnaire data were coded (e.g. gender was coded as Male = 1 and Female = 0) and entered into an Excel (2013) spreadsheet, before being exported to SPSS-24 for analysis. Respondents' levels of preference for visiting archaeological tourist sites was divided into two categories: Very likely = 1 and Unlikely = 0, though these were originally coded as Very likely=1, Likely=2, Possible visit=3, Unlikely=4, and Very unlikely=5. This merging of the 'likely', 'possible visit', 'unlikely' and 'very unlikely' classes meant that when respondents' preferences were cross-tabulated against socio-demographic variables and their previous history of archaeological site visits, there were at least five respondents in each cell. This reclassification into binary format, avoiding sparse cell counts, enabled subsequent logistic regression analysis.

In addition, following data entry, the consistency between different answers was checked. For example, if a respondent stated they were very likely to visit Bir Hima, quite likely to visit Al-Ukhdud and might visit the historic Emirate's Palace, and then stated that the site they were most likely to visit was the historic Emirate's Palace, such logically inconsistent responses were excluded from any subsequent analysis.

5.2.5 Statistical Analysis

The data collected via questionnaires were analysed in SPSS (version 24). Descriptive statistics and graphics were used to summarise the socio-demographic characteristics of respondents, as well as their history of archaeological site visits and preferences towards the three short-listed sites (Gravetter and Wallnau, 2016). Furthermore, cross-tabulations were used to analyse the relationship between two variables, such as visit to archaeological tourist sites and age.

Logistic regression analysis was used to assess the socio-demographic factors associated with a reported high likelihood of visiting each of the three archaeological tourist sites. Predictive variables included: age, gender, nationality, place of residence, and the respondent's past history of visiting archaeological sites. According to Pallant (2005: 160), logistical regression is appropriate:

1- To predict two or more categorical outcomes.

2- To use predictor (independent) variables that are categorical or continuous, or a combination of both in a single model.

Within logistical regression are Chi-square tests where the significance level selected was 95 per cent, with an error rate of 5 per cent, which indicates the relationship between two variables. If there is statistical significance, the P-value will be less than .05, the null hypothesis can be rejected and the alternative valid hypothesis accepted (Qasim, 2010). In addition, within logistical regression are Hosmer and Lemeshow test for goodness-of-fit, if there is statistical significance, the P-value will be more than .05, the null hypothesis can be rejected and the alternative valid hypothesis accepted (Qasim, 2010). Bivariate models were assessed initially (one predictor variable at a time), forming the basis for a subsequent multivariate model, containing only those dependent variables that are significant in the bivariate model but do not correlate with one another.

The respondent's history of visiting archaeological sites was represented through three categories: those who had previously visited to the archaeological site in question (Al-Ukhdud, Bir Hima, or The Emirates' Palace); those who had visited other archaeological sites but not visited the archaeological site in question; and thirdly, respondents who had never visited any archaeological sites. This logistic regression approach was applied separately for the Al-Ukhdud, Bir Hima, and the Emirates' Palace sites. Following regression analysis, a Chi-square test was undertaken on two subsets of respondents: those who had never previously visited any archaeological site; and those who had never previously visited the archaeological site in question. The test was used to assess whether respondents were significantly more likely to visit one of three sites than the other two. In conducting the chi square test, the 'likely', 'quite likely' and 'not likely' categories were grouped together because of small numbers of responses in these three categories.

5.3 Results

Table 5.1 shows the numbers of people who were interviewed in the study area, in the different locations. The majority of those respondents were in Najran shopping centres, such as malls (39.05%) and historical markets (daggers market and popular market, 37.05%), while 19.52% of respondents were in parks, and 4.38% were at the bus station.

Table 5.1: Numbers of respondents to the questionnaire based on site of interview

Location	**Number**	**%**
Daggers market	49	19.52
Popular market	44	17.53
Parks	49	19.52
Shopping malls	98	39.05
Bus station	11	4.38
Total	251	100

5.3.1 Characteristics of the study sample

The number of tourists responding to the questionnaire was 254, but three respondents' answers were excluded because of inconsistencies in their answers to successive questions. This led to the number of respondents analysed being 251, while the number of those refusing to participate was 39. Those who declined to participate by refusing to complete a questionnaire were generally with their family, in a group, where the number of people in each group ranged from three to four persons; they were likely to have Saudi nationality according to the clothes they were wearing, and were aged between roughly 35 and 55 years.

Male participants outnumbered the women with males comprising 88.8% of the sample. Table 5.2, below, indicates that 46.2% of the study sample were aged from 35 to 45 years old, whereas the majority of the sample participants were aged 25 to 45 years old, 68.9% of the whole sample. The proportions of age profiles for males and females are quite similar in this study. For instance, men's ages are concentrated in the range 35 to 45 years old, followed by 25 to 35 years, which together represent 68% of the total male sample, in contrast to women's ages, which are concentrated in the category of 25 to 45 years old and represent 78.57 % of the females sampled. From the ages of the participants completing the questionnaire, it is obvious that the majority of the respondents were located in the most critical and active age groups.

Table 5.2: Numbers of respondents to the questionnaire based on multiple variables

Respondent Characteristic	**N (%)**
Men	223 (88.8%)
Women	28 (11.2%)
Saudi nationality	216 (86.1%)
International	35 (13.9%)
Najran residents	176 (70.1%)
Not resident in Najran	75 (29.9%)
Age: under 25 years	31 (12.4%)
Age: 25 – 35 years	57 (22.7%)
Age: 35 – 45 years	116 (46.2%)
Age: over 45 years	47 (18.7)
Visited archaeological sites previously	188 (74.9%)
Have not visited archaeological sites previously	63 (25.1%)
Previously Visited Al-Ukhdud site	149 (59.4%)
Previously visited Bir Hima site	7 (2.8%)
Previously Visited historic Emirate's Palace site	137 (54.6%)
Total	251 (100%)

Table 5.2 cont.

Variables		Previous visits to archaeological sites		Three Archaeological tourist listed sites						Total
				Visit Al-Ukhdud before		Visit Bir Hima before		Visit Palace before		
		Yes	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	
Gender	Female	13	15	9	19	0	28	7	21	28
	Male	175	48	140	83	7	216	130	93	223
Age	Under 25	21	10	16	15	0	31	15	16	31
	25 - 35	43	14	32	25	0	57	29	28	57
	35 - 45	86	30	71	45	4	112	65	51	116
	Over 45	38	9	30	17	3	44	28	19	47
Nationality	Saudi	164	52	131	85	5	211	118	98	216
	International	24	11	18	17	2	33	19	16	35
Place of residence	Najran	128	48	99	77	5	171	92	84	176
	Other Saudi regions	56	15	46	25	1	70	42	29	71
	Outside Saudi Arabia	4	0	4	0	1	3	3	1	4
Total		188	63	149	102	7	244	137	114	251

Most of the participants (86.1%) were from Saudi Arabia (see Table 5.2) with 88.43% of Saudi respondents being men 91.43% of the respondents from other countries were men. The majority of these international respondents were living in Najran, with others from neighbouring regions and Arabian Gulf States (see Table 5.2).

5.3.2 Previous visits or frequency of tourist visits to archaeological sites

From Table 5.2, it can be seen that 188 (74.9%) of respondents had been to an archaeological sites before, 69.72% being men and 5.18% women.

Examining previous visits to archaeological sites (see Table 5.2), Al-Ukhdud was the most visited site with 149 visitors (59.4% of respondents), followed by the historic Emirate's Palace with 137 (54.6%) visitors, whilst only 7 respondents reported having visited Bir Hima, all male. 63 (25.1%) respondents had not visited any archaeological sites previously.

Table 5.3 shows the relationship between previous archaeological site visits and reported likelihood of visiting the three sites in the future. For all three sites, a much lower proportion of those who had previously visited the site were 'very likely' to visit it again, compared to those who had never been there. Among the remaining respondents, the proportion 'very likely' to visit each of the three sites in the future was broadly similar, regardless of whether or not they had participated in archaeological tourism previously. Discounting those who had previously visited each site, a smaller proportion of respondents stated they would be 'very likely' to visit the Emirates Palace, compared to the other two sites.

Table 5.3: Reported likelihood of visiting three archaeological sites in Najran in the future, compared to respondents' past history of archaeological tourism participation

	No. of respondents (% of row)	
Respondent's history of archaeological tourism	**'Very likely' to visit Al-Ukhdud**	**Likely, quite likely or not likely to visit Al-Ukhdud**
Visited Al-Ukhdud before	28 (18.8%)	121 (81.2%)
Visited other archaeological sites before, but not this site	30 (76.9%)	9 (23.1%)
Never visited an archaeological site before	51 (81%)	12 (19%)
	'Very likely' to visit Bir Hima	**Likely, quite likely or not likely to visit Bir Hima**
Visited Bir Hima before	2 (28.6%)	5 (71.4%)
Visited other archaeological sites before, but not this site	132 (72.9%)	49 (27.1%)

Never visited an archaeological site before	47 (74.6%)	16 (25.4%)
	'Very likely' to visit the historic Emirate's Palace	**Likely, quite likely or not likely to visit the historic Emirate's Palace**
Visited the historic Emirate's Palace before	10 (7.3%)	127 (92.7%)
Visited other archaeological sites before, but not this site	10 (19.6%)	41 (80.4%)
Never visited an archaeological site before	20 (31.7%)	43 (68.3%)

5.3.3 Relationship between previous visits to archaeological tourist sites and likelihood of visiting the same sites in the future

- **Al-Ukhdud archaeological site**

Univariate logistic regression analysis suggested that there was no statistically significant difference in men versus women, different age groups or nationalities being 'very likely' to visit Al-Ukhdud, since the P values for all demographic variables were more than .05 (see Table 5.4).

Table 5.4: Logistic regression model of respondents with different socio-demographic characteristics, and respondent's history of visiting archaeological sites being 'very likely' to visit the Al-Ukhdud site.

Variables						
	B	S.E.	Wald	df	Sig.	Exp(B)
Gender (Female)	.026	.405	.004	1	.949	1.026
Respondent's age group: *[reference category: age over 45]* Age Under 25	.064	.389	.032	1	.858	1.072
Age 25 to 35	.163	.306	.284	1	.594	1.117
Age 35 to 45	.171	.255	.449	1	.503	.843
Nationality (Saudi)	.303	.376	.650	1	.420	.739
Place of residence (From other region)	.044	.279	.025	1	.874	1.045
Respondent's history of visiting archaeological sites: *[reference category: never visited an archaeological site]* Visited the Al-Ukhdud site before	2.814	.322	76.155	1	.000	.060
Visited other archaeological sites in Saudi Arabia but not visited Al-Ukhdud	.243	.497	.239	1	.000	.784

Respondents who had previously visited the Al-Ukhdud site were also significantly less likely to visit this site in the future than those who had never visited an archaeological site, as the odds ratio or Exp (B) for this variable is 0.060, i.e. a value less than one (Tabachnick and Fidell, 2001; Pallant, 2005). In addition, respondents who had previously visited other archaeological sites, but not the Al-Ukhdud site, were significantly less likely to visit the Al-Ukhdud site in the future, as shown by the exponent of the beta coefficient being 0.784, i.e. less than one.

Goodness of fit statistics for this logistic regression model for Al Ukhdud based on respondents' past history of visiting archaeological sites confirms the statistically significance relationship (Chi square = 96.130, df= 2, P= 0.0000). A pseudo-R^2 statistic, Nagelkerke's R^2, of 0.427 indicates that respondents who had never previously visited archaeological sites were keener to report their intentions to visit Al-Ukhdud in the future than those who reported a pattern of previous archaeological site visits.

- **Bir Hima archaeological site**

Due to the very small number of respondents who had visited Bir Hima previously, this number was removed before constructing a regression model of previous visits. However, univariate logistic regression analysis showed that there was no statistically significant difference in men versus women, different age groups, nationalities or place of residence from other region versus Najran residents being 'very likely' to visit Bir Hima site, since the P value for all demographic variables was more than .05 (see Tables 5.5).

Table 5.5: Logistic regression model of respondents with different socio-demographic characteristics, and respondent's history of visiting archaeological sites being 'very likely' to visit Bir Hima site.

Variables						
	B	S.E.	Wald	df	Sig.	Exp(B)
Gender (Female)	.030	.432	.283	1	.595	.795
Respondent's age groups: *[reference category: age over 45]* Age Under 25	.121	.734	.076	1	.783	1.128
Age 25 to 35	.102	.340	.091	1	.763	1.108
Age 35 to 45	.108	.283	.145	1	.703	.898
Nationality (Saudi)	.307	.340	.509	1	.476	.736
Place of residence (From other region)	.385	.321	1.441	1	.230	1.470
Respondent's history of visiting archaeological sites: *[reference category: never visited an archaeological site]* Visited other archaeological sites in Saudi Arabia but not visited Bir Hima	1.929	.849	5.163	1	.025	6.885

In contrast, respondents who have previously visited other archaeological sites, but not the Bir Hima site, were significantly more likely to visit the Bir Hima site in the future, as shown by the exponential of the beta coefficient being 6.885, greater than one (see Table 5.5).

Goodness of fit statistics for this logistic regression model for Bir Hima based on respondents' past history of visiting archaeological sites confirms the statistically significance relationship (Chi square = 5.893, df= 1, P= 0.015). A pseudo- R^2 statistic, Nagelkerke's R^2, of 0.258, indicates the respondent's reported pattern of previous archaeological site visits explained much of their reported intentions to visit Bir Hima in the future.

- **Historic Emirate's Palace**

Univariate logistic regression analysis shows that there were statistically significant differences among two demographic variables, i.e. women versus men, and in the age group of 25 to 35 years versus the age group over 45 years as regards being 'very likely' to visit the historic Emirate's Palace, since the P value for these demographic variables being less than .05 (see Table 5.6); the female respondents were significantly more likely to visit the historic Emirate's Palace in the future, as shown by the exponential of the beta coefficient being 2.934, i.e. greater than one. Respondents in the age group of 25 to 35 years were significantly less likely to visit this site in the future than those aged over 45 years, as the odds ratio or Exp (B) for this variable is 0.236, i.e. a value of less than one.

In contrast, this analysis also shows that there were no statistically significant differences in likelihood of visiting the palace for the remaining demographic variables, since the P value for these demographic variables was more than .05 (see Table 5.6).

Table 5.6: Logistic regression model of respondents with different socio-demographic characteristics, and respondent's history of visiting archaeological sites being 'very likely' to visit the historic Emirate's Palace.

Variables						
	B	S.E.	Wald	df	Sig.	Exp(B)
Gender (Female)	1.076	.449	5.757	1	.016	2.934
Respondent's age groups: *[reference category: age over 45]* Age Under 25	.016	.522	.001	1	.975	1.016
Age 25 to 35	1.445	.621	5.420	1	.020	.236
Age 35 to 45	.420	.347	1.464	1	.226	.657
Nationality (Saudi)	.725	.433	2.811	1	.094	.484
Place of residence (From other region)	.138	.384	.129	1	.720	.871
Respondent's history of visiting archaeological sites: *[reference category: never visited an archaeological site]* Previously visited the historic Emirate's Palace	1.776	.426	17.417	1	.000	.169
Visit other archaeological sites (visits to the historic Emirate's Palace excluded)	.646	.445	2.108	1	.147	.524

Both respondents who had previously visited the historic Emirate's Palace and those who had previously visited other archaeological sites but not the historic Emirate's Palace were less likely to visit this site in the future than those who had never visited any archaeological site, as the odds ratios or Exp (B) for this variable are 0.169 and 0.524, respectively, i.e. values of less than one (see Table 5.6). However, the p value for those who had previously visited the historic Emirate's Palace was statistically significant, while for those who had previously visited other archaeological sites but not the historic Emirate's Palace it was not statistically significant.

Goodness of fit statistics for this logistic regression model for the historic Emirate's Palace, based on respondents' past history of visiting archaeological sites, confirm a statistically significant relationship especially with those who previously visited the site in question (Chi square = 19.359, df= 2, P= 0.0000). A pseudo-R^2 statistic, Nagelkerke's R^2, of 0.127 indicates the respondents'

reported pattern of previous archaeological site visits, which explains fewer of their reported intentions to visit the historic Emirate's Palace in the future, versus those who had never visited any archaeological sites previously but intended to visit this site in the future.

5.3.4 Preference for one of the three listed archaeological sites

This section examines which of the three sites (Al-Ukhdud, Bir Hima or the historic Emirate's Palace) respondents were most likely to visit in the future, after accounting for previous visits. Figure 5.3 shows that the site most likely to be visited is Bir Hima, based on respondents who had previously visited other archaeological sites but not the archaeological site in question.

This result has statistical significance, based on Chi-Square test (Chi square= 66.815, df= 6, P= 0.000). This indicates that respondents who have previously visited other archaeological sites, but not Bir Hima site, have a great preference to visit Bir Hima in the future, rather than the other two archaeological sites.

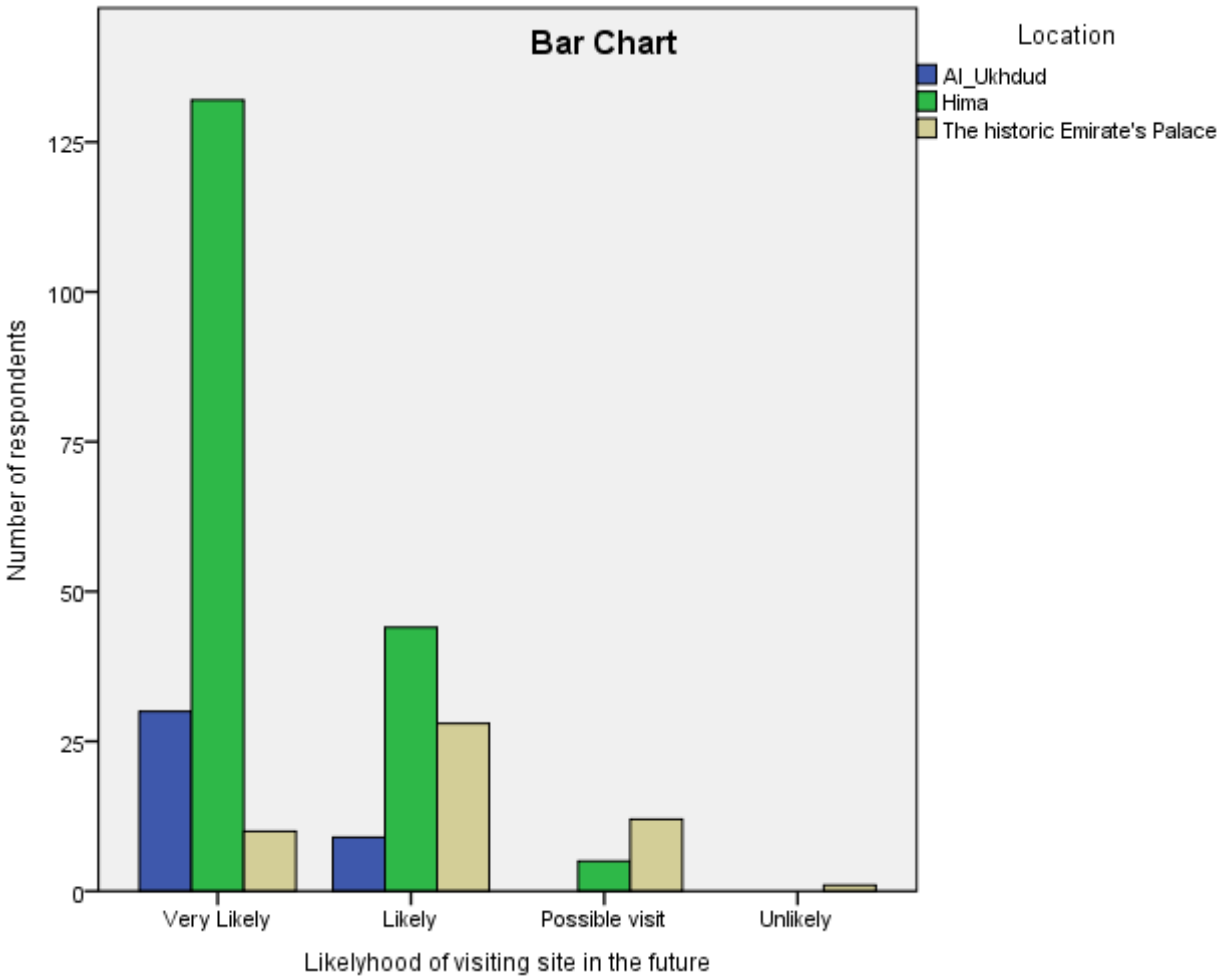


Figure 5.3: Reported future likelihood of visiting three archaeological sites in Najran among respondents who have previously visited other archaeological sites but not the archaeological site in question.

Those respondents who had never visited any archaeological sites scored highest for preference to visit Al-Ukhdud site in the future (see Fig. 5.4). This result has statistical significance, based on Chi-Square test (Chi square= 45.583, df= 6, P= 0.000). This indicates that respondents who have never visited any archaeological sites have a greater preference to visit Al-Ukhdud site in the future, rather than the other two archaeological sites.

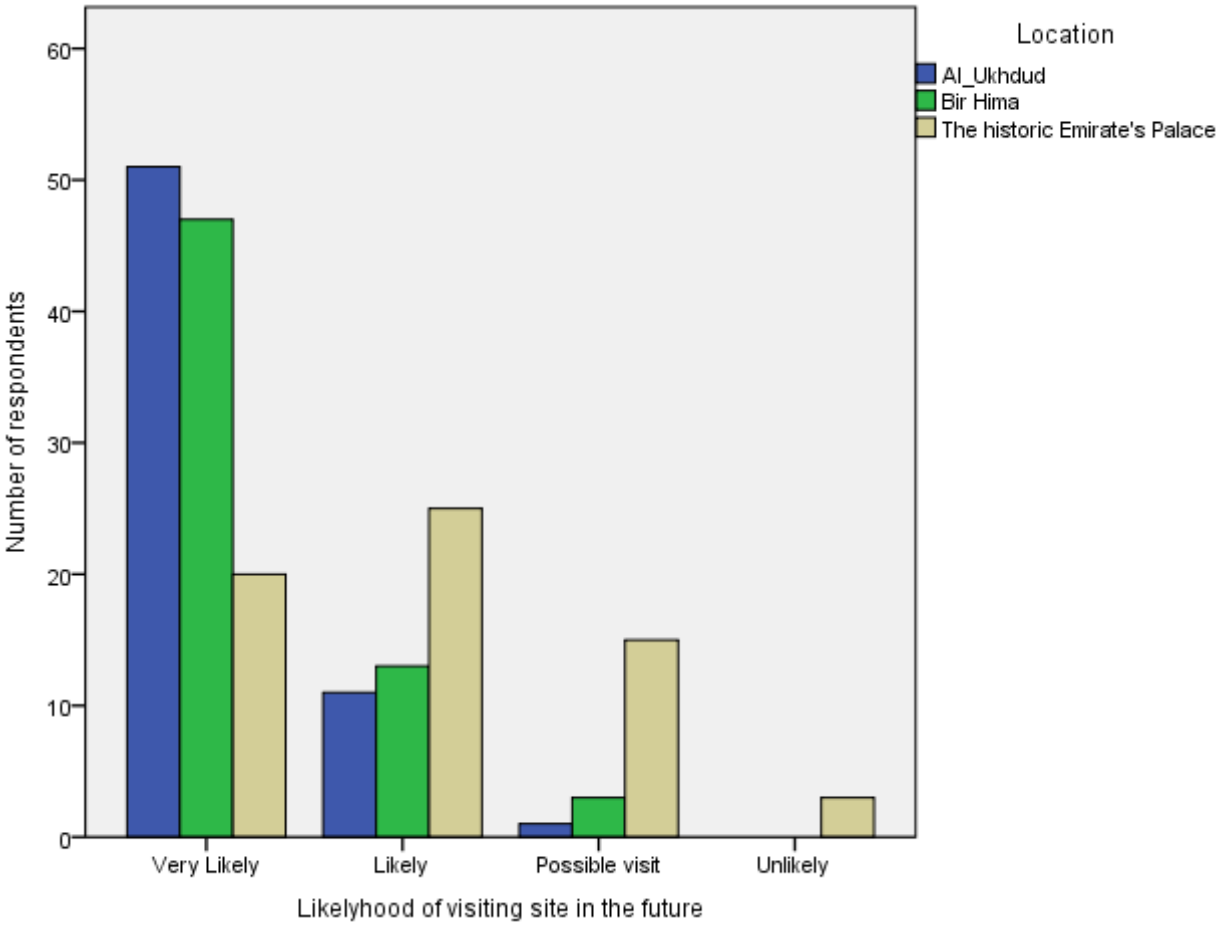


Figure 5.4: Reported likelihood of visiting three archaeological sites in Najran in the future among respondents who had never visited any archaeological sites.

5.4 Discussion

A few studies have been conducted to gauge people's intentions to visit archaeological tourist sites prior to archaeological tourism development, e.g. in northern Jordan (Abuamoud et al., 2014) and Qatar (El Menshawy, 2017). However, this is the first research conducted to gauge tourist demand for archaeological sites in Najran based on appropriate information, especially if tours are offered to them. This has been done to achieving the third aim of this dissertation, which is to estimate potential demand, whether from Saudis or international visitors, for archaeological heritage tourism at shortlisted sites in Najran by utilising a questionnaire.

The main finding from the questionnaire in this study is the demand among tourists to see Bir Hima. The high tourist demand as regards visiting Bir Hima site in the future suggests that further development of this site is required. Al-Ukhdud site comes second in terms of respondents' preferences for future visits, and it is currently undergoing maintenance work; the accompanying site museum, as well as passageways within the site, is still under construction and development, as witnessed by the author during his fieldwork in 2016. Therefore, the situation might improve after Al-Ukhdud becomes an open-air site with an accompanying museum, especially if stakeholders, e.g. the SCTNH, provide more facilities at this site, as often potential visitors to archaeological tourist sites do not just wish to view the sites themselves, they are also looking for a set of values and facilities associated with those sites (Bigné et al., 2008). The facilities that could be provided by the SCTNH include shops, cafes, seating areas, mosque and ATMs. Other facilities might they provide include electric vehicles, which could be very popular and yet not have a negative impact on the site; these could help to transport visitors around the site via several internal pathways, that should be prepared in advance for this purpose. This could also be done at Bir Hima site, but this needs to be managed by an appropriate organisation arranged by the stakeholders. The reason for suggesting electric vehicles is to avoid the effect of vehicle exhausts that might impact on the characteristics of archaeological sites, so this too must be taken into account (Amores, 2014). Moreover, this type of vehicle can help those tourists who cannot walk a long way, such as the elderly or those with children who may not find it easy to do a long walk as that requires too much physical effort (Duval and Smith, 2014: 42). Other things that could be done to give Najran an advantage over other archaeological sites is to advertise the site and protect the artefacts there. According to Castellanos-Verdugo et al. (2011: 100–112), the most important factors that can help to attract tourists to visit archaeological sites are: providing appropriate information about them; configuring tourist sites to help the elderly and disabled to access them; good tourist road signs and maps which indicate to tourists how to reach destination sites; the provision of tourist guides to explain things to visitors; using modern technologies at these sites to attract more tourists; and providing rest zones for

tourists. Therefore, preparations for the development of archaeological sites to receive tourists should seek to strike a balance between public visits and conservation of the characteristics of each archaeological tourist site (Duval and Smith, 2013), so as to ensure the preservation of the aesthetics of archaeological sites for future generations.

In this study it is clear that most tourist respondents had visited archaeological sites previously. However, no previous studies exist to support this finding and confirm that many Saudi citizens have visited archaeological sites previously yet intend to visit them in the future. Bogari et al. (2003), in their study, found that one of that most important factors that attracts Saudi tourists to visit a tourist site is its cultural value. Therefore, this could support the results here in that archaeological sites are valuable.

Furthermore, in this study, the intention to visit shortlisted archaeological tourist sites does not vary by age or gender, which is consistent with previous studies, e.g. Abuamoud et al. (2014); also, De La Viña and Ford (2011) found that demographics (age, gender) were not statistically significant in their studies.

What is more, within the intention to visit archaeological sites, the Historic Emirates' Palace was much less popular than the other two sites, which may be due to the availability of similar palaces elsewhere in Saudi Arabia that have similar characteristics e.g. in Asir region, and Jazan region, while the other two archaeological sites are located outdoors and have some characteristics, such as inscriptions, that might be more distinctive attractions for tourists.

This is supported by comments made by some of those participants who completed a questionnaire during the interviews with them by the author of this study. This may support the view that a destination's image influences the behaviours or intentions of tourists as regards visiting potential tourist sites (Lee et al., 2005). According to Chen and Tsai (2007: 1118), there are some evaluative factors that can affect tourist intentions vis-à-vis destination image, such as recreation, sun, sand, nature and culture. Based on that, the destination image differs between the shortlisted archaeological tourism sites; for example, at Al-Ukhdud and Bir Hima, the sites are located in the open air, so the evaluative factors that might influence tourists' intentions to visit these two sites include the availability of landscape e.g. mountains, watercourses (wadis) and scattered trees, in addition to the archaeological features of these sites. But, for the Historic Emirates' Palace, the destination image factors that might have an effect include surrounding mountains and the availability of certain infrastructures, e.g. an ancient market and other shops that may attract those people coming for first time from outside Najran region to this site, rather than local residents who

might visit the market but not visit the palace again. However, the author of this study included some photos of these sites within the questionnaire to show to potential participants some existing landscape characteristics around each of those shortlisted sites, which might affect future intentions to visit.

Table 5.2 suggests most respondents (74.9%) had previously visited other archaeological sites. Those who had previously visited the Al-Ukhdud and the historic Emirate's Palace were statistically less likely to express a desire to visit them again in future. This is consistent with the findings of other studies, such as Fakeye and Crompton (1991) who conducted a study in the lower Rio Grande Valley in Texas, where they found few repeat visitors. Similarly, in Hong Kong, Lau and McKercher (2004) found that first-time visitors to cultural heritage sites were less likely to make a repeat visit to the same sites in the future. A study of tourists visiting archaeological sites in Italica, Spain, (Martín-Ruiz et al. 2010) found that while tourists would recommend these sites to others, the respondents themselves were unlikely to visit the sites again in future. This supports Castellanos-Verdugo et al. (2011), who found that most international visitors to archaeological sites did not plan to visit the same sites again in the future, as did Alazaizeh et al. (2016) in a study at Petra Archaeological Park, Jordan. This is consistent with Hampton (2005), who found that when tourists have visited a place they usually do not want to make a return visit.

The most popular archaeological site in this study is Bir Hima, followed by Al-Ukhdud, which are both located in the open air, and their landscapes might influence tourists' intentions to visit those sites. This is consistent with a previous study conducted in 2007 by Al-dakhil, who pointed out that tourists in Al-Qassim region, Saudi Arabia, prefer to visit sites that have a natural character. This probably applies to the two archaeological tourist sites at Najran that were preferred more by respondents; as they are surrounded by mountains in addition to having archaeological characteristics which make them more likely to support tourism in the future. This is also consistent with Al-Thagafy (1991), who found that there is significant tourist potential for sites located in mountainous regions, though these need to be developed so that their recreational resources receive sufficient interest within the field of tourism. This agrees with Akbar et al. (2017), who conducted a study in Pakistan and found the landscape influences tourists' intentions to visit the Swat Valley in the future. This is confirmed by Jovicic (2016), who states that the number of tourists who prefer to visit archaeological or cultural tourist sites is 10 per cent higher than the average of those tourists who are likely to visit recreational sites. Furthermore, this supports the findings of Duval and Smith (2014: 44), who found that tourists who had not visited a rock-art site previously normally wished to visit such a site during their trip. The main reasons given those respondents intending to visit a rock-art site were to satisfy their curiosity through enjoying seeing rock art, in addition to enjoying hiking or walking.

In contrast, these archaeological sites, along with other potential archaeological tourist sites including remote sites which need a 4x4 vehicle, as mentioned in Chapter 4, can together create promising tourist paths among archaeological sites in Najran region. Arguably, the development of tourist amenities for these archaeological sites is compatible with the vision of Saudi Arabia in 2030, which calls for tourist projects to be given high priority by investing in museums and archaeological or historical sites to create tourist attractions which can play a greater role in the national economy (Taylor, 2016).

5.4.1 Limitations

During fieldwork, it proved difficult to approach large family groups for cultural reasons, so these were under-represented in survey findings. The sample survey was not regionally or nationally representative and reflects the characteristics of visitors to the sites where fieldwork was conducted. For example, people at the daggers market are more likely to engage in tourism than the Saudi public in general, as this site has ancient cultural-heritage artefacts.

Findings may also be subject to 'courtesy bias' (Mitchell, 1965; Olweny, 1994), whereby participants' responses reflect the perceived agenda of the interviewer. If 'courtesy bias' did occur, then intention to visit these sites would be over-estimated. Another limitation is that presenting those three shortlisted archaeological sites on cards accompanying the questionnaire could influence the findings in some way. A further limitation is there are no international tourists in the sample, given that this group would be difficult to sample because of current tourist visa restrictions.

As shown in the current analysis of archaeological tourist sites likely to be visited in the future, some associations with demographic variables have low significance levels, and in some cases no significance at all. This might be due to the use of the logistical regression analysis method employed in this study, which might produce general results that do not indicate statistical significance.

5.4.2 Future research directions

To obtain respondents' in-depth views on archaeological attractions at sites, it might make sense to employ an alternative approach, such as qualitative interviews or focus groups, to understand tourists' reasons for expressing a desire to visit particular sites. In addition, a questionnaire survey in the future could include all the archaeological tourist sites in Najran in order to give a comprehensive overview of all the archaeological attractions and sites available in the region, which might help to prevent respondent bias due to a limited number of sites.

Further research could be done by conducting interviews with international tour operators, in order to gauge the demand for archaeological tourism in the international market segment.

In addition, There are more sophisticated methods that could be used in future, either to understand tourists' underlying preferences for particular destination characteristics (conjoint analysis) or to assess potential prices that could be charged for entry to sites (e.g. willingness-to-pay; travel cost methods).

In the future, to fill a gap, other researchers are recommended to conduct studies to gauge Saudi citizens' intentions to visit archaeological tourist sites in other regions of Saudi Arabia, due to the lack of studies in the field of domestic tourism in this country. This is consistent with Sharpley (2002) and Damanhouri (2016) who point to the lack of domestic tourism studies in Middle-East countries and the need to develop tourism in those countries.

5.5 Conclusion

This chapter began by describing the methodology for data collection, preparation of a questionnaire, questionnaire translation from English into Arabic and then testing the Arabic version by doing a pilot study on Arab students at the University of Southampton to check and verify the appropriateness of the survey language. Then, fieldwork was done in Najran using that questionnaire, with the first section eliciting demographic data, the second being about previous visits to archaeological tourist sites, and the third based on information cards to find out how likely respondents were to visit each site, and which site they would most like to visit. There were 251 respondents who completed the questionnaire. Then, their data were coded and entered into SPSS. The next part summarised the techniques that would be utilised to analyse the questionnaire data, including descriptive statistical and logistic regression techniques.

In addition, this chapter has analysed data collected through the questionnaire which identified the prior visits of tourists to archaeological tourist sites and their preferences for visiting three listed archaeological tourist sites in Najran. The results begin by describing the characteristics of the study sample. They indicate that respondents who had visited other archaeological sites previously but not the current site prefer to visit Bir Hima archaeological site. While those who had never visited any archaeological sites scored highest for a preference to visit Al-Ukhdud site in the future. The majority of respondents had visited Al-Ukhdud and the historic Emirate's Palace before. Furthermore, associations with demographical variables generally have no significance level, and in some cases low significance.

Chapter 6

Landscape characteristics around the potential archaeological tourist sites

6.1 Introduction

The purpose of this chapter is to determine the landscape characteristics around the potential shortlisted archaeological tourist sites in Najran, these having been reduced to six, based on characteristics identified through GIS analysis, and fieldwork (see Section 4.2.1). As set out in Chapter 1, the fourth aim of this dissertation is to examine the shortlisted archaeological sites in relation to the surrounding landscape characteristics. This has not previously been done, for archaeological sites in the field of tourism. It is achieved following preliminary evaluation of Idrisi techniques with Landsat imagery and ArcGIS, delineating landscape characteristics from a digital elevation model (DEM), a vegetation index, building outlines, and fieldwork. By identifying landscape characteristics in this study, this helps in determining what tourists can see and experience around potential archaeological tourist sites in Najran during their visit, e.g. mountains, vegetation, wadis, sand dunes and buildings, in addition to the existing attractive archaeological features of those sites, which can eventually help stakeholders, e.g. SCTNH, to develop those potential archaeological sites for tourism.

Landscapes are defined as spaces that exist outdoors, e.g. natural (physical) or built (structure), that can be seen by tourists or visitors at potential attractions (Hull and Revell, 1989). According to O'Hare (1997: 34) a landscape in the field of tourism is considered to be a type of cultural landscape that coexists with and/or overlaps with other existing features of a place, e.g. in Britain an area of countryside can simultaneously be both a landscape of farming and a tourism landscape. This is supported by Martín et al. (2016) who classified landscapes around Madrid, Spain by what people can see when travelling on motorways, e.g. foothills between a mountain range and sedimentary basins, or woodlands that might attract people to enjoy them.

6.2 Methodology

6.2.1 Data sources and fieldwork

The landscape data around the archaeological sites shown in flowchart Fig 6.1 were obtained from three sources. The first was a Digital Elevation Model (DEM) (31m resolution), downloaded from the ASTER GDEM website (http://gdem.ersdac.jspacesystems.or.jp/). The use of this source rather than, say, SRTM, is because the elevation values in ASTER are more accurate (Srivastava, 2012; Elkhrachy, 2017). The second source was Landsat Imagery, which assisted in identifying vegetation around archaeological sites. This Imagery was downloaded from the Earth Explorer website (https://earthexplorer.usgs.gov/), from which two individual Landsat 7 ETM+ images were obtained covering the Najran study area. These files had a spatial resolution of 30m and Table 6.1 summarises other image characteristics. Finally, OpenStreetMap (OSM) building and natural features polygons were downloaded and examined against ESRI basemap imagery (World Imagery GEO1 acquired on 19 May 2017 with a resolution of 0.5 metres, and horizontal accuracy 10.16 metres) to check their completeness. Minimal OSM natural features were unavailable meaning these data could not be used for landscape characterisation. OSM building coverage was incomplete, requiring manual digitising of building outlines via visual interpretation of the ESRI basemap imagery.

Table 6.1: Landsat Imagery data set that covers the area around archaeological sites in Najran region.

Spacecraft ID	Sensor ID	Path number	Row number	Image acquisition date
Landsat 7	ETM+	166	48	13-10-2009
Landsat 7	ETM+	166	47	18-02-2010

Fieldwork undertaken from 13 July to 1 October 2016 was used to corroborate output landscape classes. During fieldwork, geotagged panoramic landscape photos were taken from the six short-listed sites and accompanying field notes used to record landscape characteristics at each site.

6.2.2. Landscape character assessment

The eastern Empty Quarter region was excluded from this analysis, since it is uninhabitable, contains no archaeological sites, and is not accessible to tourists.

The author aimed to develop a landscape-characteristics map layer including the following classes: scattered native woodland; irrigated areas and palms; built-up areas; mountainous landscapes, dune fields, wadis and other land. Except for 'other land', these landscape characteristics could be more attractive to tourists than others, due to dune fields are a distinctive feature of the Saudi landscape, whilst scattered woodland might be associated with wildlife. There is a move to promote agri-tourism (SCTNH, 2012), so the irrigated areas and palms were also included. Wadis and mountains are again distinctive features of Najran's landscape.

Landform characteristics around potential archaeological tourist sites in Najran were initially explored using an algorithm based on terrain curvatures fitting each pixel matrix (Pellegrini, 1995) using Idrisi's *Toposhape* tool. To improve the algorithm's performance and reduce the number of unclassified pixels, the DEM was first subjected to a forwards and backwards Fourier transformation. This Fourier transformation required that the input DEM had numbers of rows and columns that could be raised to the power of 2 (i.e. in the series 2, 4, 8, 16, 32, 64, 128 etc.). Numbers of columns and rows were therefore raised to 32,768 and 16,384, respectively, using Idrisi's *Zeropad* tool, by adding zeros to the input raster, enabling subsequent use of Fourier transforms. The Idrisi *Fourier* tool uses a Fourier transform, a way of representing a complex pattern as a set of wave shapes (Eastman, 2006). Following forwards and backwards Fourier transformation Idrisi's *Toposhape* tool was used to classify terrain features as follows based on Pellegrini's algorithm: 1 peak, 2 ridge, 3 saddle, 4 flat, 5 ravine, 6 pit, 7 convex hillside, 8 saddle hillside, 9 slope hillside, 10 concave hillside, 11 inflection hillside, 15 unclassified.

The output landform classification was evaluated by visual comparison to ESRI basemap imagery in ArcMap. Since it was difficult to discern patterns in the output, speckle or pixel noise was reduced using ArcGIS's *Majority Filter* tool (see flowchart Fig. 6.1), so if there was a 'concave slope' pixel surrounded by four out of eight neighbouring pixels depicting flat ground, the 'concave slope' pixel was reclassified as flat ground. Subsequently, key landform classes, such as peaks, were reclassified as '1' and all other pixel values set to '0' to create a separate new raster for each landform class. The individual output landform classes were aggregated by for example replacing each 4 x 4 pixel window with a new pixel's value of the mean of 16 smaller input pixels. This helped to discern patterns in landform features.

Pixels coded as landforms such as peaks were also converted from raster to points, and a kernel density of the output point features calculated to further help discern landform patterns. Since it proved difficult to extract landforms using Pellegrini's algorithm, several other terrain classification techniques were then used.

Wadi identification: To identify wadis, flow accumulation was calculated based on the D8 algorithm for each pixel in the DEM (Schäuble et al., 2008, and Do et al., 2011) (see flowchart Fig.6.1). Small imperfections in the DEM were first eliminated using ArcGIS's *Fill* tool. After filling sinks, flow direction was direction was calculated for each cell (Saha, and Singh, 2017), followed by use of ArcGIS's *Flow Accumulation* tool. To identify the main ravines (wadis) in the study area (Elkhrachy, 2015), all pixels with a flow accumulation greater than a threshold of 500 were identified using ArcGIS's *Con* tool. These were then converted into vectors using ArcGIS's *Stream to Feature* tool, to obtain polylines indicating the ravines and wadis in the study area (Theobald.et al., 2005).

Mountainous terrain class: Mountainous terrain was identified via the automatic extraction of lineaments around archaeological sites using ArcGIS's *hill-shade* tool. Analytical hillshading was calculated eight times, with multi-directional illumination for the sun's angle. A solar azimuth was implemented at 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315°, with a solar elevation (altitude) of 30° in each case, as recommended by Alhirmizy (2013). Then, all these hill-shaded images were summed into one image to identify lineaments and mountainous terrain (Abdullah et al., 2010; Alhirmizy, 2013), by simulating topographic illumination under assorted light orientations (Alhirmizy, 2013: 2228). The output combined hill-shade image was reclassified into two binary classes (e.g. dark colour= 1, and light colour= 0), selecting a threshold via experimentation that maximised the correct classification of mountainous terrain. Some post-processing steps were applied after the extraction of lineaments and mountainous terrain to correct some errors of omission concerning obvious highland areas. The original DEM was reclassified, so that elevation greater than 1415 metres was coded 1 and all pixels zero. To correct the misclassification by the hillshading algorithm of some upland plateaus as non-mountainous terrain, this reclassified image was combined with the hillshading output using ArcGIS's *cell statistics tool*. A majority filter was then applied to remove speckle or pixel noise from the image. Finally, 45 of polygons were manually digitised and used to correct several mountainous areas that remained incorrectly classified up to this point.

Dune field class: To identify the region's characteristic linear dune fields, the hillshading image was first clipped (see flowchart Fig 6.1), so as to exclude the western mountainous region. The next process was to remove noise, such as gaps along linear dune crests, by using ArcGIS's majority filter tool, followed by reclassification of the filtered hillshading image (e.g. with dark colours = 1, and light colours = 0), choosing a threshold that maximised delineation of dunes. After that, ArcGIS's *region group* tool was used to assign each contiguous patch of dune pixels a unique identifier (Droppová, 2011: 2; Li et al., 2008: 435). *Calculate geometry as table* was then used to computer the spatial properties of each dune (area, perimeter, thickness and the ellipse characteristics of each patch of

pixels coded as dunes, e.g. major axis, minor axis and orientation). Smaller dunes with areas less than or equal to 1,000 metres^2 were removed prior to further analysis, and the minor: major axis length ratio calculated for the remaining larger dunes. A histogram was then constructed for dune orientations, and for the ratios of major axes to minor axes of the dune ellipses. Properties such as major: minor axis ratio were also mapped using the centroid x- and y-coordinates for each dune feature.

Other histograms were constructed to identify threshold values for minor: major axis ratios and orientations, and these were used to distinguish dunes from other features. By reclassifying information in the geometry table, dune features were identified as those polygons meeting all of the following conditions:

- Area greater than 1000 metres^2
- Major: minor axis ratio greater than five
- Orientation of major axis between 20^0 and 70^0

The *Reclassify by Table* tool was then used to create a dune map using these conditions as recorded in the geometry table.

Following classification of dunes, a confusion matrix was created to assess the accuracy of the dune classification procedure via ArcGIS's *Zonal Tabulate Area* tool. Within a sample area, those features on the reclassified hillshading output that were dunes were identified through comparison with ESRI basemap imagery. The confusion matrix cross-tabulated the area of these manually digitised features against those automatically delineated via the above procedure. As a measure of agreement between manually and automatically delineated dune features, the kappa index of agreement was calculated (Kohavi and Provost, 1998; Visa et al., 2011; Deng et al., 2016). Several such tables were created using different threshold values for orientation and minor-major axis ratio, in order to identify those thresholds that achieved acceptable overall accuracy according to the kappa statistic (Viera, and Garrett 2005: 362).

Irrigated areas/palms and scattered native woodland classes: A Normalized Difference Vegetation Index (NDVI) image was derived from the LandSat ETM 7+ imagery using ArcGIS's *Image Analysis* tool, and used to identify greenness and thereby natural and irrigated vegetation in the study area (Gandhi et al., 2015). This was calculated as $\text{NDVI} = \frac{\text{NIR} - \text{RER}}{\text{NIR} + \text{RED}}$, where 'NIR is the near infrared band and RED is the red band' (Mirzaei et al., 2015: 2567). The LandSat bands used to calculate NDVI are 3 with a red band, and 4 with an infrared band.

Each raster cell was thus assigned a value in the range -1 to +1. Negative values indicate an absence of vegetation (Myneni et al., 1995), while positive values close to 1 indicate dense vegetation (Belal et al., 2014). However, the two output images were merged into a single raster data set using ArcGIS's *Mosaic tool*. After that, the NDVI image was reclassified into three classes: irrigation areas/palms, scattered natural woodland (*الأشجار الطبيعية*), this Arabic term is pronounced as 'Al-Ashjahr Al-tabieahia', and unvegetated areas. NDVI threshold values for this reclassification were derived iteratively, by comparing the output vegetation classes with a base map in ArcMap to confirm assignment of patches of vegetation.

To assess the accuracy of this process, vegetation polygons were manually digitised for a sample area of Najran (18 km^2), by visually interpreting baseMap in ArcMap (World Imagery GEO1 acquired on 19 May 2017 with a resolution of 0.5 metres, and horizontal accuracy 10.16 metres). The digitised patches of irrigated areas and scattered native woodland were compared with the results from NDVI reclassification using ArcGIS's *Tabulate Area* tool. The output table formed a confusion matrix which cross-tabulated mapped vegetation classes against those digitised from reference data, enabling accuracy assessment of the classification (Foody, 2002). These tables were created for several different threshold values of NDVI. For each table, the kappa index of agreement was calculated as a measure of classification accuracy. A value of kappa close to 1 indicates strong agreement between a classification and validation data (Baba et al., 2017).

Built-up class: As noted earlier, buildings in the study area around archaeological tourist sites were digitised from basemap imagery in ArcMap, since the buildings layer downloaded from OpenStreetMap (OSM) (accessed 6th October 2017) was incomplete. These buildings were then used as the basis for the built-up landscape class.

After completing all the above processes, there were six different landscape class map layers: mountainous terrain, dune fields, wadis, irrigated areas/palms, natural woodland, and built-up areas. Therefore, to combine these six map layers into a single, composite map layer (see flowchart Fig. 6.2), each class was assigned a unique code (e.g. by reclassifying vegetation as 2 = irrigated areas, 1 = scattered natural woodland, etc) ArcGIS's *over tool* was used, for example, prioritising scattered natural woodland over the 'mountainous terrain' layer, because scattered trees need to appear on top of mountainous areas.

6.2.3. Characterisation of landscape surrounding archaeological sites:

To characterise the landscape surrounding the short-listed archaeological sites that can be seen by tourists, ArcGIS's *Viewshed* tool was used twice for each site (see flowchart Fig. 6.2). The first

viewshed was calculated by using the highest elevation point in the site, while the second viewshed was calculated from where a site photo was taken by the author. The height of the observer (tourist) was included at 2 metres in the *Viewshed* analyses, with the Aster GDEM being used as the input surface. If an area can be seen from an archaeological site, then the value of the output is set to 1, but if the landscape area cannot be seen from an archaeological site, the pixel value of the output is set to 0 (Wheatley, 1995).

The area of each landscape class visible from each site was estimated using ArcGIS's *tabulate areas* tool using the *Viewshed* output and the integrated landscape character map layer. The output was a table that contained counts of the numbers of pixels with a given combination of visibility from a site and landscape class.

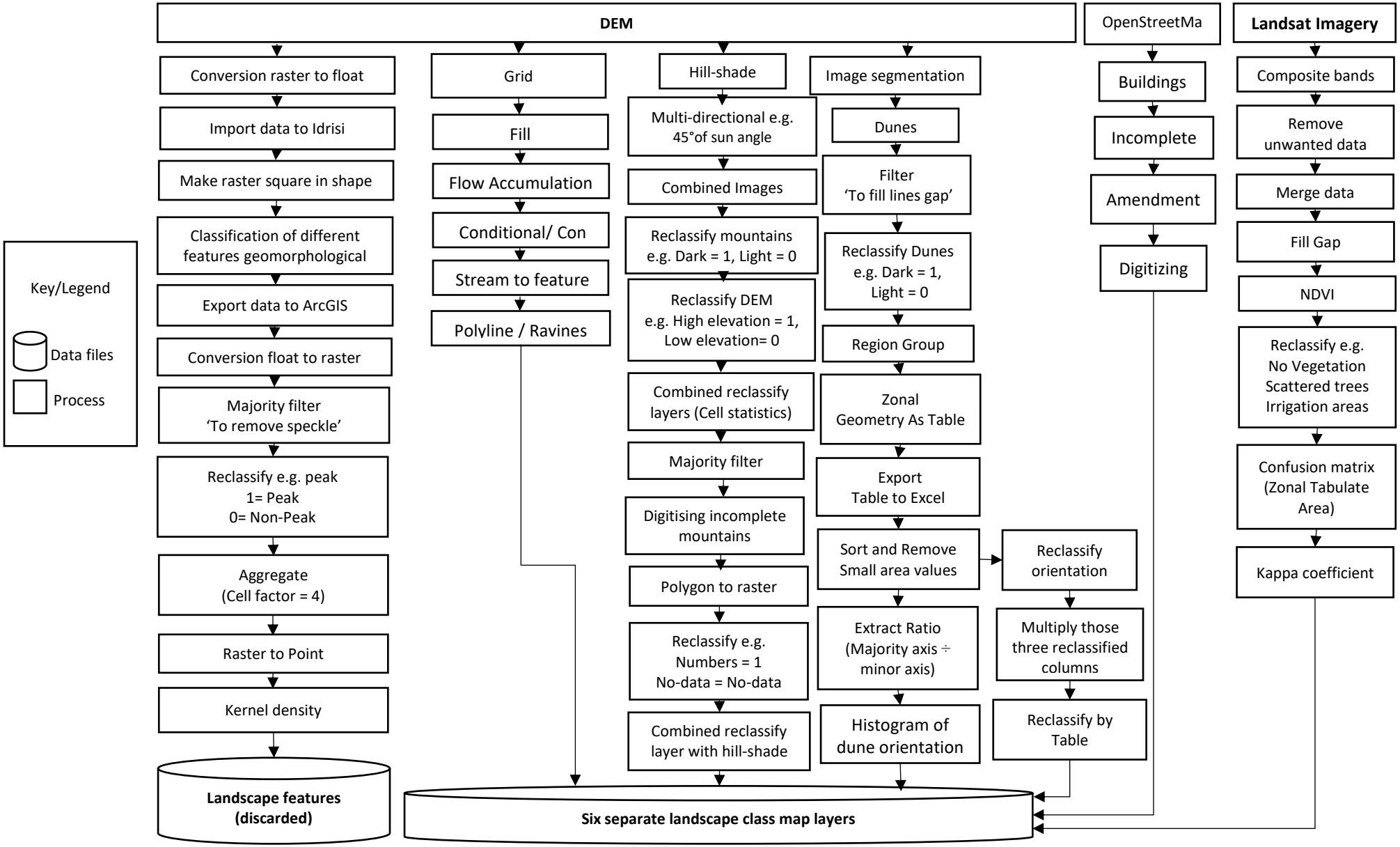


Figure 6.1: Process for determining six landscape character classes in Najran

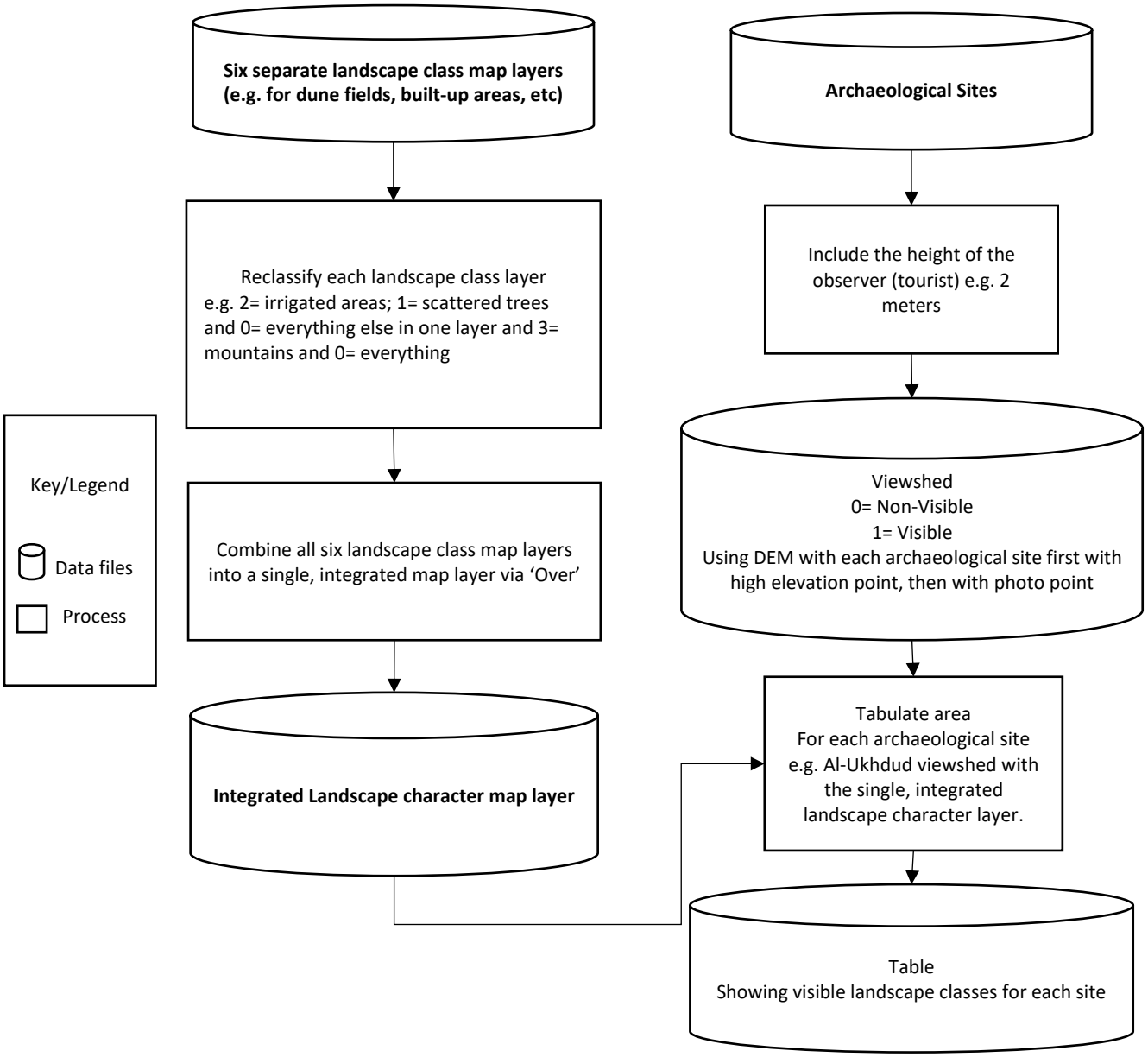


Figure 6.2: Continue process of determine Landscape characteristics

6.3 Results

Output landscape character classes are presented separately below.

6.3.1 Mountains

The result here indicate that the highest elevation point in the Najran mountains is 2,407 metres (see Fig. 6.3), while for archaeological tourist sites the highest elevation point is at Rah'om Castle, at about 1,505 metres above sea level. Then, in descending order, are Ann/Saadane Palace with an elevation of 1,351 metres, Jabal Al-husainia site at 1,270 metres, Bir Hima at 1,218 to 1,230 metres, the Emirate/Bin Madhi historic Palace and Alukhdud in the flat area. Figure 6.4 shows the Najran region is surrounded by a landscape of mountains extending in three directions: to the south, the west and the north of the region.

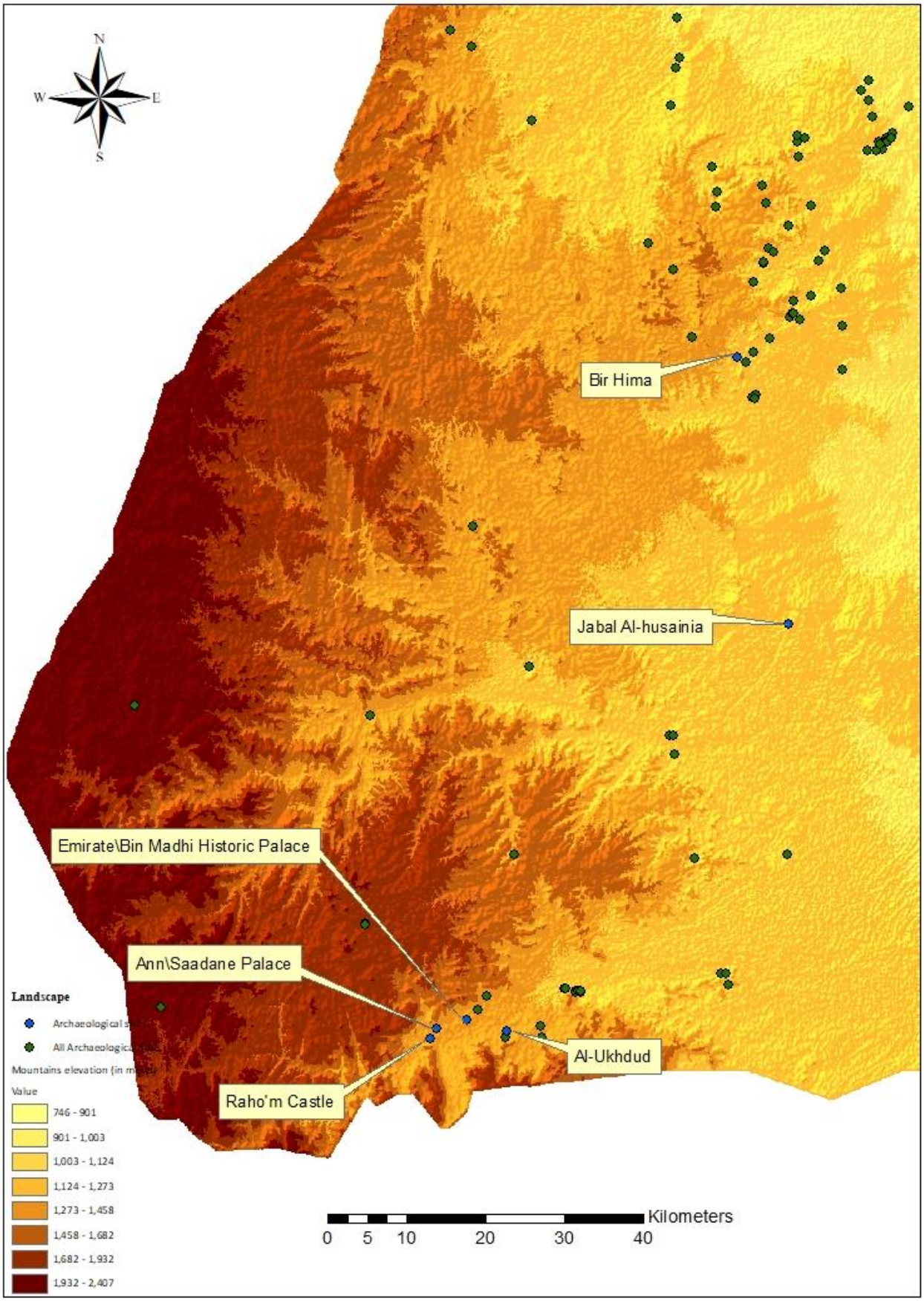


Figure 6.3: Topography of Najran in relation to archaeological tourist sites (terrain source: Aster GDEM)

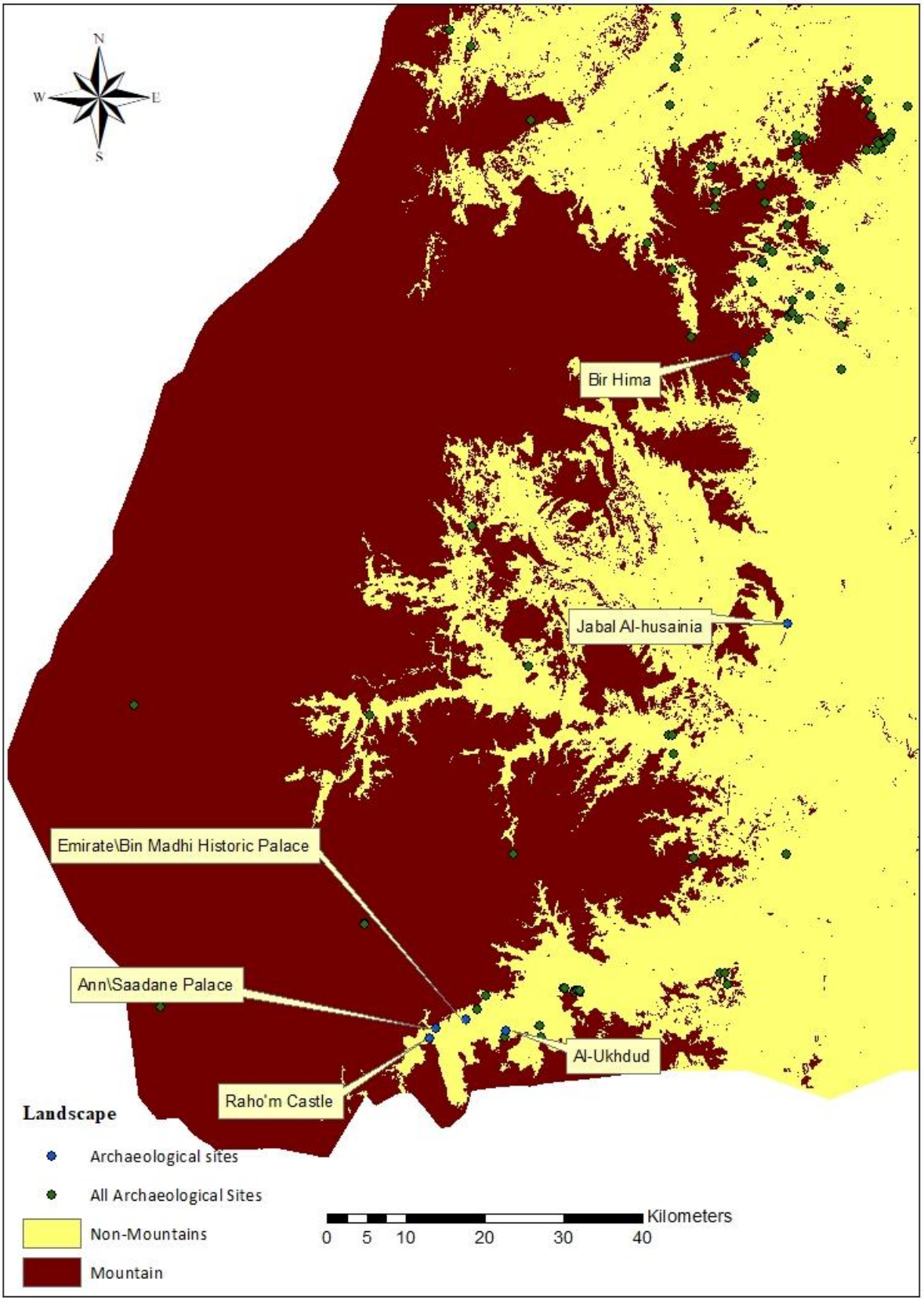


Figure 6.4: Landscape classes for mountainous and non-mountainous areas in Najran with archaeological tourist sites.

6.3.2 Wadis

Flow accumulation at Najran is shown in Figure 6.5 in relation to archaeological sites. Ann Saadane Palace is located 316 metres away from the nearest high flow accumulation channel, Rah'om Castle 500 metres away, the Emirate or historic Bin Madhi Palace about one kilometre away, Jabal Al-husainia about 1.5 kilometres, Al-Ukhdud about three kilometres away and Bir Hima at about 5.7 kilometres away. Ann Saadane Palace and Rah'om Castle are located near the Wadi of Najran, while the other archaeological sites are located farther away from this wadi, but close to other waterways, which are not major and do not lead to water accumulation.

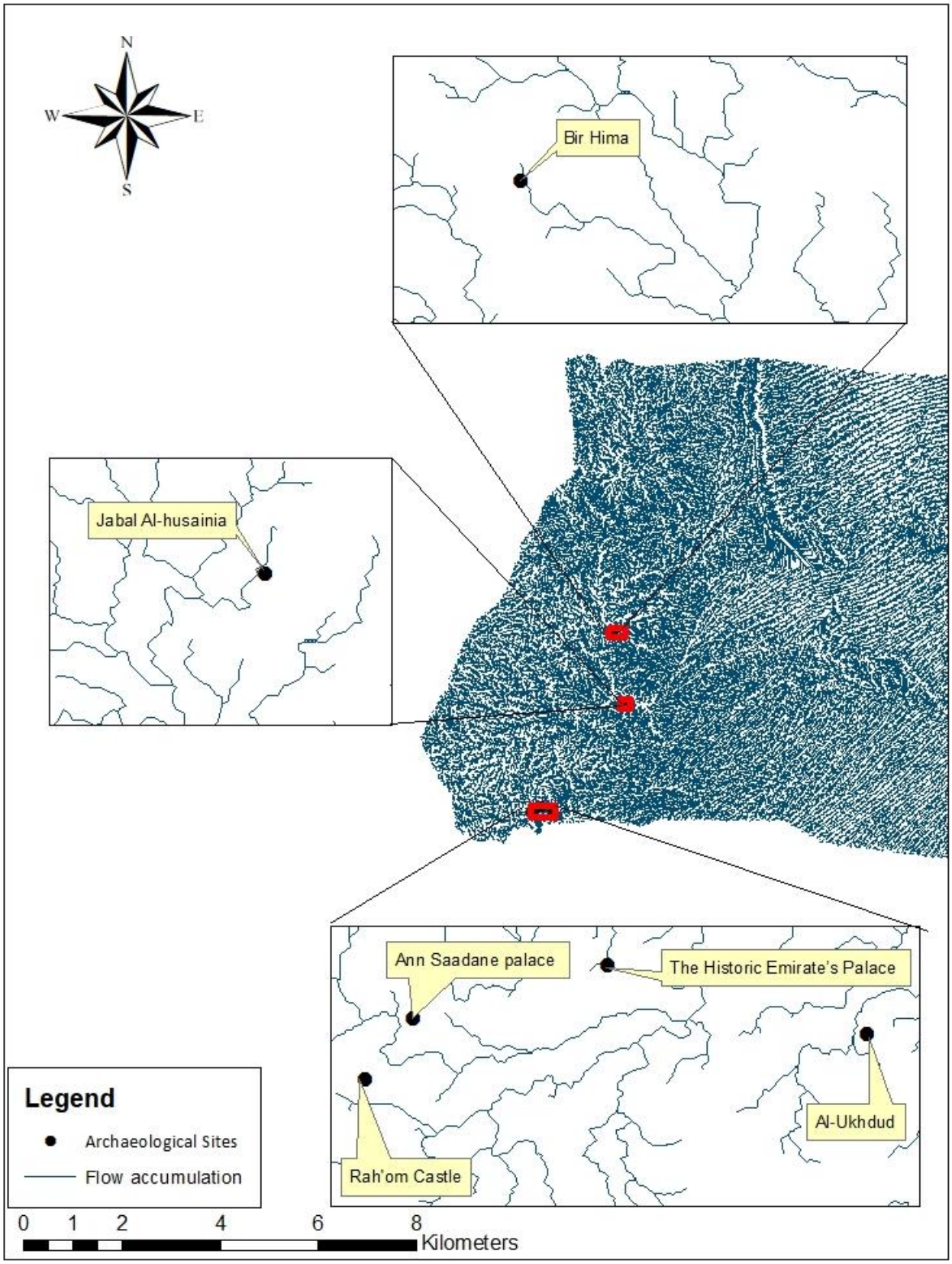


Figure 6.5: Flow accumulation and archaeological tourist sites in Najran.

6.3.3 Dunes

Figure 6.6 shows the orientation of the major axis of dunes and non-dune features that were manually digitised based on visual inspection of a small sample area of 15 km^2. Based on this histogram of sand dune orientation, dunes in the sample area had orientations more concentrated in the range 25° to 55° compared with non-dune topological features from the same area. Furthermore, the ratios of major to minor dunes axes for the sample area are shown in Figure 6.7, showing ratios greater than four are seldom found in non-dune topographic features.

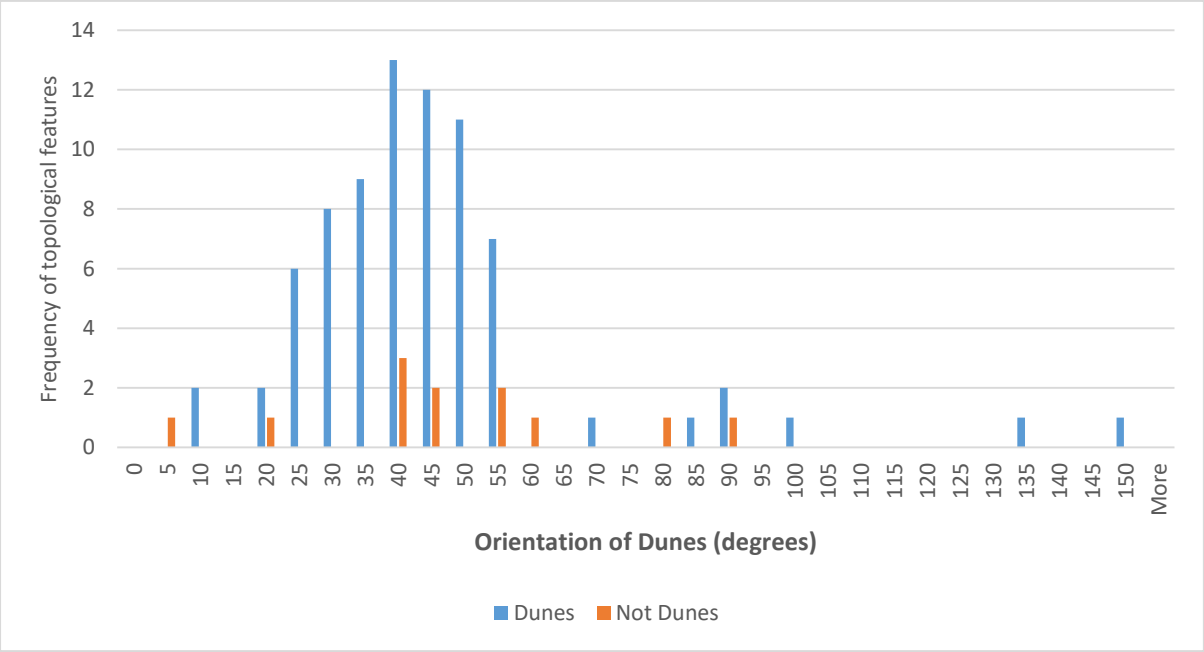


Figure 6.6: Histogram of dune orientations, with sample area frequencies.

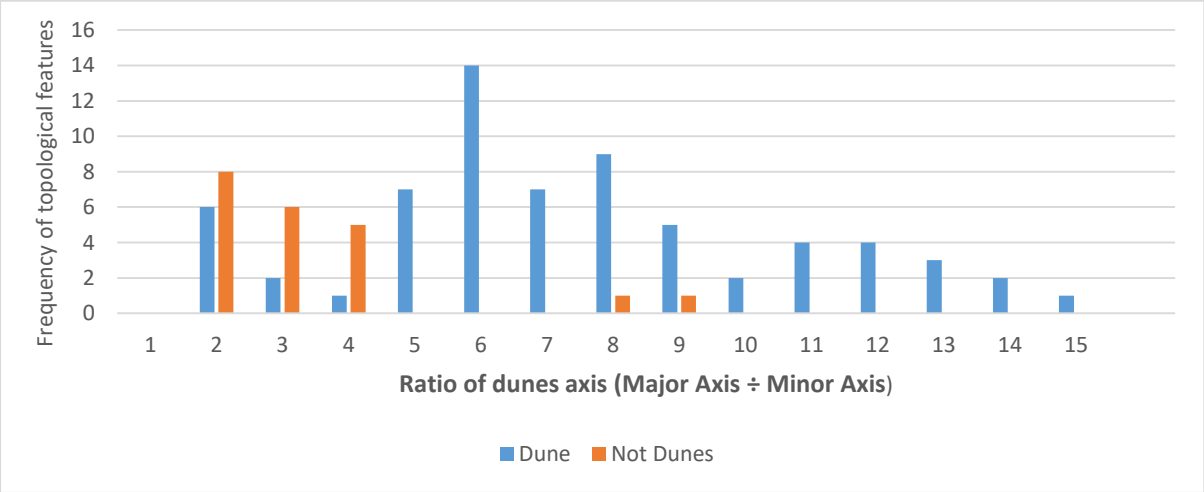


Figure 6.7: Histogram of dune major: minor axis ratios, with frequencies of manually digitised dune and non-dune topological features in a small sample area

Based on these histograms and inspection of maps of topological features, those topological features with a minor: major ratio greater than five and a major-axis orientation of 20 to 70 degrees were reclassified as sand dunes. A histogram of dune orientations for the entire study area following this classification is shown in Figure 6.8. The dune field thus has an orientation direction of northeast-southwest, given that many of these existing dunes have an orientation of 45 degrees, 22.8 % of the total dunes area of 2271 km^2, followed by 50 degrees (18.14%) and so on (see Fig 6.8).

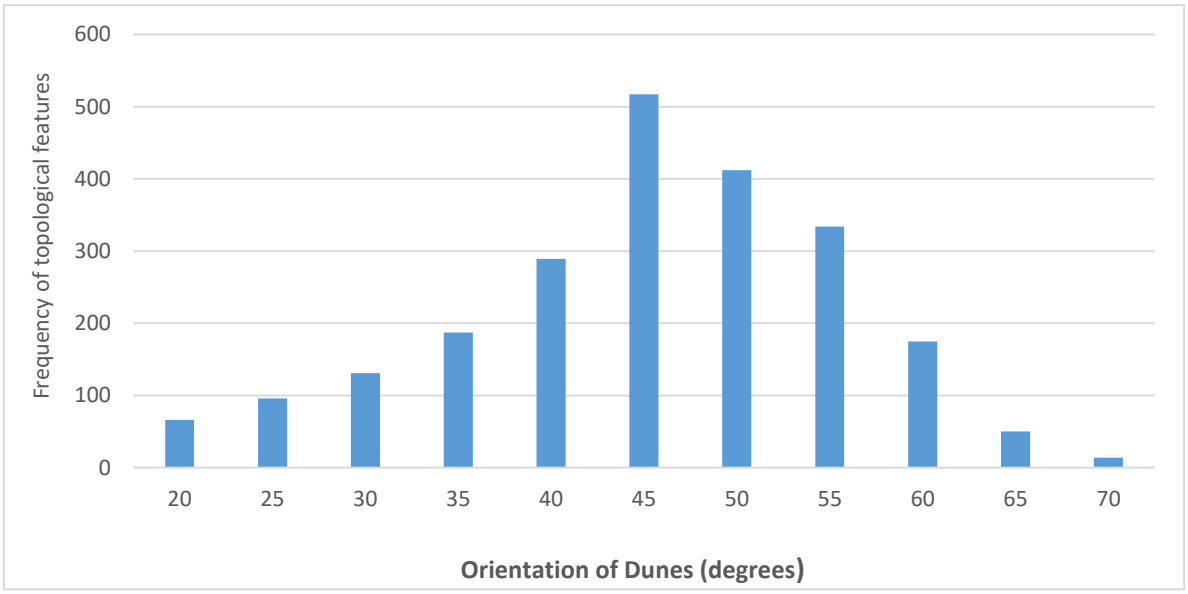


Figure 6.8: Histogram of orientation of features classed as dunes across the entire study area, with area frequencies

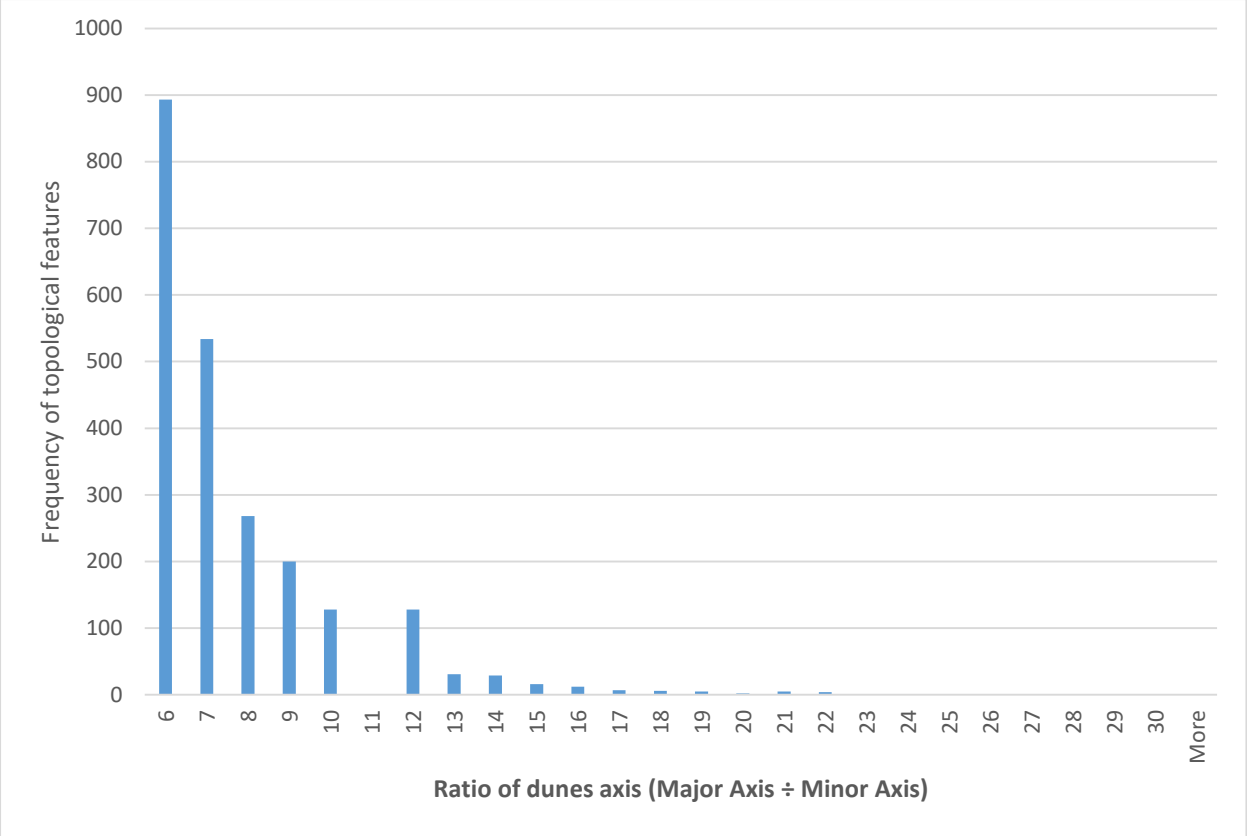


Figure 6.9: Histogram of dune axis ratios, with area frequencies

Following reclassification of topological features across the entire study area, the ratios of major to minor dune axes are shown in Figure 6.9. Most dunes had axis ratios of less than eight, though a few had ratios greater than ten.

Figure 6. 10 shows the spatial distribution of topological features classed as dunes based on minor: major ratio greater than five and an orientation of 20 to 70 degrees.

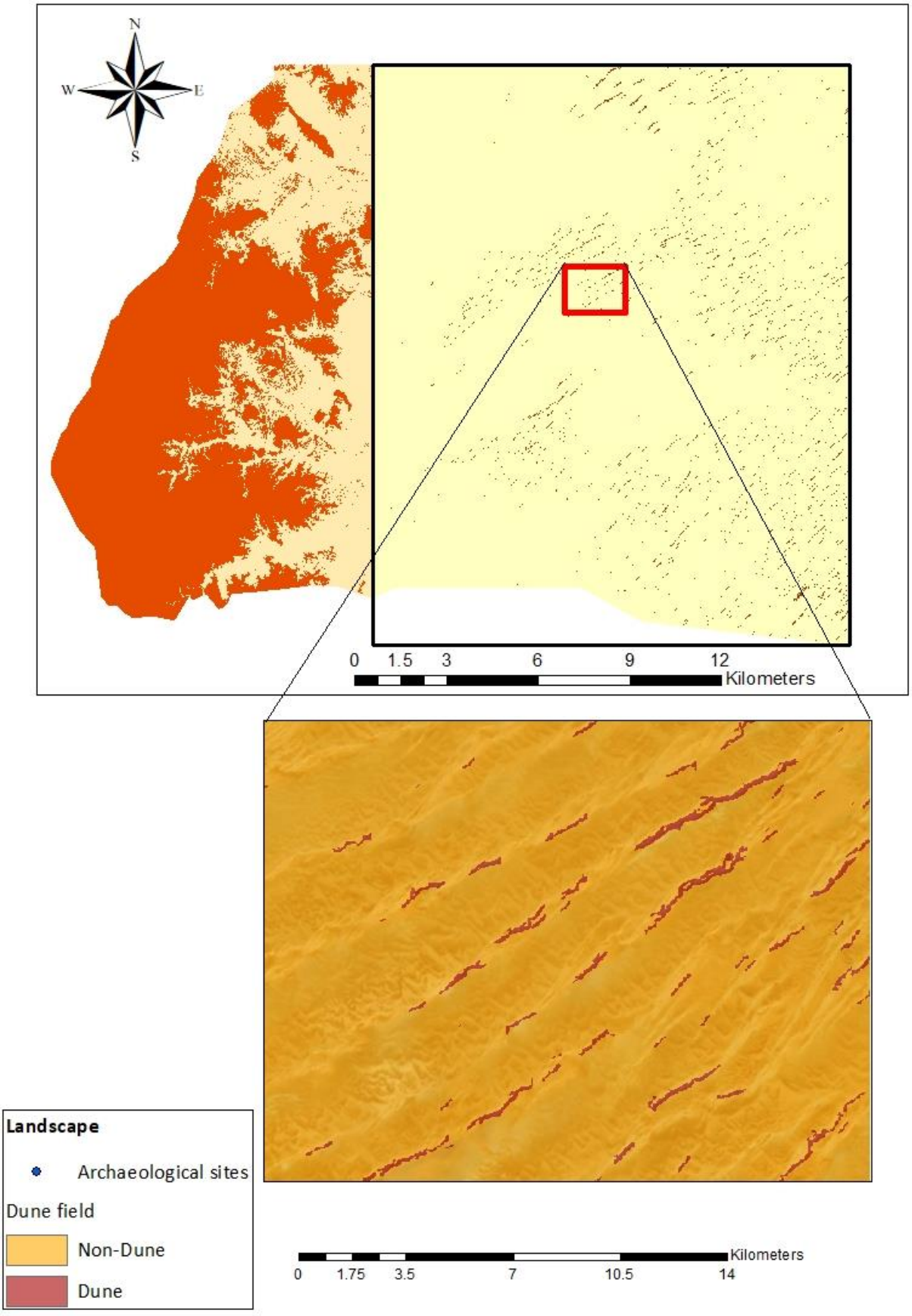


Figure 6.10: Sand dunes in Najran, concentrated in the east of the region.

6.3.3.1 Accuracy assessment of dune field landscape character classes

The accuracy of the output dune map layer was assessed by a confusion matrix and derived overall percentage accuracy and kappa coefficient (see Table 6.2). This assessment was based on dune features from the classified image relative to dune features derived through visual interpretation of a small area of ESRI basemap imagery. The results indicate that the overall accuracy is 82.45%, and kappa is 0.65, which means the strength of agreement here is considered to be ' Substantial or good' (Viera, and Garrett, 2005).

Table 6.2: Confusion matrix, overall accuracy and kappa coefficients for dune features (cells indicate areas in m^2) identified from ESRI basemap imagery versus those identified via classification.

Information from classification	**Information from reference data set (digitised from basemap)**			
Object class	**Dunes**	**No Dunes**	***Row total***	**User's accuracy**
Dunes	17775253	863854	18639107	95.36%
No Dunes	7022180	19278360	26300540	73.3%
Column Total	24797433	20142214	44939647	
Producer's accuracy	71.68%	95.71%		
Overall accuracy = 82.45% , Kappa coefficient = 0.65				

6.3.4 Vegetation

Figure 6.11 shows the two categories of vegetation, scattered native woodland (الأشجار الطبيعية المنتشرة) and irrigated areas / palms, relative to potential archaeological tourist sites in Najran.The majority of the vegetation is concentrated in the district of Najran.

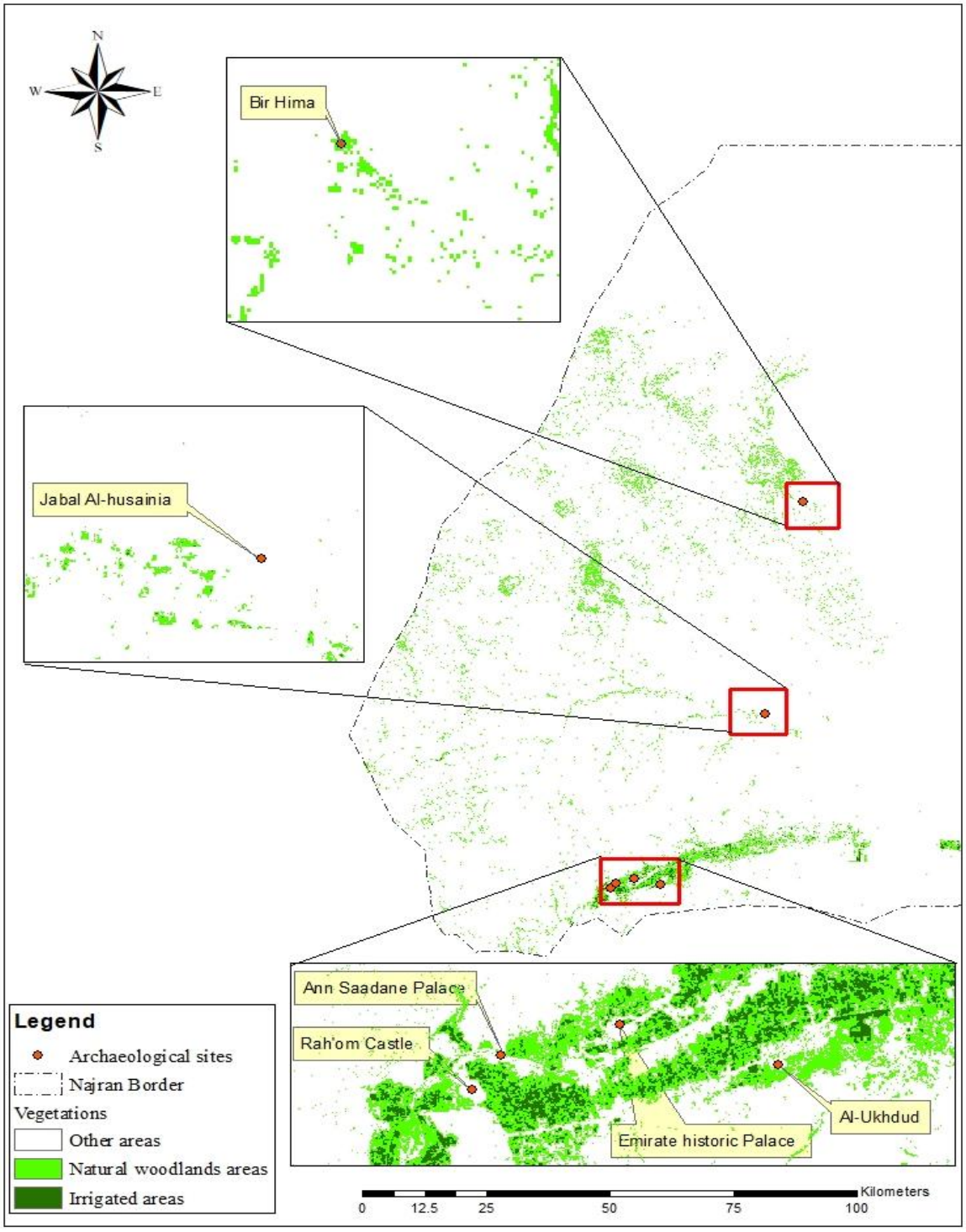


Figure 6.11: Distribution of scattered native woodland and irrigated areas/palms in Najran relative to potential archaeological tourist sites.

The presence of scattered native woodland varies from site to site; for example, around the Bir Hima site, there are acacia trees and a few palm trees. The Al-Ukhdud site has *Salvadora persica* and *Ziziphus* trees. The Jabal Al-husainia site has some acacia trees but these are not very close to the site. At Ann Saadane Palace and Rah'om Castle, the two sites overlook a combination of irrigated areas and scattered palm trees. The Emirate or historic Bin Madhi Palace is surrounding by several irrigated areas or industrial palm trees, due to its city-centre location surrounded by market buildings.

The results here are confirmed by a confusion matrix, overall accuracy and kappa coefficient (Table 6.3), which shows the values (pixel counts) of the reclassified image in contrast to vegetation manually digitised through visual interpretation of ESRI basemap imagery. The results indicate that the overall accuracy is 85.98%, and kappa is 0.76, which means the strength of agreement here is considered to be 'good' (Viera, and Garrett, 2005).

Table 6.3: Confusion matrix, overall accuracy and kappa coefficients for reclassified Landsat images versus visual interpretation of ESRI basemap imagery (pixel counts)

ESRI basemap imagery (reference)	**Classification of LandSat imagery from**				
Object class	**No vegetation**	**Scattered native woodland**	**Irrigated areas**	***Row total***	Producer's accuracy
No vegetation	162000	22500	1800	186300	86.95%
Scattered native woodland	12600	62100	4500	79200	78.4%
Irrigated areas	0	5400	63000	68400	92.1%
Column Total	174600	90000	69300	333900	
User's Accuracy	92.78%	60%	90.91%		
Overall accuracy = 85.98%, Kappa coefficient = 0.767					

6.3.5 Buildings

The output built-up landscape class shown in Fig 6.12 confirms the concentration of buildings inside the city of Najran, while these buildings decrease away from the centre of Najran.

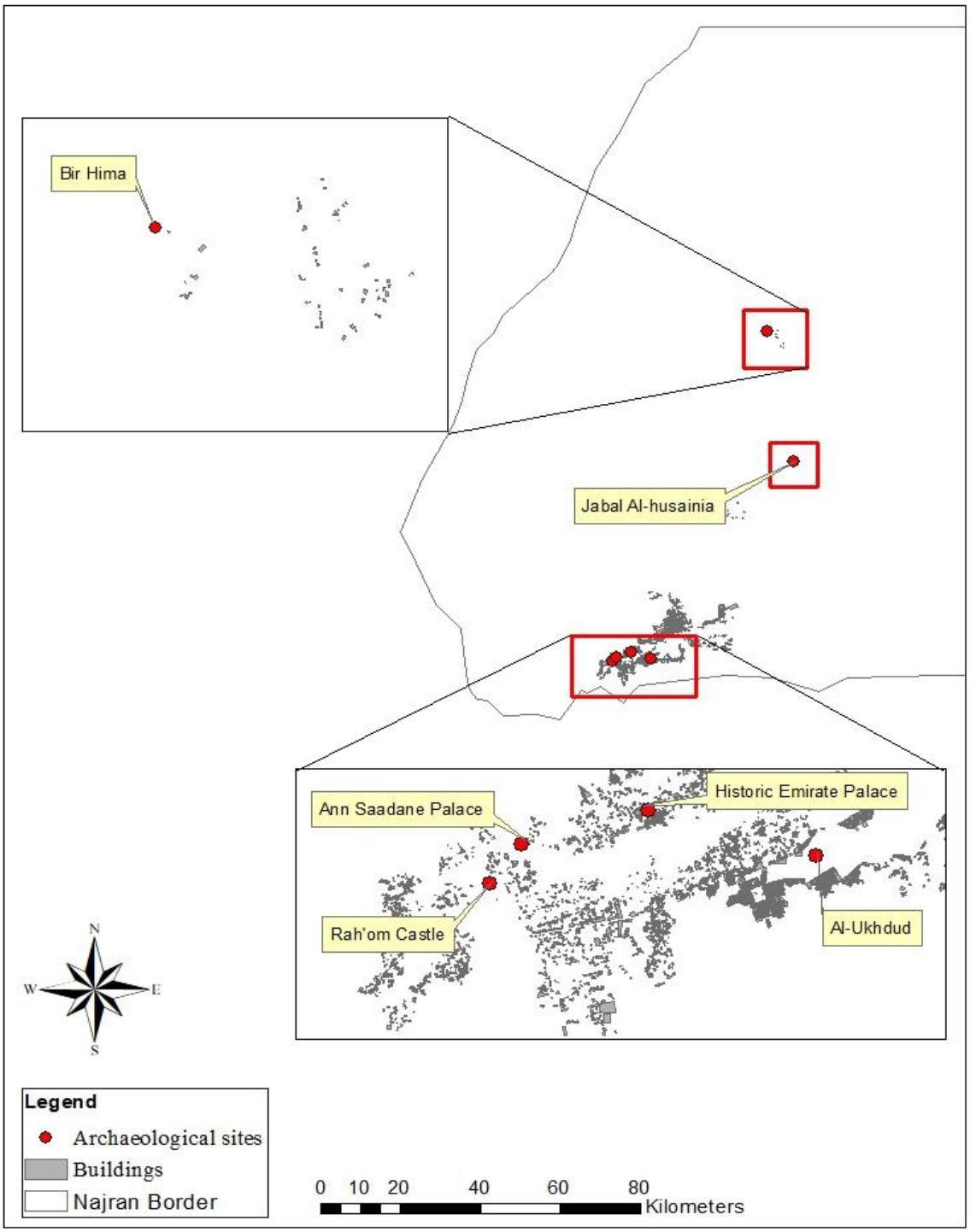


Figure 6.12: Built-up areas in Najran relative to potential archaeological tourist sites

6.3.6 Viewshed analysis of landscapes visible from archaeological sites

The results indicate the visibility of the landscape in Najran as seen by tourists from the highest elevation point when visiting potential archaeological sites. Table 6.4 shows the visibility of different landscape classes from the highest vantage point at the six shortlisted archaeological sites and landscape classes. In the large area shown in Viewshed, Jabal A-husainina takes up 37.77% of the total area, followed by Rah'om Castle at 31.69%, while Bir Hima is just 5.06% of the total area.

From the Bir Hima site, there are high numbers of visible pixels with mountains (13.54% of the visible area), followed by scattered trees (8.54%), wadis (1.95%), sand dunes (1.02%) and then buildings (0.02%). Other land represents 74.93% of the total visible area (see table 6.4).

Figures 6.13 and 6.14 show the Bir Hama site, where tourists who visit can see a landscape of mountain ranges, as well as scattered trees, such as palm trees and acacia trees scattered around the site, also some secondary wadis and low sand dunes.

Table 6.4: Visibility of different landscape classes from six short-listed archaeological sites (cells show Numbers of pixels, each pixel is 30 x 30m)

Archaeological site	Dune field	Scattered native woodland	Irrigated areas / palms	Mountains	Built-up areas	Wadis	Other land	Total Viewshed area
Bir Hima	223546 (1.02%)	1872644 (8.54%)	0 (0%)	2968780 (13.54%)	4799 (0.02%)	428088 (1.95%)	16434358 (74.93%)	21932215
Jabal Al-Husainia	42232 (0.029%)	4464209 (2.73%)	1919 (0.001%)	38091199 (23.3%)	0 (0%)	955999 (0.58%)	119933766 (73.36%)	163489324
Al_Ukhdud	0 (0%)	2750897 (6.93%)	209244 (0.53%)	31209155 (78.64%)	2045416 (5.15%)	404092 (1.02%)	3067644 (7.73%)	39686448
Historic Palace	0 (0%)	683405 (2.18%)	123819 (0.39%)	26900439 (85.76%)	1311139 (4.18%)	253397 (0.81%)	2094368 (6.68%)	31366567
Ann Saadane Palace	0 (0%)	9419857 (24.05%)	1321697 (3.38%)	14840066 (37.9%)	2207629 (5.64%)	2207629 (5.64%)	9160700 (23.39%)	39157578
Rah'om Castle	0 (0%)	31977986 (23.31%)	3866230 (2.82%)	44077713 (32.14%)	5311747 (3.87%)	4658097 (3.4%)	47261498 (34.46%)	137153271

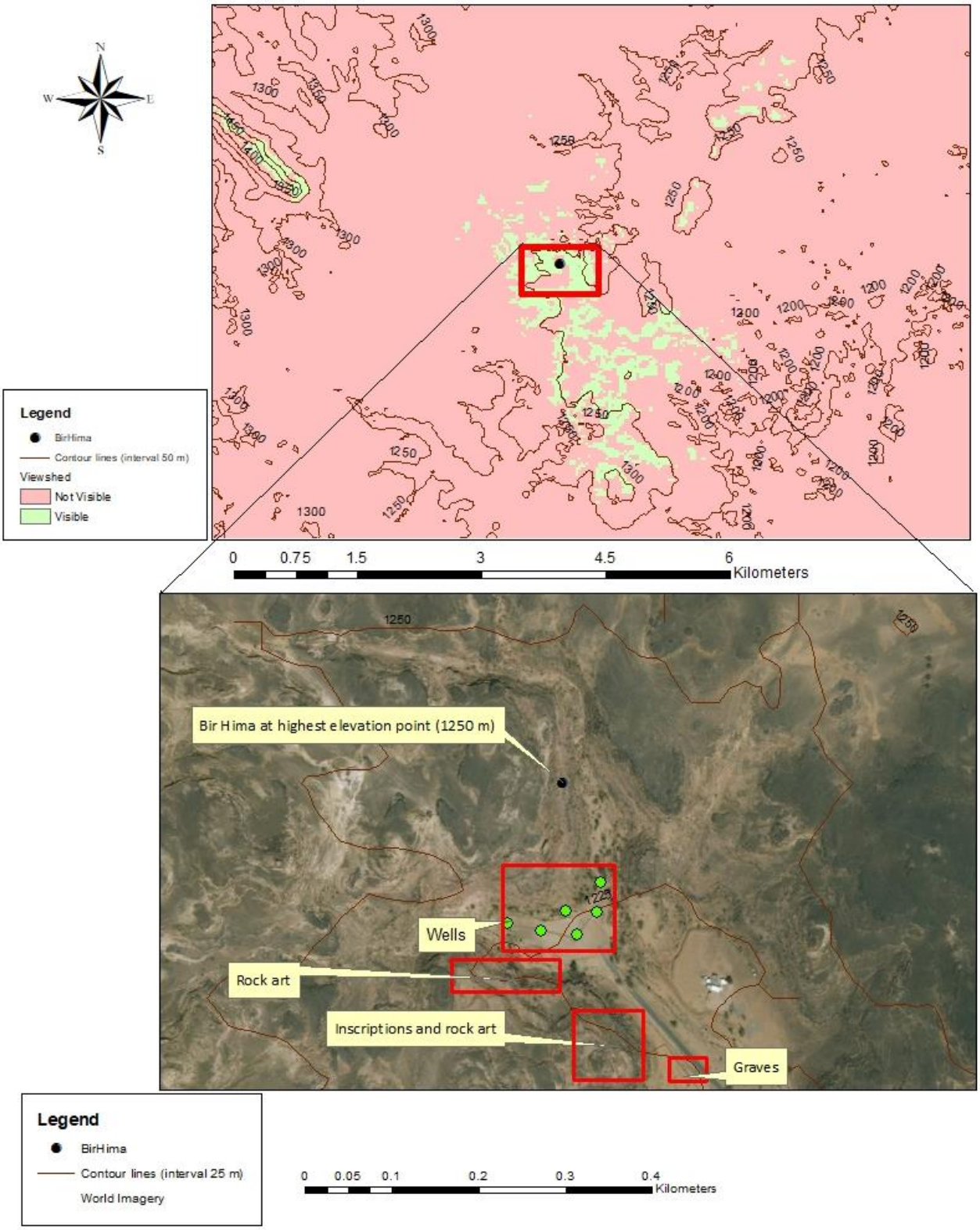


Figure 6.13: Viewshed for the Bir Hima archaeological site in Najran, from the highest elevation point at the site.

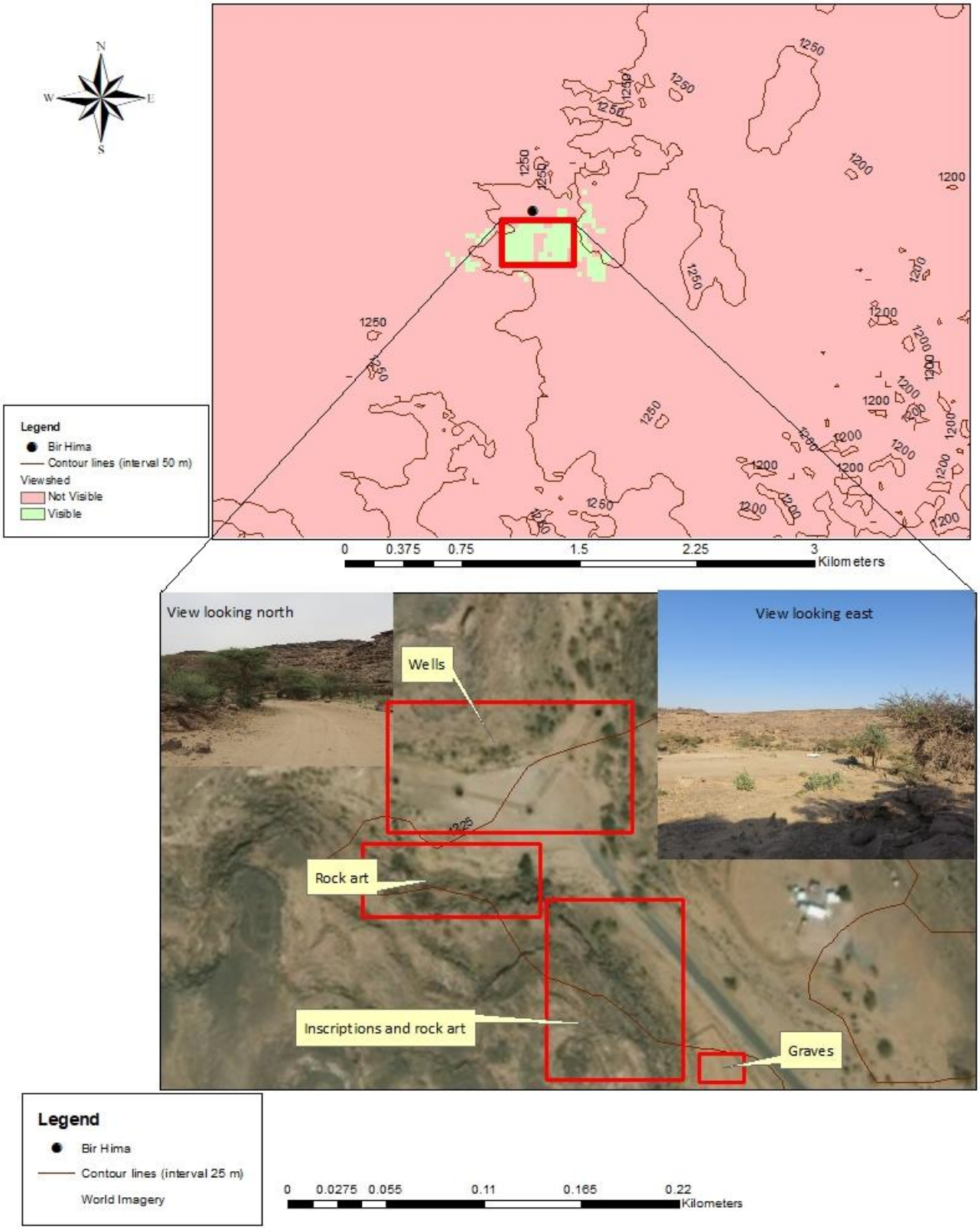


Figure 6.14: Viewshed for the Bir Hima archaeological site in Najran, generated from the same vantage point as two photographs taken during fieldwork.

The second site is Jabal Al-husainia where tourists can see a landscape of sand dunes, some scattered trees but these are not very close to the site, and mountains (see Figs 6.15 and 6.16). As confirmed by the researcher this site is located in the north of Najran, on the way of Bir Hima. This site contains inscriptions and rock art, plus it allows tourists to see desert and wildlife, including camels wandering around the site.

Table 6.4 shows the numbers of pixels with given combinations of visibility from Jabal Al-husinia site and landscape class, where there are high numbers of visible pixels with other land (73.36% of row visibility in total), followed by mountains (23.3%), scattered trees (2.73%), wadis (0.58%), dune fields (0.029%) and irrigated areas (0.001%).

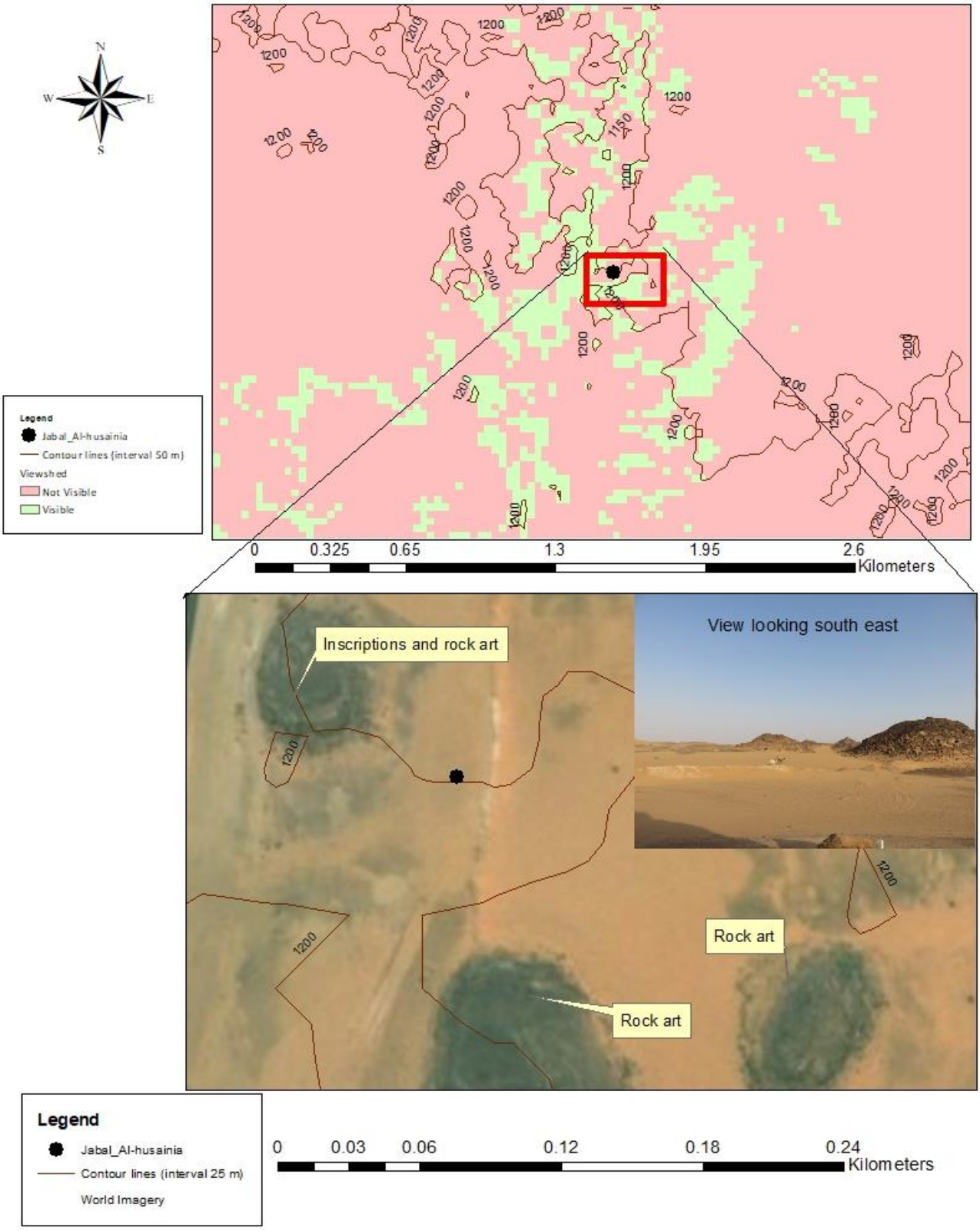


Figure 6.15: Viewshed landscape of Jabal Al-husainia archaeological site in Najran, from a high elevation point value at the site

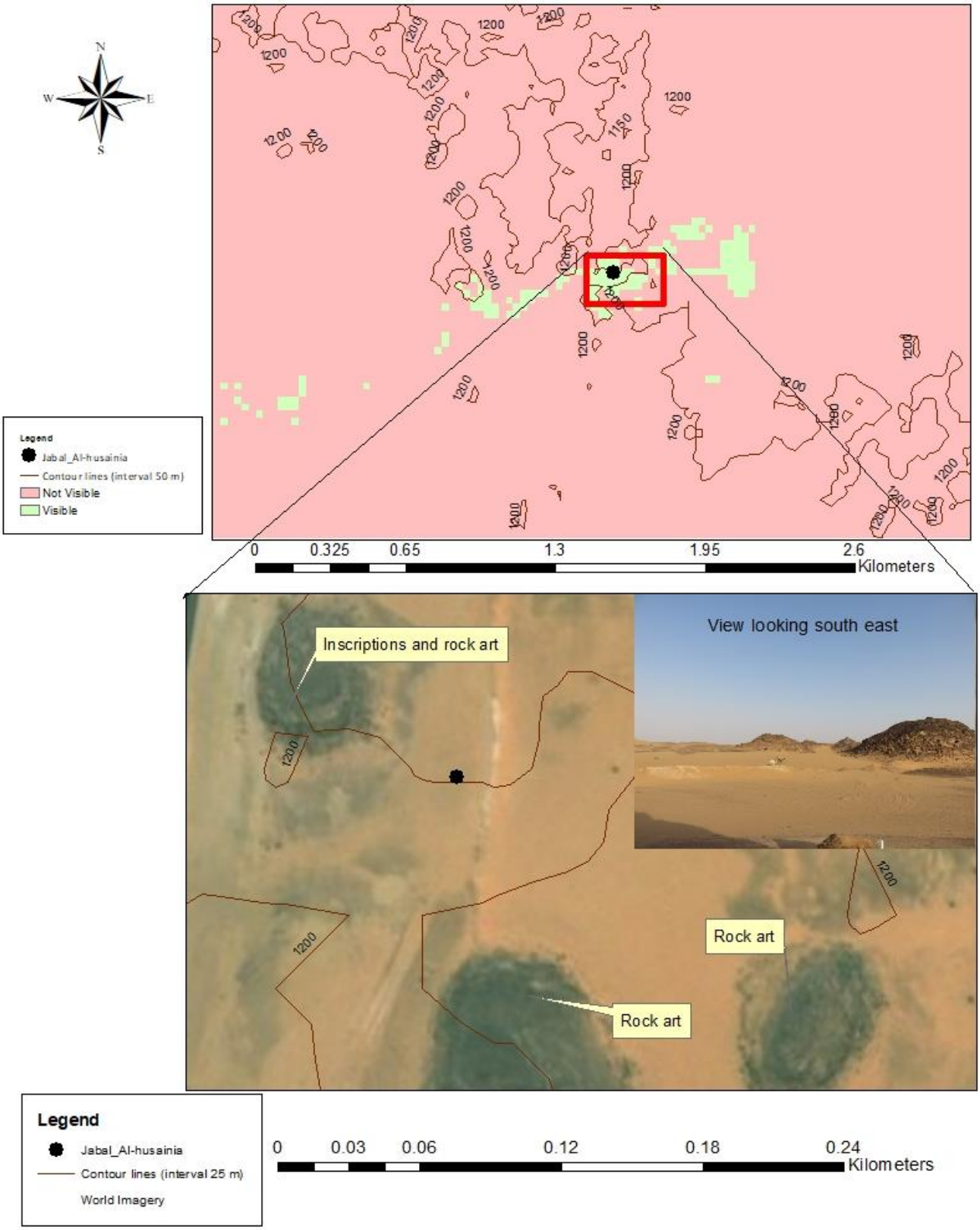


Figure 6.16: Viewshed landscape of Jabal Al-husainia archaeological site in Najran, from where a photo was taken of the site.

The third site is Al-Ukhdud as tourists visiting this site can see a landscape of trees and houses, with a mountain range beyond (see Fig. 6.17). The description of this site, along with the availability of archaeological characteristics there, such as destroyed buildings, remnants of pottery scattered on the ground, millstone, some rock art and other artefacts. All this is located outdoors and can offer tourists or visitors to this site some unique archaeological characteristics, plus there are scattered trees across the site providing shade, in addition to towering mountains surrounding the site, as well as modern houses. However, high numbers of visible pixels are for mountains (78.64%), followed by other land (7.73%), scattered trees (6.9%), sand and buildings (5.15%), wadis (1.02%) and irrigation areas (0.53%)s (see table 6.4).

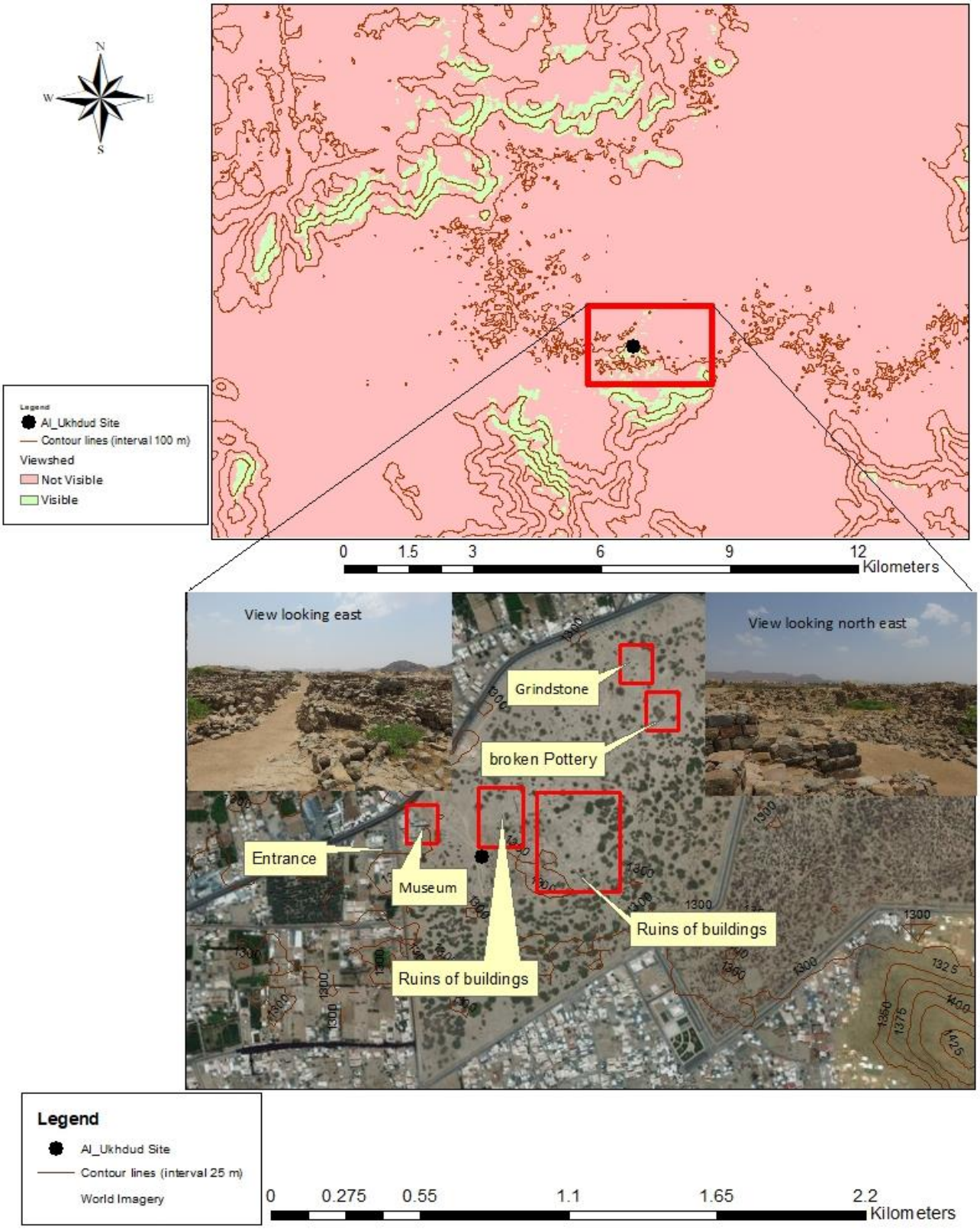


Figure 6.17: Viewshed landscape of Al-Ukhdud archaeological site in Najran, from a high elevation point value at the site, where as well a photo was taken of the site has same elevation point

The fourth site is the Emirate or historic Bin Madhi Palace, where visitors to this site can see a landscape of buildings and palm trees around it, as well as a mountain range in the distance (see Fig. 6.18). The researcher confirmed that allows tourists or visitors to the palace to see how people lived in the past; it is built from clay and contains several rooms, in addition to a historic well located in the centre of the palace yard. Furthermore, visitors can enjoy the view of mountains surrounding the site, as well as various markets, such as the daggers market and the popular market.

The high numbers of visible pixels from the Emirate's Historic Palace show mountains (85.76%), followed by other land (6.68%), buildings (4.18%), wadis (0.81%), scattered trees (2.18%) and irrigation areas (0.39%) (see table 6.4).

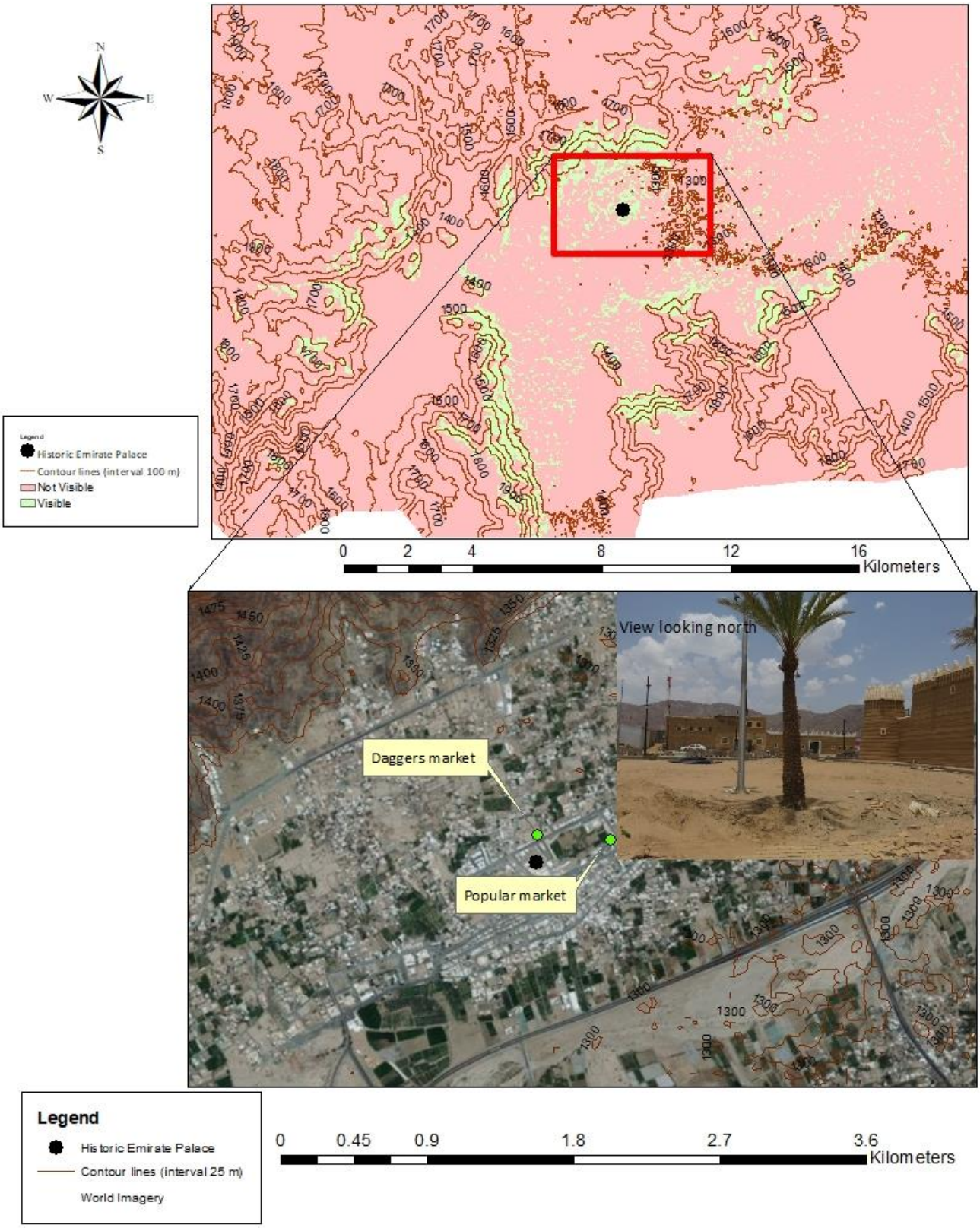


Figure 6.18: Viewshed landscape of the Emirate's Historic Palace archaeological site in Najran, from a high elevation point value at the site, where as well a photo was taken of the site has same elevation point.

The fifth site is Ann Saadane Palace, which is built from clay and allows tourists or visitors to the palace to see the habitation of people in the past.It can also provide tourists or visitors with a vision of mountains surrounding the site, and there are both modern and historic buildings adjacent to this location, plus farms and palm trees (see Figs 6.19, and 6.20). However, the high numbers of visible pixels from Ann Saadane Palace site show mountains (37.9%), followed by vegetation (27.43%), other land (23.39%) and buildings and wadis with the same percentage (5.64%) (see table 6.4).

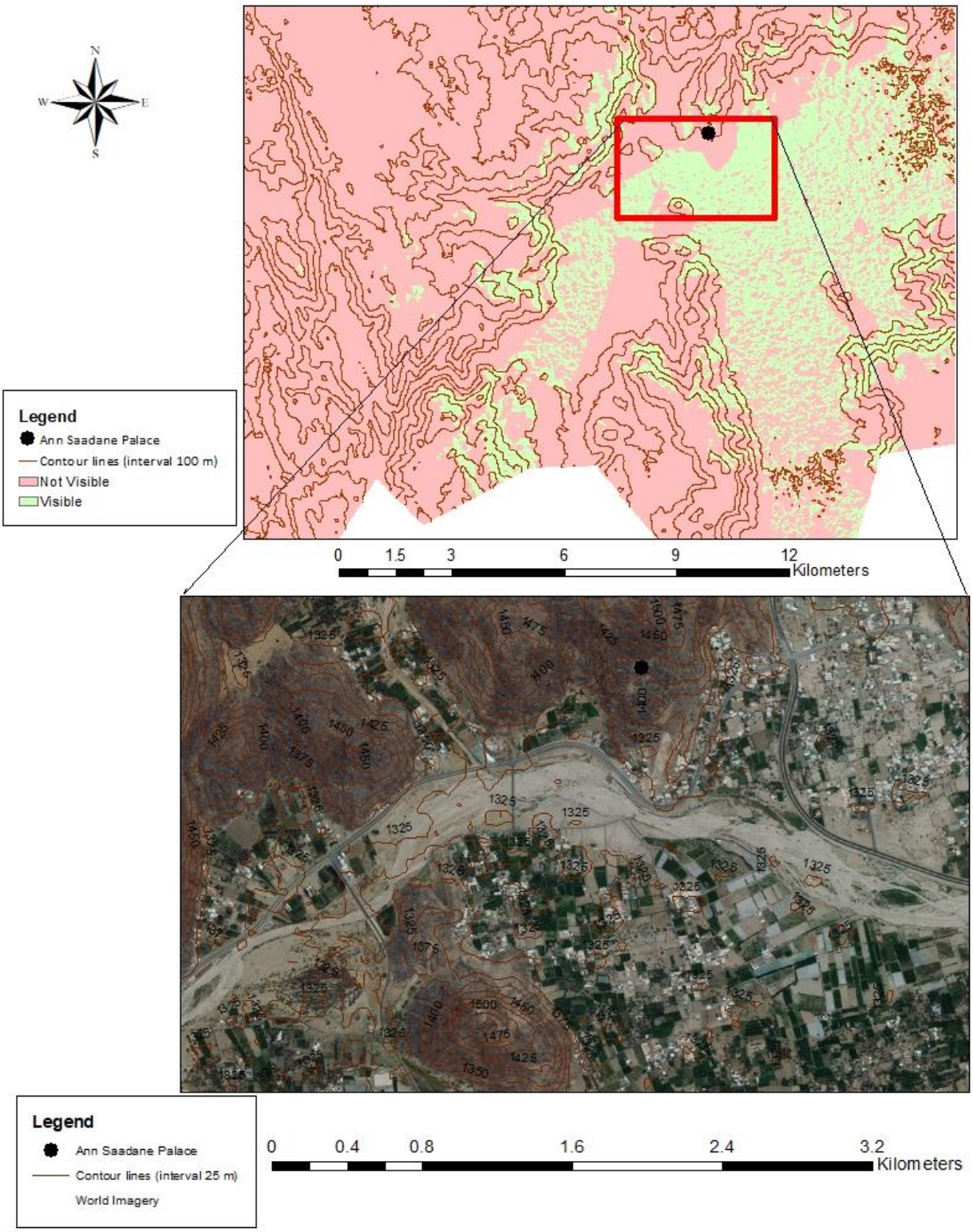


Figure 6.19: Viewshed landscape of Ann Saadane palace archaeological site in Najran, from a high elevation point value at the site.

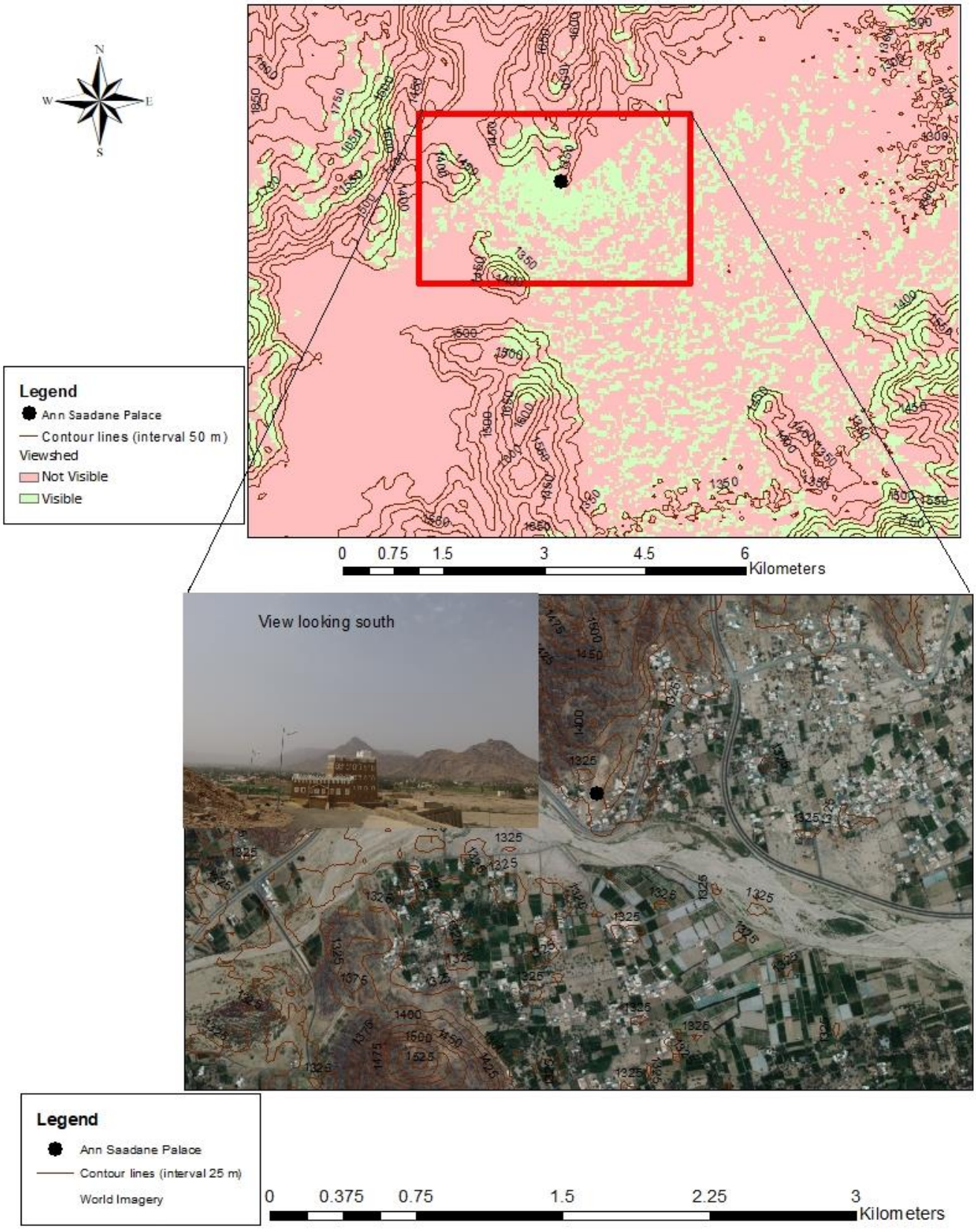


Figure 6.20: Viewshed landscape of Ann Saadane palace archaeological site in Najran, from where a photo was taken of the site.

The final site is Rah'om Castle, which is located on the top of Mount Rah'om; this castle is built of stone and the site can give tourists or visitors a chance to see unique scenery that starts with a climb up this mountain to the top and the castle. Tourists can see a diverse landscape, including Wadi Najran, a mixture of palm trees and irrigation areas, a mountain range in the distance and buildings around the site, in the foreground (see Figs 6.21 and 6.22). However, the high numbers of visible pixels from Rah'om Castle show other land (34.46%), followed by mountains (32.14%), vegetation (26.13%), buildings (3.87%) and wadis (3.4%).

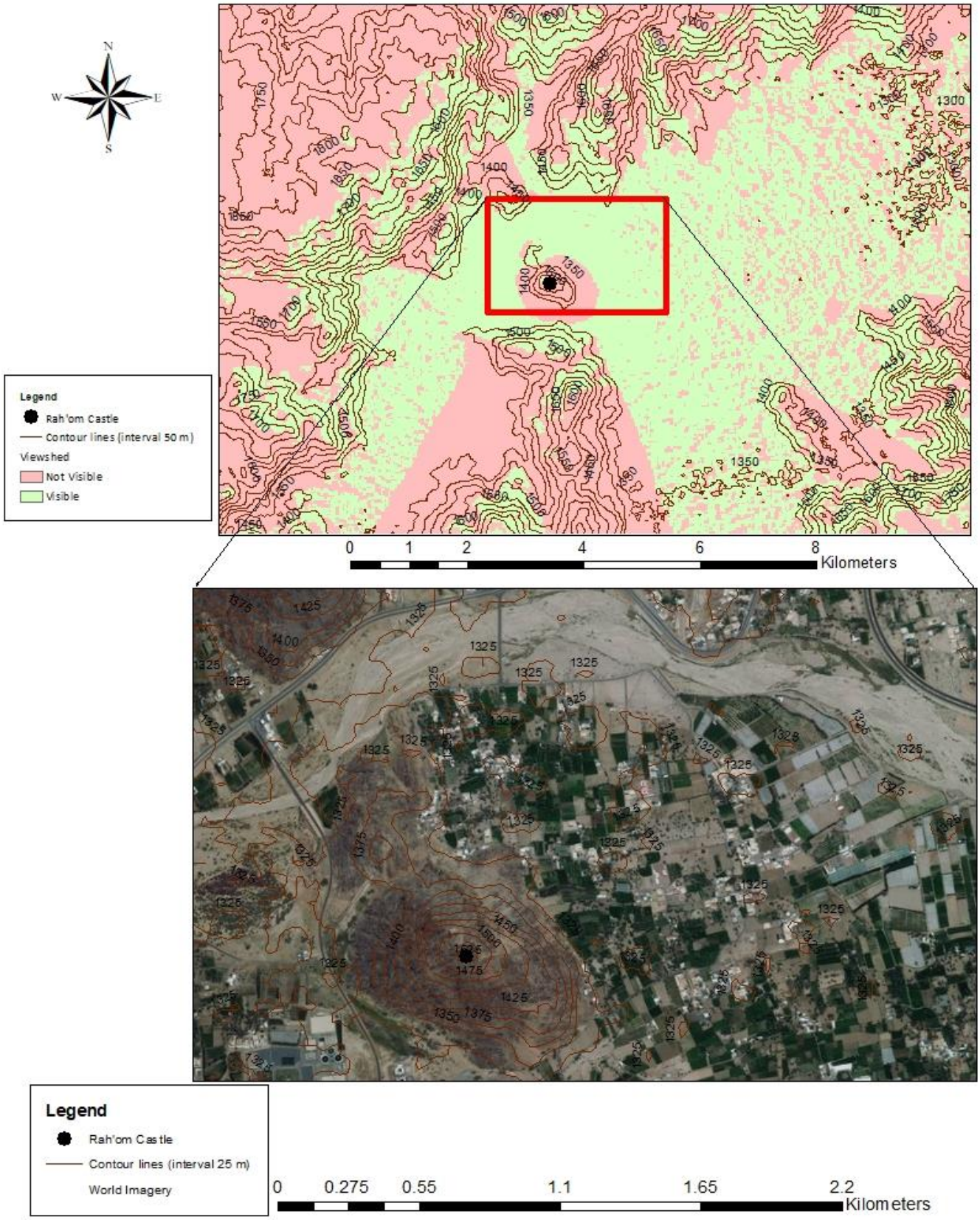


Figure 6.21: Viewshed landscape of Rah'om Castle archaeological site in Najran, from a high elevation point value at the site.

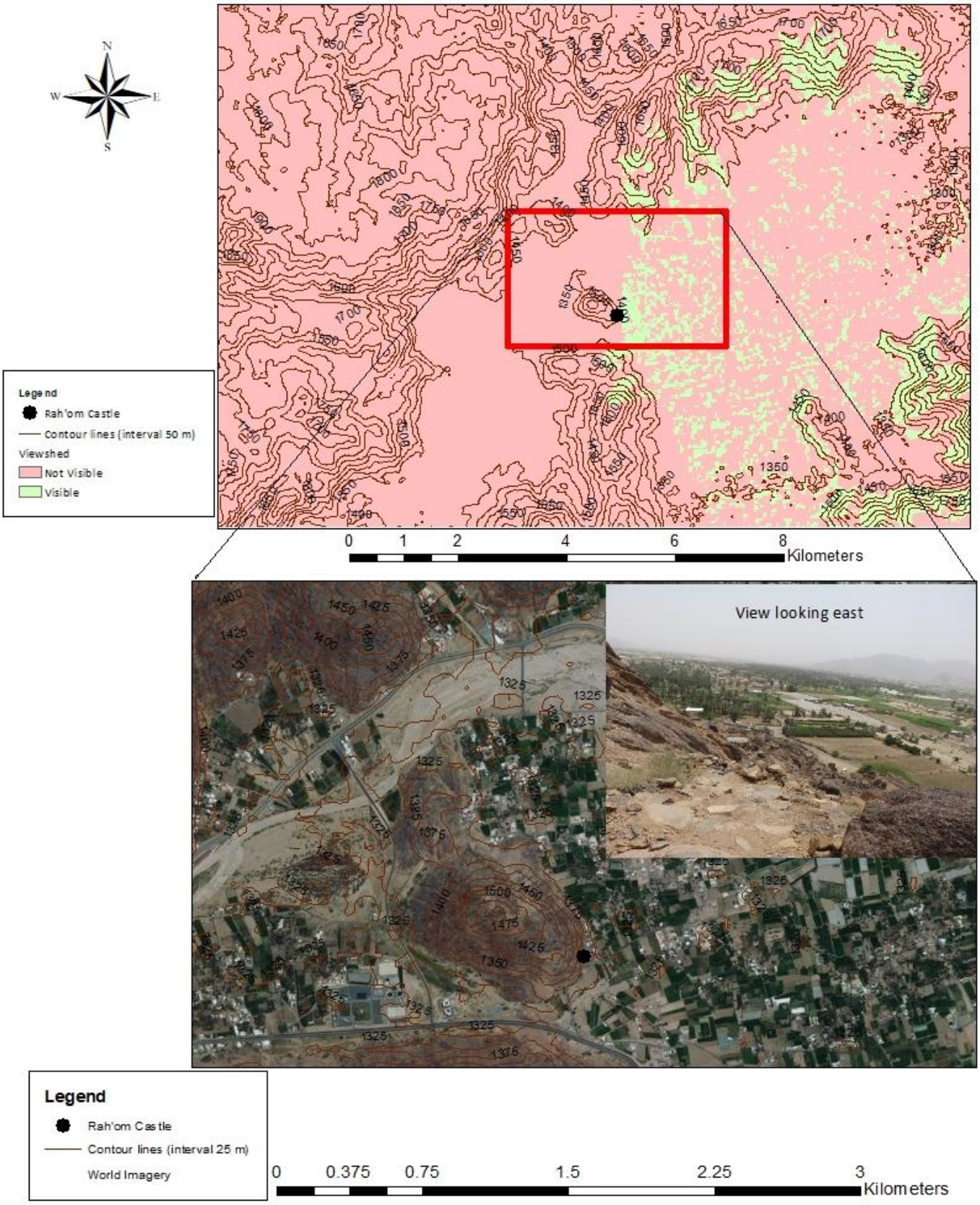


Figure 6.22: Viewshed landscape of Rah'om Castle archaeological site in Najran, from where a photo was taken of the site

6.4 Discussion

This chapter has identified the landscape characteristics surrounding potential archaeological tourist sites, involving developing a method that could be used by the SCTNH to develop and manage such sites in the future. The analysis could be used for marketing both these surrounding landscapes as well as the sites themselves when attracting tourists to visit Najran in the future. It could also be used to manage planned developments in the areas surrounding these sites, such as proposed new buildings that could affect the context of Najran's archaeological sites.

Applying landscape character and Viewshed techniques to archaeological tourism planning represents a new application of these tools. To date, no studies have been conducted using GIS on the landscape characteristics of areas surrounding archaeological sites within the field of tourism. Most previous archaeological studies involving landscape assessment have been conducted for other reasons, e.g. to show historic settlement landscapes (De Clercq et al., 2012; Glebova and Sergeev, 2018), to assess existing distributions of archaeological artefacts in the landscape (Khalaf, 2016) or to understand past and present urban landscapes (Herold et al 2002; Hall, 2006). Furthermore, in terms of the landscape characteristics of archaeological sites, studies usually concentrate on identifying or describing archaeological resources based on various historic periods (Turner, 2006), regardless of the characteristics of landscapes adjacent to sites that might attract potential tourists to enjoy those places. For example, Jennings et al. (2013) carried out a study using GIS to build a database for the site at Jubbah, in northern Saudi Arabia. In their study, they concentrated on archaeological features, aiming to show these on maps and be able to examine the spatial relations between rock-art sites and paleo-lakes in the study area. In addition, Jennings et al. (2014) conducted another study to classify rock-art panels in the north of Saudi Arabia, especially at Shuwaymis archaeological site in Ha'il Province, where they recorded the details of panels using DGPS and GIS. However, although they use the term landscape, they only focused on rock-art features, not landscapes.

Landscape character assessment has seldom been used in the Arabic-speaking world, despite the concept of landscape being known in Arabic, i.e.,المناظر الطبيعية, (section 3.5.3), though researchers in those countries do not use this Arabic term; instead, some Arabic researchers have used its English equivalent in their studies, e.g. Eben Saleh (2001) conducted a study to assess the aesthetic quality of Al-Alkhalaf village, in southwestern Saudi Arabia, where he used the term landscape term to refer to the structure of the study area and provide a complete description of the site features. This is in line with a previous study conducted by the same author in 2000, when he tried to describe the architectural shapes and landscapes of vernacular settlements in Asir region, Saudi Arabia. In contrast, some other studies have been conducted, such as Jaber and Al-juthery (2015), to analyse

the spatial features of sand dunes and their distribution in Iraq; although they classified sand dunes in their study, they did not use the phrase 'landscape character'. This also applies to another study conducted by the Saudi Geological Survey, in 2006, to explore Rub' al Khali (Empty Quarter); in this study they provided a summary of the main characteristics, e.g. valleys, water resources and roads, but they did not use the term 'landscape character assessment'. However, it can be said that this term is used more in Europe; therefore, the analysis provided in this dissertation of landscape character assessment could be more applicable to visitors from outside the country, due to the landscape classes that have been used being fundamentally different to those used in Europe, e.g. because so much is desert. This could be especially true if Saudi tourist visas start being issued.

The most important landscape characteristics that have been classified in this study near potential archaeological tourist sites in Najran are mountains, wadis, sand dunes, buildings and vegetation, which include irrigation areas and scattered trees; all of these characteristics were confirmed by the researcher of this dissertation during his second fieldwork trip to the study area, Najran, in 2016.

The landscape classification applied in this study is in line with Clement (1999), who indicates that the availability of landscape features around historic and archaeological sites, such as topographic lineaments, vegetation, water characteristics and buildings, give sites extra aesthetic value to attract more visitors. This is consistent with Jellema et al. (2009) and Jaber et al. (2015), who indicate that the main features of a landscape are its aesthetic attributes, such as topography, soil, land use, settlements, surface geology and the distribution of hedgerows and trees, and all of these characteristics taken together can add aesthetic value to a tourist destination site with such landscape features (Gravis et al., 2017).

The results in this study show potential archaeological tourist sites in Najran that are surrounded by landscapes with aesthetic characteristics that can attract tourists in future to visiting them, e.g. Bir Hima has mountain scenery, some secondary watercourses, scattered trees (palms and acacias), several buildings and visible dune fields. Al-Ukhdud site has mountain scenery located behind it, ruins of buildings, settlements around the site, scattered trees (Salvadoran presica and ziziphus) and wadis. All the archaeological tourist sites mentioned in this study offer views of mountain landscapes, and this characteristic, according to Beza (2010) and Vigl et al. (2017), can be a wonderful and attractive feature popular with tourists. There is added attractiveness at sites located in the open air that overlook mountains, especially those with rock-art panels (Guagnin et al., 2016; Guagnin et al., 2017). The landscape characteristics described comprise vegetation, wadis and buildings around potential archaeological sites in Najran; some of these features are identified in a general way, without any details, by Elkhrachy (2015), who used them to create a map of flood

hazards for the area around the main wadi of Najran city, not including the rest of the Najran region or any specific archaeological sites based on the main objective of that study, which was to focus on the flood plain. Therefore, these characteristics are addressed in more detail in this dissertation and include those areas around potential archaeological tourist sites in Najran that might give added tourist value to those sites, in addition to their existing archaeological features. This is supported by Chen (2001), who conducted a study of the landscapes of Taihang Mountain, China, and found that wadis, peaks, mountain terraces and hillsides can offer something attractive for tourists to enjoy, along with immediate scenic landscapes, with a sense of happiness. This aligns with Woźniak et al. (2018), who indicate that the availability of aesthetic landscapes at tourist destinations contributes to the well-being of tourists and their happiness, especially at outdoor sites.

The shortlisted archaeological sites occupy certain positions in the landscape, e.g. most of them are typically at the bottom of mountain slopes and thus close to surface drainage lines, e.g. wadis; for example, Al-Ukhdud site contains traces of an ancient dam located near the south of this site, with some Sabaean inscriptions (Zarins et al., 1983). This is consistent with Bir Hima, which is located close to a secondary watercourse and has six ancient water wells that have abundant water based on what was seen by the researcher of this dissertation who visited this site during fieldwork in 2016. It was indicated that water availability was, historically, a key factor when siting settlements in this environment. This is supported by Argyriou et al. (2017), who conducted a study on the Greek island of Crete, in the Mediterranean, to examine the relationship between topographic positions and archaeological sites in the Bronze Age, with the results showing archaeological settlements are in flat areas at the bottoms of mountains, close to surface water and arable land, which encouraged ancient populations to stay at those sites rather than at other topographic positions; meanwhile, they used the walls of those mountains or panel rocks located closed to their settlements for inscriptions and art. This is consistent with Cunningham and Driessen (2004), who suggest that ancient settlements had the locations they did, in the environment, not only for economic or political reasons but also due to environmental conditions, and the exploitation of spatial resources encouraged people to live at those sites. This means, however, that finding an appropriate location for a settlement in the environment has an economic component. For example, A-Ukhdud and Bir Hima sites are both located in flat areas adjacent to mountains that were formerly rich in water, and this put them on ancient trade routes.

Furthermore, place names can indicate information about the landscape, e.g. 'Bir Hima' indicates wells or mountain water as the word 'Bir' in Arabic meaning 'wells', of which six still exist at the site. This agrees with Sweeney et al., (2007), who indicate that place names may refer to patterns of sites

found in the landscape. Calvo-Iglesias et al. (2012) conducted a study in the northwest of Spain using place names to determine if these related to the distribution of historical landscape features; their results indicated a significant correspondence between place names and landscape characteristics in the study area. This is in line with Sousa and García-Murillo (2001), who conducted a study to compare place names with landscape features in Spain; they found a relation between them and if there were differences that was due to some place names having more than one word, or because names were replaced to link them to new land uses, e.g. tourist activity. This method may help in the future to create a point map of place names associated with the meanings of site names, for Najran or any other region. However, there were too few names that indicating landscape characteristics in OpenStreetMap for the Najran sites, but such information could potentially be used to develop landscape character assessments at other sites.

The landscape characteristics around potential archaeological tourist sites with existing archaeological features that were identified in this study can help the SCTNH in the future to develop those sites and create tourist itineraries including them. This also can help stakeholders to put sites and their features on online maps, which might encourage tourists and travellers to visit them. In addition, the techniques used in this study could be useful to the SCTNH which can apply them to other regions of Saudi Arabia to build a comprehensive database for the whole country.

Five automated terrain-classification techniques are used in this dissertation to extract the characteristics of landscapes around potential archaeological tourist sites in Najran (see section 6.2.2). The first method applied is Pellegrini's algorithm, based on terrain curvature and implemented in Idrisi software. This method was, unfortunately, not appropriate as it gave incorrect results, based on the knowledge of the researcher, who also compared the output with base maps in ArcMap, which were different from the real situation due to the locations of landforms being present in different pixellated forms; therefore, this method was discarded to avoid incorrect interpretations of results (Pechanec, 2015). This is consistent with De Laet et al. (2007) and De Laet et al. (2011), who used Idrisi and recommend examining data that might be used, as well as doing a visual interpretation before implementing an automatic extraction approach, as such a method sometimes gives results that are not satisfactory, being different from real locations on the ground.

Instead, five alternative landscape characterisation methods are applied in this dissertation, which are: flow accumulation based on the D8 algorithm, automated lineament extraction based on analytical hillshading, digitising features, image segmentation, and geometry of geomorphological objects (i.e. orientation and axis ratios) to identify dunes which all these methods helped in the classification of landscape features around potential archaeological tourist sites, e.g. mountains,

wadis, sand dunes, buildings, vegetation with irrigation areas and scattered trees. This is also consistent with Zubair and Ji (2015), who point out that using more than one approach when doing any classification process, e.g. land-cover classification, helps to produce more accurate results, e.g. in maps, and to interpret them correctly. However, the accuracy of classification in this study and others is subject to uncertainty due to the elevation values of Aster GDEM, as it has a vertical accuracy of ±16m and ±5.07 after removing errors (Demirkesen, 2008; Elkhrachy, 2017). But the acceptance of classification errors was addressed by using, for example, kappa coefficients and confusion matrices in this dissertation, as this helped to confirm the classification accuracy of the results for vegetation and sand dunes, which is considered to be good (see tables 6.2 and 6.3). This is supported by Moisen and Frescino (2002) and Liu et al. (2005), who point out that the use of kappa coefficients helps to ensure correct proportions for sites, particularly after checking for coincidence probability agreement. Some studies have tried to extract terrain lineaments from digital elevation models (DEMs) based on hillshade with multiple sun angle directions, as applied in this study, e.g. in Ethiopia (Kusák et al., 2017), Iraq (Alhirmizy, 2013) and Malaysia (Abdullah et al., 2010). The difference in this dissertation is that some mountainous areas that were not shown were resolved by digitising them (section 6.2.2). Also, it did not combine all eight hillshades together in one image, rather they only put four into one image, but did that twice. Also different in this dissertation is that applies reclassification by using GIS in order to determine the correct site features that correspond with the right places on the map.

6.4.1 Limitations

There are some limitations to this study, especially in the identification of landscape characteristics due to the limited available data, e.g. geological data. In addition, this study does not differentiate between different types of 'built-up' areas, though some built-up areas will be attractive to tourists, e.g. historic old towns, whereas others will not, e.g. modern developments. Furthermore, time was also limited and hence the researcher did not visit archaeological sites with low potential as access to them was restricted. In addition, based on time, there are differences in the acquisition dates for ESRI imagery, compared to Aster GDEM and LandSat, which may affect accuracy assessments.

A further limitation when using GIS was that during attempts to extract terrain classification using Pellegrini's algorithm, based on terrain curvature and implemented in Idrisi software, the results were discarded at the end due to landforms not being classified in their correct locations. Furthermore, when applying the method of automated lineament extraction, based on analytical hillshading, in order to identify mountainous landscapes, there was a simple limitation due to the

absence of some mountain boundaries because of the intensity of sunlight on those sites, which was resolved by the researcher digitising them.

In addition, the findings for vegetation were based on reclassified Normalized Difference Vegetation Index (NDVI) images to determine three types: no vegetation, scattered trees and Irrigation areas. This approach is limited as it takes time to find an appropriate threshold in the range of -1 to +1 in order to present acceptable results, which were confirmed through applying a confusion matrix to check overall accuracy, and kappa coefficients for Landsat images (see Table 6.3). This could be due to the existence, in some areas, of a mixture of irrigation and scattered trees, making it difficult sometimes to distinguish what was there.

More findings for sand dunes are required to reclassify images until acceptable results are produced, as applying appropriate sand-dune indications takes more time, especially when calculating geometry measures, e.g. dunes' major and minor axes and orientations, which should be taken into account by other researchers in the future, whether in Saudi Arabia or other countries; this could be due to the resolution and pixel sizes of the images covering the study area, especially if an area is large. Further limitation, there were as well problems along the join between east and west arising from segmentation of the study area.

The Viewshed images produced by DTMs are subject to uncertainty. Inaccuracies and imprecisions in elevation rasters can affect Viewshed ouputs (Fisher, 1991).

A further limitation of Viewshed is that 'The visual significance of terrain is heavily influenced by the vertical dimension (i.e. slope, aspect and elevation) and distance from the observer, neither of which are adjusted for in standard viewshed analyses' (Nutsford et al., 2015: 1). Another limitation concerns the Viewshed images from shortlisted sites, but not those from other sites or what tourists experience whilst travelling to these sites. During the fieldwork, the author did not explicitly consult tourists about this; therefore, there is no evidence to suggest that tourists value certain landscape classes over others.

6.4.2 Future work

Further research on the landscapes around archaeological tourist sites in Najran could include their geological characteristics in order to provide more comprehensive information about other features of those potential archaeological tourist sites, in addition to their archaeological ones. Further research on landscapes is recommended for buildings in Najran, and that should concentrate on their distribution and classification, including whether they are residential or not, modern or old, populated or not, which will help stakeholders with future plans, especially in the field of tourism.

There are some types of maps that have been created, e.g. a historic environment assessment for Milton Keynes' urban expansion (available at:

http://old.buckscc.gov.uk/media/130436/A_MKUE_Figures3-14.pdf), which might, in the future, help Najran region if it uses the same style, as these maps can show historic landscape zones, settlements (modern) and other features. Further research is also recommended at archaeological sites with low potential, because of access issues, to identify the landscape characteristics around those sites. This would give a good indication to stakeholders, e.g. SCTNH, of the possibilities for future development and management of those sites within the field of tourism. Currently, however, the author does not know if the shortlisted sites are in attractive landscapes, as compared to sites not shortlisted. This could be addressed through follow-up fieldwork. And further research is recommended on landscape characteristics in regions in the rest of Saudi Arabia, in order to build a comprehensive database of all Saudi archaeological sites, along with surrounding area features. This will be helpful for future tourism in the whole of Saudi Arabia. A further method that could be used is a point map of place-names associated with, for example, water, to be used as input in the future, which might help to revise landscape classification in the study area by including additional map layers. Also, the methods applied in this study to evaluate vegetation could be replaced in the future by using a supervised classification technique, though this approach too is limited as it requires prior knowledge of the study area (Lillesand and Kiefer, 2000), while another technique known as unsupervised classification might be an appropriate method, especially for researchers who do not have prior knowledge of the study area (Lillesand and Kiefer, 2000). This method might not require more time to apply it. In further research, it might be beneficial to examine landscapes that visitors experience when travelling to and from shortlisted archaeological sites, to determine which landscapes found in Najran that visitors consider to be attractive. Further research could include follow-up visitor consultation exercises, e.g. asking visitors to rate different landscape perspectives on a Likert scale.

Further research could use photos uploaded to online repositories, such as Panoramio or Flicker, to evaluate a Najran landscape characteristics map, rather than relying on photos from fieldwork. This could be done by using 'tags' uploaded with such photos (e.g. tag words associated with emotional reactions to landscapes, such as 'beautiful') to understand which landscapes visitors prefer, given that recent years have witnessed significant developments in digital cameras and cameras in mobile phones, which has resulted in huge numbers of spatial photographs being taken by users and widely shared on social media (Frias-Martinez et al., 2012; Memon et al., 2015).

6.5 Conclusion

This chapter is fundamental for the construction of a database of landscape characteristics around potential archaeological tourist sites in Najran. The existence of a landscape characteristics database will help archaeological tourism development.

It has been determined that key landscape characteristics include mountains, wadis, vegetation, sand dunes and buildings, and these features can attract tourists to visit potential archaeological tourist sites in the future, along with the archaeological features available at those sites.

In addition, viewshed analyses helped to identify potential visible areas for tourists who might visit archaeological tourist sites in the future. This can give an overview for stakeholders, e.g. SCTNH, to develop and manage potential archaeological sites within the field of tourism.

The research recommended in this chapter in the future can be advantageous to researchers and stakeholders wishing to build a database of archaeological sites, which might then help with future plans in the field of tourism.

Chapter 7

Implications for managing archaeological resources for tourism in Najran Region

7.1 Introduction

The aim of this chapter is to discuss how well the objectives of this study have been achieved. It further discusses the conflict in Yemen, its impact on archaeological tourism in Najran and alternative tourism plans during the conflict. Moreover, it discusses the contribution of this work, its implications for managing archaeological tourism in relation to archaeological resources and the utilisation of GIS in archaeological tourism. Then, suggestions are made for further research directions, after discussing limitations, before coming to a brief conclusion of this chapter.

7.2 Research objectives for the development of archaeological tourism

This section concentrates on the objectives that were introduced in Chapter 1 (section 1.4) and reviews the evidence that was gathered in response to relevant objectives.

7.2.1 Objective 1: To review the distribution and characteristics of archaeological sites in Najran region and build a spatial database suitable for archaeological tourism planning.

There is currently no single database containing all the archaeological sites in Saudi Arabia and their characteristics. Therefore, this objective was addressed in this study by using the GIS tool to fill this gap, taking Najran region as an example, so that it can be used in the future for other Saudi regions. The current objective was achieved by constructing a comprehensive spatial database of archaeological sites in Najran region, drawing on existing archaeological information in the literature, and also from government documentation and fieldwork. The Saudi Commission for Tourism and National Heritage (SCTNH) only provides an Excel spreadsheet which contains the coordinates of 190 archaeological sites obtained from the SCTNH, these do not allow spatial queries. One problem with this table is that multiple entries may represent the same site and share the same name, such as at Bir Hima. This was used an initial database of archaeological sites but it did not contain any site characteristics (Section 4.2.1).

The actual number of sites included in the archaeological tourism database is about 69, but on examining these archaeological sites in conjunction with the road network, and the characteristics of sites with sufficient archaeological value, it was found that only about 13 archaeological sites are easily accessible and fulfill other criteria as explained in Chapter 4 and illustrated in Fig. 4.1. Figure 4.1 shows the processes and stages applied to build a database of archaeological sites. Eventually, these sites were reduced to six, based on available unattractive characteristics for tourists based on

second fieldwork done in 2016 by the researcher of this study. Additionally one of those 13 archaeological sites was excluded due to its inaccessibility, being located close to a security checkpoint.

Part of the first objective of this thesis was to create an infrastructure database for the study area, Najran, to include accommodation, transportation and other amenities. This would help to determine the availability of tourist infrastructure services for archaeological tourist sites, alongside fieldwork done in Najran.

As stated in section 3.5.1, there are no specific studies that concentrate on or show spatial database development for archaeological tourism and contain different layers of archaeological tourist characteristics, except for two studies conducted in Jordan. One of these is by Bazazo and Afana (2010), who used GIS to build a database for archaeological and heritage mosques in the province of Mafraq, Jordan. In their study, they adding some details for each mosque to the database, including the historical era in which each mosque was built (Ottoman, Umayyad, and Mamluk periods) and each mosque's scheme. Then they endeavoured to illustrate the tasks in the main bar of ArcMap, in order to demonstrate how GIS can help to produce maps in a very short space of time, compared to conventional methods which require more time and effort. The same authors (Bazazo and Afana 2011), carried out another study in Jordan to document archaeological resources by taking hard copy documents and copying it into a digital format using GIS; this study concentrated on religious tourist sites in Jordan. The researchers highlighted the importance of GIS as they created a database of religious archaeological sites in Jordan, including such information as the itineraries of each prophet to those religious sites, the path of the Levantine pilgrimage and historic castles. Then, they used GIS to displayed those religious archaeological sites on a map, in order to show the potential of GIS for tourism use in Jordan.

Their study documented religious archaeological sites in Jordan, converting hard copy into a digital format, which undoubtedly helped to make those sites more accessible than before. But their study does not include detailed information about the contents of those sites, the researchers only recorded the names of sites and itineraries or sites and then displayed them on a map to highlight the importance of GIS. In addition, the researchers tried to highlight important icons in the taskbar of ArcMap, as they did in their previous study, the purpose here being to illustrate the ease of searching for and identifying required information on a digital map, especially if it is uploaded to the Internet to boost tourism. While these researchers' two studies might be consistent with the first aim of this thesis, what is different in this thesis is that it builds a spatial database that includes the

distribution and characteristics of each archaeological site in the study area of Najran so as to be suitable for archaeological tourism planning.

7.2.2 Objective 2: To prepare a shortlist and database of archaeological sites with high potential tourism value

This objective required both an archaeological database and an infrastructure one, which had been already built to address the first objective in this study. These two databases helped to identified a shortlist of archaeological sites with high potential tourism value, based on examining those archaeological sites in conjunction with the road network, and the abundance or otherwise of valuable archaeological characteristics, e.g. inscriptions, rock art, pottery, ancient buildings and stone tools, (e.g. grinding stones), with the final outcome being six potential archaeological tourist sites which satisfy the second objective of this study, i.e. located in a travel-time zone of 0–180 minutes by car, which were all verified by the researcher of this study who visited these sites during a second fieldwork trip in 2016.

7.2.3 Objective 3: To estimate the potential domestic demand for archaeological heritage tourism at shortlisted sites in Najran.

This objective was achieved by using a questionnaire which included three archaeological sites used to measure the demand within the domestic tourism market segment for visits to archaeological sites. Those sites were Al-Ukhdud, Bir Hima and the historic Emirate's Palace. The reason for focusing on three sites was to make the questionnaire shorter and thereby maximise the response rate. They were also selected because of their archaeological characteristics, which might be more likely to attract tourists to visit them (see chapter 5). The details of those three archaeological sites were provided with the questionnaire on three separate information cards, where each card presented text and photographs describing the era that the site dated back to, the most prominent structures and artefacts at each site, examples of any inscriptions, and also the wider landscape or settlement in which each site is located (see Appendix 5.2).

A key finding indicated was that there was demand among tourists to visit Bir Hima, a hitherto largely undeveloped site, followed by the Al-Ukhdud site and then the historic Emirate's Palace in terms of the preferencef of participants in the survey. Therefore, as discussed in chapter 5 and according to Chen and Tsai (2007), there are some evaluative factors that can affect tourist intentions vis-à-vis a destination’s image, such as recreation, sun, sand, nature and culture. Based on that, the destination images differ for the shortlisted archaeological tourism sites; for example, at Al-Ukhdud and Bir Hima, the sites are located in the open air, and so evaluative factors that might

influence tourists' intentions to visit these two sites include the availability of distinctive landscape characteristics such as mountains, watercourses (wadis), and scattered trees, in addition to the archaeological features of these sites.

7.2.4 Objective 4: To examine the shortlisted archaeological sites in relation to the spatial distribution of landscape characteristics.

As there was no database available showing landscape characteristics around the archaeological sites in Najran, or other regions of Saudi Arabia, the six potential archaeological tourist sites identified in Najran were chosen for a case study, so that the lessons learnt can then be applied to regions across the rest of Saudi Arabia in the future. The fourth objective of this study was achieved (see chapter 6) by creating a database, using GIS, to show the spatial distribution of the landscape characteristics of the areas around the shortlisted archaeological sites, which helped the researcher of this study to identify features that can be seen by tourists or visitors on their journeys to those archaeological sites in the future. This will ultimately help stakeholders in the field of tourism to manage those sites.

The most important landscape characteristics that have been classified around potential archaeological tourist sites in Najran are mountains, wadis, sand dunes, buildings and vegetation, which includes irrigation areas and scattered trees; all of these characteristics were confirmed by the researcher of this dissertation during a second fieldwork trip in 2016 to the study area. The results vary from one site to another (section 6.3) and they indicate what can be seen, e.g. at Al-Ukhdud there are ruined buildings, remnants of pottery scattered on the ground, millstone, some rock art and other artefacts. All this is located outdoors and can thus offer tourists and visitors to this site some unique archaeological characteristics, plus there are scattered trees across the site providing shade, in addition to towering mountains surrounding the site, as well as modern houses. The second site is the historical Emirate's Palace; it is built from clay and contains several rooms, in addition to a historic well located in the centre of the palace yard. Furthermore, visitors can enjoy the view of mountains surrounding the site, scattered trees and various markets, such as the daggers market and the popular market. The third site is Ann or Saadane Palace, which allows tourists and visitors to the palace to see how people lived in the past; it too is built from clay and offers tourists and visitors a view of mountains surrounding the site, and there are both modern and historic buildings adjacent to this location, plus irrigation areas and palm trees, as well the main wadi of Najran. The fourth site is Rah'om Castle, which is located on the top of Mount Rah'om; this castle is built of stone and the site gives tourists and visitors a chance to see some unique scenery that

starts with a climb up this mountain to the top and the castle. There is landscape scenery surrounding this site, such as irrigation areas, palm trees, modern houses and some mud houses, as well as water flowing in the wadi of Najran. The fifth site is Jabal Al-husainia, which is located in the north of Najran, on the way to Bir Hima. This site contains inscriptions and rock art, plus sand-dune landscapes and wildlife, including camels wandering around the site. The last site is Bir Hima, which contains inscriptions, rock art, historic wells and other features, in addition to various landscape features around this site, such as mountains, acacia trees and palm trees, sand dunes and some buildings, as well as some wadis.

7.3 The conflict in Yemen, its impact on archaeological tourism in Najran, alternative tourism plans during the conflict.

After concentrating on the objectives achieved in this study so far, this section will highlight those factors that might influence tourism in Najran, and the alternatives proposed by the Saudi government to overcome those unhelpful external influences.

There are some changes that occurred during the time of this thesis: the most prominent of these was the conflict in Yemen, relatively close the main airport in Najran; work starting to establish a new airport in a safe area; one of the archaeological sites in Najran (Bir Hima) was put on a tentative list of UNESCO world heritage sites; the changing visa policy of Saudi Arabia to include tourist visas; the establishment of a new agency in KSA interested in entertainment; the establishment of a new company in KSA interested in handicrafts will be launched. For more details of these variables see below:

7.3.1 Complex emergency in Yemen

This study began in 2013, before the conflict in Yemen erupted in 2014, and concentrates on Najran region, which neighbours Yemen. As such, there is evidence that the conflict and fighting in neighbouring Yemen has and would deter tourism in Najran region, especially by international tourists. Table 7.1 summarises these events in relation to the thesis timeline. By the time of the second fieldwork period (July to Oct 2016), although the local population in Najran remained largely unaffected by the conflict, Najran airport was closed for security reasons. Furthermore, some countries began advising their citizens against travelling to Najran, given its proximity to the Yemeni conflict zone (see Table 7.2). For instance, the USA, Canada and the UK advise their citizens against travelling to regions adjacent to the conflict in Yemen, including Najran region. The UK Foreign & Commonwealth Office (FCO) advised travellers against all travel to within 10 km of the border with Yemen and against all but essential travel between 10km and 80km from that border. There are five potential archaeological tourist sites located in that area, between 10km and 80km of the border,

except Bir Hima site which is located away from the centre of Najran. But based on the experience of the researcher of this study who visited the archaeological sites in this category in 2016, it can be assured that this area is safe and that visitors and tourists can visit these sites without risk. The only risk in that area is close to the border with Yemen, i.e. within 10km.

In addition, it appeared Yemeni events were affecting tourism in Saudi regions: an interview with the Hamad bin Quresha (section 4.2.1) director of the Al Ukhdud site indicated that visitor numbers had declined from between 50,000 and 53,000 tourists per annum before the conflict to 20,000 tourists in 2015

Table 7.1: Conflict timeline in Yemen from 2013 to 2017, along with activities of this thesis

Events in the Yemeni conflict and thesis activities				
Time	**First quarter**	**Second quarter**	**Third quarter**	**Fourth quarter**
2013	-----	-----	**------**	Started PhD
2014	**------**	**------**	**------**	*Houthi rebels capture Yemeni capital, Sanaa 2014 (Hokayem and Roberts, 2016; Groizard et al., 2016; Perkins, 2016, Mitreski, 2015). * The emergence of territorial and/or ethnic wars between citizens (Groizard et al., 2016). * Absence of foreign tourists or visitors (Groizard et al., 2016).
2015	* Putschists against seized the international airport and neighbouring suburbs (Hokayem and Roberts, 2016). * The legitimate president of Yemen, resorted to seeking help from KSA (Mitreski, 2015), after he was under house arrest by the Houthis (Laub, 2016). * The commencement of Decisive Storm (a military operation) through several coalition countries in order to restore the legitimacy of Yemen and demolish the Houthi movement in Yemen and along surrounding borders (Hokayem and Roberts, 2016; Sharp, 2015).	* The coalition countries have been gradually regaining control over southern parts of Yemen (Dessouki, 2016). * Houthis attacked the Saudi border near Najran (Reuters, 2015). * Issuance of UN Security Council Resolution 2216, which calls for peace in Yemen, and a ban on the supply of weapons etc., to Houthis and Saleh (Hokayem and Roberts, 2016).	* Recapture of Aden port city from Houthi forces (BBC, 2016). * Saudi Arabia boosts its defence and security on the border with Yemen (Hokayem and Roberts, 2016).	* President Hadi has returned to Aden for a temporary days after recapture this port city from putschists (BBC, 2016). ---------- * **Performance of the first fieldwork in Najran by the researcher of this thesis.**

Cont. table.7.1

Events in the Yemeni conflict and thesis activities				
Time	**First quarter**	**Second quarter**	**Third quarter**	**Fourth quarter**
2016	Continuous fighting	* Start of UN-sponsored talks between the President Hadi government and Houthis and former president (BBC, 2016), but they could not reach a political solution (Hokayem and Roberts, 2016).	* The Houthis continued to violate the UN resolution to stop their attacks and bring security to Yemen. ---------- *** Performance of the second fieldwork in Najran by the researcher of this thesis:** - Influenced by the conflict in Yemen; one site has not been visited due to it being located near a military base - Najran Airport closed and cannot be used.	* Houthi forces attacked a UAE aid ship near the Strait of Bab al-Mandab (Pennington, 2016). * Houthi rebels fired a missile towards Mecca, Saudi Arabia (Gambrell, 2016), as well as towards Najran region (Al-khudahli, 2016), endeavouring to destroy holy sites and property and terrorize unsuspecting civilians.
2017	* Continuous fighting and conflict in Yemen (Al-doshi, 2017). * Saudi forces intercepted a missile fired from Yemen, by Houthi militias, towards Najran (Al Arabiya, 2017a). * Houthis attacked a Saudi frigate off Bab Al-Mandab on the western coast of Yemen (Al Arabiya, 2017b).	* Saudi forces thwarted Houthi attacks near Najran boundary (Al Arabiya, 2017).		

Table 7.2: Advice from national governments concerning travel to the region near the conflict in Yemen.

Country	Travel advice	Date	Sources
Gulf States	No travel warnings at all for passengers to Saudi Arabia	7/10/2016	Based on each foreign ministry in these countries, there are no warnings
UK	UK Foreign & Commonwealth Office (FCO) advise travellers against all travel to within 10 km of the Saudi border with Yemen and against all but essential travel between 10 km and 80 km from that border.	7/10/2016	https://www.gov.uk/foreign-travel-advice/saudi-arabia
USA	U.S. Passports & International Travel advised travellers against all travel to Saudi Arabia within 50 km of the border with Yemen and against travel to Najran city.	7/10/2016	https://travel.state.gov/content/passports/en/alertswarnings/saudi-arabia-travel-warning.html
Canada	Global Affairs Canada advised travellers to be careful and exercise a high degree of caution when traveling to Saudi Arabia, especially to areas within 30 km of the Yemeni border.	17/12/2016	https://travel.gc.ca/destinations/saudi-arabia
Egypt	There are no travel warnings for passengers to Saudi Arabia or adjacent countries, with the exception of travel to Yemen.	17/12/2016	http://www.mfa.gov.eg/Arabic/ConsularServices/TravelGuide/Details/Pages/mediteriniansea.aspx and http://www.mfa.gov.eg/Arabic/ConsularServices/TravelGuide/Pages/CountryDetails.aspx?country=Yemen

7.3.2 Close of the main airport in Najran

According to the website of the General Authority of Civil Aviation (GACA), Najran Airport is about 7 km from Najran city centre, it was built in 2011 and has a capacity of 1,400,000 passengers per annum. However, this airport is currently closed for the safety of passengers, due to the complex emergency situation in Yemen (Al-Kulaib, 2015).

In contrast, the Saudi government has approved the construction of a new airport, with an area of 35 m^2, located towards the north-east of Najran, 77 km from the original Najran airport and 5 km east of Bir Hima junction (Al-Kulaib, 2017). The new Najran airport will be completed and operational by 2020 (Al-Qarawi, 2017). According to GACA (2017), Saudi regional airports will be converted to international airports, and the new Najran airport will be one of those converted, which will allow international travellers to come directly to this region.

7.3.3 Changing visa policy of Saudi Arabia

A very significant change that would have a positive impact on the Saudi tourism sector hinges on whether the government starts to issue tourist visas, as this would allow international tourists to visit Saudi Arabia and enjoy its archaeological sites, alongside museums also worth visiting, as well as other entertainment venues. This type of visa is close to being made available as part of the Saudi government's vision for 2030, a plan to give more priority to domestic tourists along with international tourists. At present, there are several kinds of visas that allow entry onto the territory of Saudi Arabia, such as hajj, umrah, visitor, work or business (Walker et al., 2007). But based on the government's vision for the coming years until 2030, there is good potential in the tourist sector for which, in 2016, the General Entertainment Authority (GEA) was established, in addition to the previously existing Saudi Commission for Tourism and National Heritage (SCTNH). The aim is to better support the Saudi tourism sector due to the role which it can play in the future economy, as recently tourism has attracted the attention of economists, especially in the area of archaeological and cultural heritage tourism (Laplante et al., 2005).

7.3.4 Establishment of a new agency in Saudi Arabia oriented to 'tourism entertainment'

Part of the vision of Saudi Arabia for the year 2030 is the establishment of the General Entertainment Authority (GEA). This authority is a government entity formed in 2016, it is responsible for regulating the entertainment sector in Saudi Arabia, developing it and elevating all of its components and capabilities, including plans and criteria to organize venues, facilities and entertainment events and support them, through encouraging investors from both inside and

outside Saudi Arabia to participate in cultural and entertainment projects. This is in order to create comprehensive and diverse leisure opportunities that meet international standards and to make them available throughout Saudi Arabia; this initiative will take into consideration the suitability of activities for families and friends from all segments of society, whether citizens or residents, in accordance with their levels of income (GEA, 2017). The authority's plan is to reach all Saudi regions, though investment will be largely concentrated in the three largest cities in Saudi Arabia, i.e. Riyadh, Jeddah and Dammam (GEA, 2017).

The presence of this agency in Saudi Arabia along with the Saudi Commission for Tourism and National Heritage (SCTNH) will give more opportunities to create a unique form of Saudi tourism, especially if archaeological sites are exploited in the tourism field to form museums in the open air. This, along with Saudi Vision 2030 and issuing tourist visas, would help to diversify the sources of Saudi income through attracting international tourists.

7.3.5 The establishment of a new company in KSA interested in handicrafts as part of the National Transition Programme 2020 initiatives

According to SCTNH (2017), the Saudi government is seeking to launch a handicrafts company to develop and market Saudi craft products in local and international markets. This company will play a role in preserving the national heritage of handicrafts and improving the skills of its employees. Furthermore, this company will increase the numbers of workers in this sector in different regions of Saudi Arabia, in addition to increasing the range of craft products and offering them throughout the year in various designs, sizes and colours, as well as contributing to raising the demand for craft gifts of high quality. This company will bring good returns for craftsmen and communities surrounding those sites, which can be developed. Better organization of the handicrafts sector will help to support the tourism sector, which will contribute to improving the economic conditions in various Saudi regions. This will be done by State enterprise, as it will support traditional craftsmen by providing them with what they need, e.g. training courses, and places to display and sell their products, e.g. at festivals, markets or other sites expected to be visited by tourists.

7.3.6 Application for Bir Hima to become a UNESCO World Heritage site

Bir Hima is an existing archaeological site in Najran, it is located on the caravan route and has unique archaeological characteristics, particularly internationally important inscriptions. According to a French-Saudi expedition report (SCTNH, 2014), the team found the earliest Arabic inscription located at Bir Hima, Najran. This inscription dates back to 469–470 AD. It is in Nabatean Arabic, the first stage of Arabic writing. This discover represents the oldest form of Arabic writing known to date, the "missing link" between Nabatean and Arabic writing.

Furthermore, based on the archaeological characteristics of Bir Hima, it is currently on the tentative list of UNESCO world heritage sites.

According to the UNESCO website (http://whc.unesco.org/en/tentativelists/6033/), accessed 6 April 2017, the Bir Hima site has 'universal appeal due to its archaeological characteristics, the most prominent of those are as follows:

1- This site has an impressive array of inscriptions and rock art, some of which represent human figures and evoke possible trade and religious practices some 7,000 years ago, while the representations of animals depict daily and social life as prehistoric parietal art, which has an aesthetic naturalistic realism.
2- The rock inscriptions bear exceptional witness to an approach to life that has disappeared. This is evident in the way they graphically represents activities connected with trade, hunting and travel at a time when the climate and vegetation of the area were more amenable to daily living.
3- The existing diversity of landforms at Bir Hima site played an essential role in fostering human settlement. In addition to the rock art, inscriptions document the settlements of successive communities, which engaged in mobile animal husbandry and agriculture and form part of the wider context of human interaction with the semi-arid southern desert environment of the Arabian Peninsula (Empty Quarter desert), illustrating the adaptability and ingenuity of human communities to make the most of scarce resources to sustain a continuous presence'.

7.4 Contribution and implications for managing archaeological tourism

The use of Geographical Information Systems (GIS) in archaeological tourism in Najran, Saudi Arabia, has provided important information for stakeholders who might wish to use it, e.g. the Saudi Commission for Tourism and National Heritage (SCTNH), as well as academics who are interested in archaeological tourism, as the analysis took data from several sources and presented the results in a spatial context. This section will be discuss the implications for managing archaeological resources for tourism and the utilisation of GIS in archaeological tourism more generally.

7.4.1 The implications for managing archaeological resources

The analysis of various data sources and the use of a questionnaire in the current study has contributed to resolving the lack of data on potential archaeological tourist sites, which can help to identify such sites able to receive visitors in the future. The contributions of the questionnaire respondents indicate that archaeological tourist sites located in the open air are more attractive to

tourists. Therefore, this study confirms that archaeological tourist sites in Najran are an important resource within the field of tourism, and so they should be included along with other archaeological sites in an examination of potential tourist sites in other Saudi regions in further research.

Furthermore, stakeholders managing and developing archeological resources would help to preserve the contents and characteristics of archaeological sites by involving the community and raising their awareness of the importance of archaeological sites through visits and preservation. In addition, by placing signs near archaeological sites that indicate their value, this also will bring financial benefits to those sites, e.g. through ticket fees paid by tourists, particularly if Saudi Arabia starts issuing tourist visas, as the government proposes to do as part of its vision 2030; which is expected to start happening during the current year, i.e. 2018 (SCTNH, 2018). The benefits suggested here have already been applied elsewhere, e.g. in Jordan, whose national economy depends heavily on revenues from tourism; hence, it endeavours to promote tourism through the international media, in addition to local and national institutions, textbooks and art galleries that tell stories from the past (Porter and Salazar, 2005). This is in line with Abuamoud et al. (2014), who recommended compiling an inventory of archaeological, historical and cultural sites in Jordan, and then putting this information online, along with available facilities, such as attractions, hotels and activities, and site fees, to attract tourists. This kind of tourism promotion for archaeological sites should be applied in Saudi Arabia, especially in the study area, i.e. Najran, along with providing such things as tourist guides, controlled access, ticket kiosks and areas for car-parking around archaeological tourist sites, which would help to support the continuity of archaeological sites by promoting sustainable tourism that can satisfy tourists so that they return to visit the same or other sites in the future.

7.4.2 The utilisation of GIS in archaeological tourism

This study has utilised GIS as a tool to identify potential archaeological tourist sites in Najran region and their archaeological characteristics, in addition to identifying the landscape characteristics that surround each of those sites, as well as amenities. This study is the first one to explore archaeological tourism in Saudi Arabia by utilising GIS, its contributions are as below:

- In terms of the distribution and characteristics of archaeological tourist sites, and their amenities, the research contribution is the combination of data from multiple sources and building a digital database by using GIS, which helps to present the characteristics of archaeological tourist sites, surrounding landscapes and convenient amenities. Furthermore, this study contributes to solving the problem of a lack of digital data on Najran.
- Archaeological tourist sites have been identified that can be accessed within a particular travel time, computed from Najran's hotels to those archaeological sites by using the cost-

surface tool in GIS. This study is the first one on Najran to gather relevant data to determine travel times to archaeological tourist sites. This method can be applied to other regions across Saudi Arabia, especially given the current shortage of road-network data, such as nodes, so that this method can be advantageous in use.

- Using a Map Overlay method with a viewshed analysis in this study helped the researcher to determine the characteristics of landscapes that tourists can see while visiting archaeological sites. Therefore, decision-makers within the tourism sectors can utilize these results to develop and manage those potential sites.
- The use of UNWTO data in this study helped the researcher when using GIS to prepare a map showing the average numbers of inbound tourists to Saudi Arabia per year from 2007–2011, though on examining the categories of Saudi visas (section 3.3.3), no Saudi tourist visas were issued and so the whole data set from the UNWTO may comprise only pilgrimage visas.
- Help users to raise queries about archaeological destination sites, e.g. if a user is looking for Bir Hima site the results can show the site on a spatial map, with archaeological and landscape characteristics, plus site images already in the database.
- Help users in future to raise queries about distances from the potential new airport in Najran to archaeological destination sites.

7.5 Limitations of the study

There are several limitations to this study that relate to data, time, cultural factors and the system of government visas.

As mentioned in chapter 4, building a database for the development of archaeological heritage sites was based on certain limitations that might affect the results, e.g. there is a lack of information in the literature review from the SCTNH, which became obvious as the researcher worked to extract the characteristics of archaeological sites; some sites were not found in the literature review but were found in the SCTNH, and vice versa. In addition, some secondary data were not readily, and so it has taken time to determine and then digitize them (Section 4.2.2), e.g. limited data were extracted to build a database for the development of tourism infrastructure and amenities, based on two sources, the first one being brochures from the Saudi Commission of Tourism and National Heritage (SCTNH) on Najran that only covered the central part of the Najran; the rest of the region was omitted, so other areas were digitised after identifying their locations online using Google Web browser; then; due to limited time, the researcher could only check for facilities on the main road via the use of OpenStreetMap and during fieldwork in 2014. While the second source for this database

is Open Street Map, the road network downloaded from this source was limited due as it did not cover all roads in the study area, and some were found to be slightly displaced from their true routes, all of which was resolved by the researcher by manually digitising ESRI imagery in ArcMap.

The findings from the questionnaire (Chapter 5) about the preferences of tourists vis-à-vis future visits to the shortlisted archaeological tourist sites in Najiran cannot be generalised without having additional samples, which might include all remaining archaeological sites of potential interest to tourists. In addition, this study is limited as the questionnaire did not include, for example, any evaluations of tourists regarding the quality and availability of existing amenities at archaeological tourist sites visited previously by them. Also, if tourists do not wish to repeat their visits, the reasons why and how to resolve them have not been covered. Furthermore, during the fieldwork, it proved difficult to approach large family groups for cultural reasons, so these are underrepresented in survey findings. Another limitation of this study it that it has not covered those tourists who require a tourist visas due to the Saudi Government not having issued them yet, which means this study only applies to those who do not require this type of visa.

A further limitation is the methodology applied to work out travel times, i.e. a GIS cost-surface approach was used to measure accessibility rather than network analysis due to insufficient data being available on road networks, nodes, traffic lights and restrictions etc., as normally a network analysis methodology is used to find the shortest path to a destination (Babiker and Abuelwafaa, 2017). As is known, a lack of accessibility normally reduces the use of services to go to some destinations, even if they are of high quality (Lovett et al. 2002), as found in this thesis, with times based on cost surface, where poor accessibility affects travel times, sometimes driving over three hours and using a 4x4 vehicle due to location and topography. This indicates the limited potential of some archaeological tourist sites, though less accessible sites may have characteristics that are attractive tourists, meaning stakeholders would need to create and develop tourist tours in such areas (Chapter 4).

Another limitation when using GIS, as stated in chapter 6, was that during attempts to extract terrain classification using Pellegrini's algorithm, based on terrain curvature and implemented in Idrisi software, results were discarded at the end due to landforms not being classified in the correct locations. Furthermore, when applying the method of automated lineament extraction based on analytical hillshading in order to identify mountainous landscapes, there was a simple limitation due to the absence of some mountain boundaries because of the intensity of sunlight on those sites, which was resolved by the researcher digitising them (Section 6.2.2).

In addition, the findings for vegetation were based on reclassified Normalized Difference Vegetation Index (NDVI) images to determine three types: no vegetation, scattered trees, and Irrigation areas. This approach is limited as it takes time to find an appropriate threshold in the range -1 to +1 in order to present acceptable results, which were confirmed through applying a confusion matrix to check overall accuracy, and kappa coefficients for Landsat images (see Table 6.3). The method applied in this study to evaluate vegetation could be replaced in the future by using a supervised classification technique, however, this approach too is limited as it requires prior knowledge of the study area (Lillesand and Kiefer, 2000), while another technique known as unsupervised classification might be an appropriate method, especially for researchers who do not have prior knowledge of the study area (Lillesand and Kiefer, 2000).

What is more, buildings that were identified to show the landscapes around potential archaeological tourist sites do not show the types of buildings; and whether they are residential or not, modern or old, is not indicated. This is due to the lack of data in this regard.

The findings for sand dunes, as a type of landscape, show where they are located, and they have been reclassified to show their type if present or their absence, confirmed by applying a confusion matrix for overall accuracy, and kappa coefficients for Landsat images (see Table 6.2). A limitation here is the time required to reclassify images until acceptable results are produced to apply appropriate sand dune indications. In addition, after calculating geometry measures, the results were put in a table, and that helped to find dunes' major and minor axes and orientations, but it takes a lot of time to create such a table, which should be taken into account by other researchers in the future, whether in Saudi Arabia or other countries; this could be due to the resolution and pixel sizes of the images which cover the study area, especially if an area is large.

7.6 Recommendations

The researcher presents the following important points and recommendations, which might be taken in account to help stakeholders:

1- There is a need to build a comprehensive database to include all the characteristics of archaeological sites in Saudi Arabia, and landscape features around archaeological sites, in a digital format to help stakeholders develop and protect these sites in the future. This will also help researchers, especially in the fields of tourism and planning.

2- An examination of the preferences of males and females towards archaeological tourist sites should be undertaken, using a large sample, to help stakeholders make the right decisions for the development of sites. In the meantime, 'research should overcome the social

barriers encountered by researchers who use interviews (questionnaires) in their studies' (Aldakhil, 2007), e.g. female family members who are not accompanied by their patresfamilias normally refuse to complete questionnaires or participate in interviews conducted by male researchers, so in this case it might be better to have both male and female researchers working together when conducting interviews to avoid rejection by some participants (Aldakhil, 2007).

3- Saudi Arabia is rich in archaeological sites, so research should be extended to include all the sites in other regions of Saudi Arabia and identify their potential within the field of tourism. Questionnaires could be designed and used to determine which sites are more likely to be visited in the future in each region.

4- People visiting historic markets, such as the Daggers Market in Najran, are more likely to engage in tourism than the Saudi public in general, so it is recommended to provide appropriate services at such markets, including places to sit, toilets, ATMs and detailed maps at market entrances where all these services can be found to encourage visitors to enjoy and return to such markets in the future, and also the SCTNH can provide brochures with maps at these markets of potential archaeological tourist sites in the region, which can encourage tourists to visit them in the future, especially visitors from outside the region.

5- Small businesses in the field of tourism (e.g. souvenir shops, guided tours, security and surveillance of sites etc.), whether in Najran or other Saudi regions, still require research to support these projects and highlight their importance to the nation's cultural heritage, especially if the Saudi government issues tourist visas.

6- Developing archaeological tourism, in addition to issuing tourist visas in the future, can bring many international tourists to these sites. Therefore, it is recommended that the government encourage citizens to show off national Saudi values and ethics when receiving tourists from outside the region or the state to let tourists better enjoy their time, and at the same time this will benefit local investors.

7- For those key archaeological sites it is essential to protect them from plundering and vandalism.

8- This research, because it is so useful for planning, should be revisited in the light of major change (For example, if the Saudi government begins to issue tourist visas).

9- To inform planning for management of archaeological sites, it is recommended to visit, for example. Places such as Stonehenge (UK) and/or view their websites; here stakeholders can get useful information on managing popular sites.

10- There is a need to further develop and apply the methods used in this study to enable the analysis of spatial relationships of archaeological resources, and landscapes in relation to infrastructure, amenities and the road network; this can then be utilised in other regions of Saudi Arabia and countries around the world.

11- As for potential archaeological tourist sites in Najran, the recommendations for them are as follows:

A- Safety should be taken into account at archaeological sites, e.g. the mountain path leading to Ra'am Castle in Najran requires the addition of a safety barrier on both sides of the path, due to the absence of one at the present time based on fieldwork done by the researcher; this site also needs to provide signboards showing the history of the castle. The researcher also proposes establishing a main gate indicating the entrance to the site at the bottom of the mountain, As well as providing some necessary services, such as a coffee shop, seating and so on.

B- At Bir Hima site it is recommended to install a main gate and a visitor centre to control access to the site, as it is located in the open air. This site and all the other archaeological sites, except the historic Emirate's Palace, currently lack such amenities such as a mosque, toilets, an ATM, a coffee shop and parking, plus information boards are very few; however, these missing amenities, as well as tourist guides, could be provided by stakeholders as they are needed by tourists. Moreover, it is recommended to encourage investors in these archaeological sites and other sites to set up souvenir shops at them, and perhaps cook and sell traditional foods there too, as this should not negatively affect these sites as food can be eaten in designated zones which have litter bins to keep the sites clean. These and other sites could also have some activities that represent their history, such as wearing old costumes and making them available for visitors to wear and take photographs for memories in the future. This will have a special impact on children and other visitors in terms of enjoying the archaeological characteristics of sites, and seeing at the same time some people wearing clothes that represent these sites in the past. This in turn will bring financial benefits to those sites for maintenance and preservation.

C- At Al-Ukhdud site, despite that currently being under development, based on fieldwork conducted by the researcher, it is clear that the site does not have the amenities needed by tourists; the development only includes rebuilding the museum and creating pathways among the site features. Hence it is recommended that stockholders, e.g. the SCTNH, provide small electric tourist buggies inside the site to transport tourists around

the site due to its large area which requires a lot of walking; electric buggies have no exhausts to affect the characteristics of the site, which also needs the same amenities required as tourists at other sites, e.g. Bir Hima.

12- For those archaeological sites with low potential because of access issues, below are some recommendations and suggestions for how to take advantage of those sites, as mentioned previously in section 4.2.2:

A- Archaeological sites located far from the noise of the city may encourage tourists to go there to enjoy a quiet atmosphere, so the researcher of this study suggests having museums out in the open, in the fresh air, which might be attractive to tourists, especially during the holiday season, provided that basic amenities are available.

B- Create new roads to connect these archaeological sites in a logical order to help tourists to access them, as currently they require a 4x4 vehicle and a drive that takes 180–360 minutes.

C- Encourage investors to provide vehicles to drive tourists between all archaeological sites located in the same zone so that they can enjoy inscriptions and drawings dating back to different periods.

D- In zones where archaeological sites have low potential because of difficult access and an absence of amenities, the researcher of this dissertation propose that stakeholders provide mobile buffets with a traditional character that is commensurate with the old way of life, as well as tents which can be rented to tourists to let them enjoy both the wildlife and archaeological sites. In addition, let tourists who so desire stay in these tents for two to three days under the supervision of the Najran branch of the SCTNH.

E- Provide sufficient tourist guides and observers to maintain the sustainability of these places, because they are a non-renewable resource.

F- Provide mosques, toilets and shaded seating areas close to archaeological sites.

G- Organise access to a group of archaeological sites via a single gate in order to facilitate the observation and registration of visitors.

The idea here is to have a cluster of remote archaeological sites, with camping, which highlights that archaeological tourism need not be narrow but may encompass other ideas in the future, e.g. ecotourism.

7.7 Further research directions

Future research work in the field of archaeological tourism is still required and this could be as follows:

1- There is a need for further research at archaeological sites in Najran, including those sites with low potential because of access issues; these can be studied in more depth, together with the development of landscape character assessments around those sites.

2- An assessment should be made of the contribution made by archaeological resources to tourism in Najran, including a record of poor and absent amenities. Furthermore, a survey should be conducted to identify the most important obstacles to investment in this type of resource.

3- Analyses are needed which concentrate on the distribution and classification of geological characteristics, buildings, land use, and types of landscapes, particularly at archaeological sites around Najran, using GIS.

4- There is a lack of data on the demand for archaeological tourism in Najran and other Saudi regions; therefore, this requires further research focusing on measuring the demand for those sites, and the possibility of repeat visits to them. This is especially true of international tourism.

5- There should be further analyses which focus on assessments of infrastructure and amenities around archaeological tourist sites in terms of their quality and distribution.

6- Further research is need that concentrates on decision-making processes for developing and managing archaeological sites in the field of tourism, especially sites located in an open air, where currently there is a lack of this type of data.

7- Further research is need on how to preserve the characteristics of archaeological sites, in the event of receiving many tourists.

8- Further research needs to be conducted on people who live near archaeological tourism sites to elicit their impressions vis-à-vis the development and rehabilitation of these sites to receive local and international tourists, as this would help stakeholders to overcome obstacles to the benefit of the tourism sector.

9- A further method that could be used is to develop a point map of place-names associated with important features, for example, the presence of water, to be used as input in the future. This might help to revise landscape classification in the study area by including additional map layers.

10- Further research could use photos uploaded to online repositories, such as Panoramio or Flicker, to evaluate a Najran landscape characteristics map, rather than relying on photos from fieldwork.

7.8 Conclusion

In conclusion, it can be said that the archaeological tourist sites that exist in Najran can make a great contribution to the tourism sector in Saudi Arabia. The multiple GIS methods applied in this study have helped to determine which of these archaeological sites have high or low tourist potential, and this has shown the advantages of using GIS techniques in further research, especially within archaeological tourism. In addition, the information on tourism in Najran described here, based on a questionnaire and other data analyses using GIS, could help stakeholders, especially the SCTNH or investors in the field of tourism in the region, to concentrate on potential archaeological tourist sites attractions and manage and develop them to better promote tourism. This does not mean neglecting those archaeological sites located away from the road network, where the government could encourge investors to develope the surroundings of those archaeological sites which only can currently be visited by using a 4x4 vehicle, which might deter tourists from visiting these sites.

However, all these changes will contribute to the development of Saudi tourism, especially in Najran, which could, due to the circumstances of the war, become an alternative tourism destination for those who might otherwise go to Yemen, as Najran is close to the Yemeni border, and Najran is a remarkable example of a multi-period archaeological heritage landscape. As well as being an important historic trading hub, Najran includes significant sites from the former Yemeni kingdom, which are inaccessible to tourists elsewhere, because of ongoing political insecurity in modern-day Yemen, especially after the opening of the new airport in Najran, expected in 2020. This, along with the issuance of tourist visas in the future, will play a significant role in supporting Saudi tourism, particularly in the study area as regards archaeological sites; for example, Bir Hima site could see a great opportunity to receive tourists as it will be near the new Najran airport, and that will give stakeholders a chance to invest in this site to prepare it to receive tourists who can enjoy the existing archaeological characteristics of that site.

Chapter 8

Conclusion

This research study was the first to use GIS for archaeological tourism in Najran region, Saudi Arabia, where it has used different approaches that can help in the future planning of archaeological tourism in the study area. In this context, there is currently no single database containing all the archaeological sites in Saudi Arabia and their characteristics. Therefore, this study has addressed this gap by using the GIS tool to fill it, taking Najran region as an example, so that it can be used in the future for other Saudi regions. In contrast, GIS has rarely been used as a planning tool to support archaeological tourism, despite the widespread archaeological application of GIS more generally.

Najran is an interesting area geologically and ecologically, as well as containing some archaeological sites of world importance. It has a long history, being a focal point for trade and caravans for many centuries and also being influenced by the ancient Yemeni kingdoms, which also have a rich history. There are still many archaeological sites dating from different periods, the information coming from the features of each site, such as rock art or stone tools found at the site. The database of Najran sites should form an importance contribution to Saudi archaeology, as it provides a baseline of information that can guide both the preservation and development of the regional archaeological heritage.

The tourism literature and definitions of tourism are varied and complex. In this thesis, archaeological tourism is the focus, while it is recognized that tourism development in the region might incorporate elements of other forms of tourism. For example, the remote sites to the north might be visited as part of a wilderness camping experience. Saudi archeological tourism has its own special problems and possibilities (section 3.4), as the current market is largely domestic or focuses on visitors from neighbouring states and their interests (e.g., Gulf Cooperation Council, Pilgrimage). International tourism is virtually non-existent, but this is expected to change and international visitors should be prepared for. Meanwhile, the main source of information on tourist attitudes comes from local people or regional visitors to Najran. Understanding the potential foreign market will be important. Combining the database and GIS tools can help those who are planning tourism development over the next several years, and this study provides examples of how this can be done, and these tools could be adopted in other regions also.

The author has endeavoured to identify potential archaeological tourist sites in Najran based on their accessibility and the availability of landscape characteristics at those sites, in addition to their archaeological features, in order to achieve the objectives of this study (section 1.4). However, these

objectives were achieved in chapters four, five and six, respectively, and briefly reviewed in section7.2._Six potential archaeological sites have been identified that might be developed by the SCTNH for use in the future in the field of tourism. Meanwhile, the existing features of these sites may offer aesthetic scenes and attract tourists to visit them, especially international tourists wishing to visit Yemen so that Najran could be an alternative due to the war in Yemen, given that the archeological sites in Njaran contain attractive characteristics from several ages: the Palaeolithic, Neolithic and Islamic periods, e.g. inscriptions, depictions and some broken pottery (section 2.10). However, international tourists may be able to visit Najran once tourist visas start being issued, which is expected to be this year, i.e. 2018, and also after opening a new airport being built in the northeast of Najran, on the road towards Bir Hiam archaeological site, as currently Najran airport is closed for security reasons. Meanwhile, other tourist market segments, e.g. tourists from Gulf Cooperation Council states, can visit Saudi Arabia without a tourist visa (section 3.4.2). The majority of this research is centred on domestic tourists, while parts of chapter 6 are relevant to other tourist categories, including both domestic and international segments, e.g. sand dunes are commonly preferred by domestic tourists for visits in the winter and spring seasons to enjoy the wildlife or the life of the Bedouin, and this might be wonderful for those international visitors who come from other countries that do not have sand dunes.

Nevertheless, Najran is located in a region, parts of which travellers are advised not to visit, e.g. the UK Foreign & Commonwealth Office (FCO) advises travellers to Najran to avoid all travel within 10 km of the border with Yemen and against all but essential travel between 10km and 80km from that border (section 7.3.1). However, there are no archaeological sites located in the first category, within 10 km of the border with Yemen, while in the second category, between 10km and 80km of the border, there are five archaeological sites, except the Bir Hima is located away from the centre of Najran and not within this category. But based on the experience of the author of this study, who visited the archaeological sites located in this category in 2016, there is no discernible risk to visitors as these sites appear quite safe: people go about their daily work, all the markets are open and people walk in the streets without feeling scared. In contrast, there are no countries in the Middle East where citizens are advised against travel to this region.

Furthermore, the Saudi government pays attention to tourism and its development in its Vision 2030, but it can be argued that Saudi tourism has not yet reached its full potential, as there is still weak investment in those archaeological sites which are considered important to attract tourists, particularly as reminders and narratives for visitors of the lives of former peoples in the area. The six potential archaeological tourist sites identified in this study (chapter 4, suffer from a general lack of

amenities, except the historic Emirate's Palace, and despite one of these sites, Al-Ukhdud, being under development, that does not include key amenities, e.g. toilets, coffee shop, seating and so on. It only includes rebuilding the museum and creating path between the site's features, as witnessed by the author of this study who visited this site in 2016.

This study included a questionnaire on three archaeological shortlisted sites and that helped the author to ascertain which potential archaeological sites are more likely to be visited in the future. The preferences of participants leant more to those archaeological sites located in the open air (chapter 5). This could help stakeholders, e.g. the SCTNH, to develop and manage those sites located outdoors, and this could encourage cooperation between Saudi regions to develop the archaeological sites located on the ancient trade road and thus create a tourist route along that road, which might attract tourists to visit it. In addition, it would be beneficial if the stakeholders were to develop and manage those archaeological sites currently with low potential due to access issues (sections 4.2.2 and 7.6).

Finally, it can be argued that the role of GIS in this study has helped to build a database of the characteristics of archaeological sites in Najran, and to identify which of those sites are accessible, in addition to determining the landscape characteristics located around each potential archaeological site in the study area. Furthermore, it helps to identify the distance and/or travel time to archaeological sites in Najran. This will also help the scope of the enquiry, e.g. with site features and photographs. Moreover, this has helped to identify potential archaeological sites for tourism and surrounding landscapes that might be seen by tourists who could visit these sites based on Viewshed analyses.

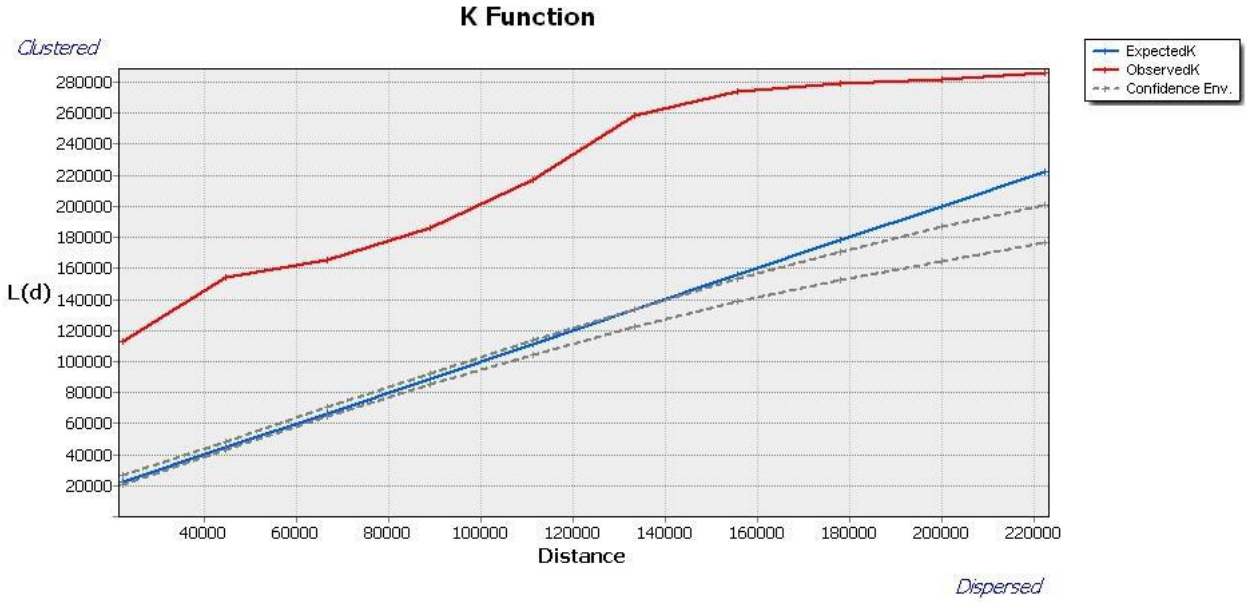
The analysis worked better from the highest point of the site rather than from where the photos were taken, and that is reasonable as the elevation points of the site were applied using Viewshed. However, this could work better for Ann Saadane Palace and Rah'om Castle.

However, it can be said that sites with the greatest potential site for tourism in the future are those sites located in the open air, e.g. Bir Hima, which is a UNESCO site, and Al-Ukhdud, as these two sites have many archaeological characteristics (e.g. inscriptions, rock art etc.), accompanied by attractive landscape features surrounding them (e.g. scattered native woodland, mountains, wadis and so on). Those sites located around the main wadi of Najran, e.g. Ann Saadane Palace and Rah'om Castle, have high Viewshed potential, i.e. mountains, scattered native woodland and irrigation areas. Sand dunes can be seen from two sites: Bir Hima and Jabal Al-husainia.

In conclusion, this thesis has endeavoured to build a comprehensive digital database for archaeological sites in Najran region, combining historical and spatial distribution, as well as the landscape contents of sites that already exist. In doing so, it has created a potentially important baseline of information and developed a useful tool that can be used in future planning for archeological tourism.

Appendix

Appendix 4.1



Appendix 5.1

Questionnaire

Dear Respondent,

As part of a research project, I wish to ask you some questions about archaeological sites you can visit as a tourist in Najran. I am a postgraduate student at the University of Southampton in the United Kingdom doing my PhD in archaeological tourism with GIS on the following topic:

"The role of Geographical Information Systems (GIS) in archaeological tourism assessment and development in Najran, Saudi Arabia".

The purpose of the questionnaire, which is part of my PhD, is to find out how tourists evaluate selected destinations of archaeological tourist sites in Najran region.

Your positive participation can contribute to the success of my research, thus it would be greatly appreciated if you could help in assessment of selected archaeological tourist sites in Najran region. There is no immediate benefit for you in answering the questionnaire, but your answers will help in looking after Najran region's archaeology. Your participation is voluntary and you may finish the interview at any time.

The questions will only take around 5 minutes of your precious time to answer. I can confirm that all information will be processed anonymously. No name is required; any data collected may be published but without the inclusion of personal information.

Yours sincerely,

Ali Alawer

Appendix 5.1 cont.

Location of interview……. **Date ……../……../2016**

Respondent information

1)- Gender: (a) Male ☐ (b) Female ☐

2)- Age: (a) Under 25 ☐ (b) 25 – 35 ☐ (c) 35 – 45 ☐ (d) over 45 ☐

Where are you from?

3)- Nationality: (a) Saudi ☐ (b) International ☐

4)- Place of residential: ……..City.

……. Region.

Please tick (√) the appropriate answer(s) to the following questions:

5)- Have you been to any archaeological sites as a tourist or visitor in Saudi Arabia?

(a) Yes ☐ (b) No ☐

If yes, which ones?

☐ Al-Ukhdud

☐ Bir Hima

☐ Other site(s) in Najran. Specify name(s): …….

☐ Other sites in Saudi Arabia outside Najran region

6)- I am now going to show you some information about three sites in Najran [SEE 3 SEPARATE INFORMATION CARDS]. Based on the information, how likely would you be to visit each site if a tour was offered to you:

Al-Ukhdud site:

☐ Very unlikely ☐ Unlikely ☐ Possible visit ☐ Likely ☐ Very likely

Bir Hima site:

☐ Very unlikely ☐ Unlikely ☐ Possible visit ☐ Likely ☐ Very likely

The historic Emirate's Palace:

☐ Very unlikely ☐ Unlikely ☐ Possible visit ☐ Likely ☐ Very likely

7)- Which site would you most like to visit of the three?.....

Appendix 5.2

Information cards

Al-Ukhdud archaeological site:

It is located in the southwest part of Najran. it's considered as one of the most famous archaeological sites in Najran region which dated back to 1000 BC, and several historical eras passed through it. It has the castle which is built of stones and mud. It consists of more than 25 buildings. Some archaeological excavations has been done, and there were a significant positive findings in this site such as inscriptions, and potteries.

Appendix 5.2 con

Bir Hima:

It is located in the northeast part of Najran. It is one of the most important archaeological areas in Najran and it dates from the Stone Ages, as well as Pre-Islamic history. This site has castles, cemeteries and a number of wells called Abar Hima. Also, this site contains epigraphy and inscriptions, and it has perhaps the most important of the petroglyphs that contains twelve Sabaean inscriptions which tell us about the King Yusuf Assar Yathar; and his army's







Appendix 5.2 cont.

The Emirates' or Bin Madhi Palace:

It is located in the city centre of Najran, at the historical district of Aba Al-Saud. This building is renowned in Najran as was used as a residence for princes, but also as government offices, such as a police station, a telegraph office and a courthouse. This building dates back to 1942 AD (1361 AH), it was built of mud, on stone foundations, and is surrounded by mud walls. There are four watchtowers located at the corners of this building, in addition to a mud mosque, and an ancient well dating back to the pre-Islamic era.

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