SEARCHING FOR TARHUNTASSA: USING GIS SPATIAL ANALYSIS AND DIVERSE DATA-SETS TO INVESTIGATE A QUESTION OF HISTORICAL GEOGRAPHY IN HITTITE SOUTHERN ANATOLIA

by

MATTHEW ALEXANDER JONES

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Classics, Ancient History & Archaeology

School of History & Cultures

College of Arts & Law

University of Birmingham

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Abstract

Spatial analysis techniques, performed using Geographical Information System (GIS) software packages, have become commonplace, even ubiquitous, in landscape archaeology over the last three decades. However, they have not had as significant an impact in the field of Ancient Near Eastern historical geography, despite the inherently spatial nature of this area of research. Settlements and regions named in documentary sources are still sought using traditional methods of textual study and field survey, with digital methodologies rarely implemented. An excellent example of such a case is the search for the Hittite city of Tarḫuntassa - capital of the Hittite Empire in the early 13th century BC, then the seat of a vassal kingdom and a rival dynasty for the throne in the Empire's declining years, but as yet unlocated. This thesis first critiques previous attempts to locate the borders and city of Tarḫuntassa, putting forward a case for why and how GIS spatial analysis techniques can be used to assess the criteria on which these previous studies based their conclusions, and investigate the context of, and relationships between, Bronze Age settlements and the regional landscape. These analyses are combined to form a model of Hittite regional landscape use, which forms the basis for a new hypothesis as to the capital's location. Finally, it is argued that this innovative GIS-based approach can, alongside a broader understanding of Hittite interaction with the landscape in terms of settlement, religion and monumentalism, challenge current consensus as to Tarḫuntassa's location and expand the study of Hittite historical geography beyond the traditional methods of survey, excavation and toponymy.

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1. Introduction

The Hittites were the greatest political and military power in Late Bronze Age Anatolia for a period of over 400 years, from around 1600BC until the death of their last king, Suppiluliuma II, in 1178BC, reaching the height of their power in the mid 14th-century BC under Suppiluliuma I. The history of the Hittites is divided roughly into the 'Old Kingdom' period, from 1600BC until the rule of Telepinu around 1460BC, and the Empire period, starting with the rule of Tudhaliya I in the early 14th century BC and ending in the collapse of the Empire in 1178BC. These two periods are separated by a poorly documented period of weakness, lasting around 70 years, known as either the Middle Kingdom or 'Dark Ages'.

It was during the Empire period that the Hittites reached the peak of their power and influence in the Eastern Mediterranean. From their capital at Hattuša (the site of Boğazkale, Çorum province, Turkey), the Hittite Empire at its zenith controlled a territory encompassing much of Anatolia, from the Aegean coast in the west to the upper Euphrates in the east, and into modern Syria in the south. They were considered one of the major powers of the Ancient Near East alongside Egypt and the Middle Assyrian Empire, and were engaged in both diplomatic discussions and military conflict with both of these powers and many other regional polities.

Constructing a detailed picture of the history of the Hittite Empire is made much easier by a firm knowledge of its historical geography, so that key events in the political, military and religious life of the Hittites can be linked at least to the area, if not the exact location, in which they took place. The excavations at Boğazkale/Hattuša have revealed thousands of Hittite cuneiform tablets, the majority of which have been studied and translated, and these provide an invaluable source of Hittite place names, the events which took place there, the itineraries which involved them and the political negotiations which included them. However, it has been estimated that over 3000 place names are listed in these texts, of which but a small fraction have been satisfactorily located (Alparslan & Doğan-Alparslan 2015).

The study of Hittite geography has, since its inception, relied upon the translation of these textual sources, and the identification of the geographical features and sequences listed. This process of identification has often been carried out alongside toponymy, the study of the place names themselves, in order to identify Classical or even modern Turkish place names which display elements of philological development from Anatolian roots. Of course, sites can also be identified by the discovery of identifying evidence, such as textual sources or monuments, through archaeological excavation, although the proportion of Hittite sites which have been subject to excavation remains very small.

The development of Hittite historical geography has been one of starting with the broadest picture possible, the identification of the names of Hittite regions, and then narrowing down the locations of more specific place names, such as cities or natural sites of religious significance, as much as possible. This process started with the works of Forrer (1924) and Goetze (1940), but really began in earnest with the landmark publication of Garstang & Gurney's 'The Geography of the Hittite Empire' in 1959 - this work has remained the foundation of much our knowledge of Hittite historical geography to this day. Further work has been carried out recently by the likes of Forlanini, who has published more than 50 articles on the subject since the 1970s (Alparslan & Doğan-Alparslan 2015), Gander (2010) and Bajramovic (2011).

While the broad geographical picture developed by Garstang & Gurney has been subsequently refined on a regional basis by studies such as these, and others focussing on more specific sites, the methods used have remained remarkably consistent. This is in spite of the extensive technological developments made in the study of archaeological landscapes, which could potentially be used in such an inherently spatial field. The end result is that many sites can only be satisfactorily said to be in a general area of Anatolia as we now know it, rather than being matched up to specific archaeological sites which have not been excavated.

Among the most significant developments in spatial archaeological and historical studies is the use of Geographical Information Systems (GIS), a computer software package designed for the express purpose of constructing spatial databases and performing analyses based, essentially, on the relationship between 'What' and 'Where'. It is the intention of this thesis to show not only that GIS has huge potential for use in the study of Hittite historical geography, but that it is possible to formulate a structured, systematic and repeatable methodology based around analyses that both critique the use of spatial criteria in the formulation of previous hypotheses on the locations of specific sites, as well as Hittite and broader Late Bronze Age settlement patterns, and produce a model for creating new hypotheses regarding site location on the basis of the results of these analyses.

In order to test this new methodological approach to Hittite historical geography, it will be necessary to focus on a particular question of Hittite site location which has been intensively studied, but to which no satisfactory conclusion has yet been reached; and few named and undiscovered Hittite cities have been the subject of as much academic scrutiny as Tarḫuntassa.

From 1295-1272BC, the ruler of the Hittite Empire was Muwatalli II, grandson of Suppiluliuma I and eldest son of Mursili II. Muwatalli is best known for two pivotal moments in the history of the Empire - firstly, his conflict with Egypt, culminating in the Battle of Qadesh in 1275BC, and secondly, for relocating the capital of the empire to the hitherto unknown city of Tarḫuntassa in the 'Lower Lands' of the Empire. This second action was unprecedented, and his motivations uncertain - the possibilities are complex and numerous, and the decision may have been as much religious as political or strategic. Regardless of the reason, the move was short-lived. Muwatalli's eldest son and successor Urhi-Teshub (throne name Mursili III) returned the capital to Hattuša, and the move was further criticised in the propagandistic account of Muwatalli's brother Hattusili III (known by scholars as 'The Apology'), after he had usurped the throne from his nephew Urhi-Teshub.

After its brief role as capital of the Hittite Empire, Tarḫuntassa became the centre of a new vassal state ruled by the descendants of Muwatalli II. The deposed king's brother (Hattusili III's nephew and foster-son) Ulmi-Teshub, was made ruler of Tarḫuntassa and may have later taken the throne name of Kurunta. The borders of the new vassal state were outlined in a series of treaties, first between Hattusili III and Ulmi-Teshub, and then between Hattusili's son and successor Tudhaliya IV and Kurunta, the latter written on a tablet of bronze. This latter document is of paramount importance to Hittite scholars, not only as a unique artefact in its own right (the only Hittite political document recorded on metal) but as an almost complete treaty it is of tremendous value to geographers and linguists alike.

While relations between Tudhaliya IV and Kurunta were initially very friendly, this situation quickly deteriorated as the Empire, entering its final decades, was weakened. Kurunta and (possibly) his descendants began to agitate for control of the empire, claiming the title of Labarna (Great King) as the legitimate dynastic descendants of Muwatalli II. The Bronze Tablet was symbolically buried in Hattuša, and Tarḫuntassa was defeated in battle by Suppiluliuma II, the final king of the Hittites. This political rivalry was monumentalised by both parties, by the Hittites in the inscriptions of Nisantas and Sudburg at Hattuša, and by Kurunta and his descendant Hartapus in a series of monumental inscriptions and carvings both within and beyond the borders of Tarḫuntassa.

Even with the border treaties providing scholars with a limit to the territory controlled by the city and, therefore, a defined area in which to search for it, however, the location of the city of Tarḫuntassa remains one of the great mysteries of Hittite historical geography. Since the name of the site was first mistakenly transliterated as 'Dattasa' by Götze (1940) and located in the 'Lower Lands' of southern Anatolia by Garstang & Gurney (1959), attempts have been made by a number of scholars to locate Muwatalli's capital within this region and the borders outlined in the treaties. Numerous surveys have been undertaken, sites assessed and hypotheses put forward, but with very few archaeological excavations having taken place and no likely toponyms for the site to go on, these studies have yet to reach a firm conclusion or make a universally accepted identification.

It is clear from this lack of conclusion that, in order to add new impetus to the academic debate as to where the city may be located, and without recourse to new archaeological or linguistic evidence, Tarḫuntassa makes an excellent candidate for a case study on the use of a new methodological approach to the study of Hittite historical geography.

Rather than focussing on the nature of sites themselves through site visits or studies of toponyms, this new approach should instead aim to identify the wider patterns of Late Bronze Age settlement in the study area, how these differ from those of preceding and succeeding periods and how they relate to the wider landscape. By analysing the relationships between Late Bronze Age settlements in the area outlined in the border treaties, the regional topography and other facets of the archaeological record (both contemporary and those preceding and succeeding) in the area, it should be possible to make a suggestion for the most likely location of Tarḫuntassa which is based not on observation, but on a detailed, systematic and analytical approach to the evidence provided by the local archaeological record and the landscape in which it is situated.

The first stage in this process is to critically assess the previous attempts to identify the location of Tarḫuntassa, and identify the hypotheses put forward by these studies regarding the motivating criteria for the Hittites in choosing the site for the new capital. These hypotheses must then be tested against the available archaeological data through the spatial analysis of a database of known Bronze Age settlement sites within the region, to ascertain which of these hypotheses provide an accurate representation of the criteria which influenced Hittite settlement location - or, conversely, the extent to which the Hittite criteria might differ from existing local patterns of Late Bronze Age settlement. Finally, these results must then be used to create a statistical model representing the comparative extent to which each of the known Late Bronze Age settlement sites within the region fulfils the above criteria, as well as identifying any areas where sites have not yet been discovered, but which may also have been desirable areas for Hittite settlement. However, the results of spatial analysis alone cannot be enough to satisfactorily identify the location of Tarḫuntassa, but must be viewed in the context of other factors, primarily religious and other socio-cultural considerations, which cannot be spatially analysed in this fashion. Furthermore, the methodology must not be assumed to be accurate without first testing it, by comparing the results gained through spatial analysis to the conclusions which have been reached through the numerous archaeological investigations of a much more intensely studied Hittite landscape, namely that around Hattuša.

The results of the above process should not only serve to identify those sites which would have been the most favourable to Muwatalli in choosing the location of his new capital, but also highlight other areas within the region, particularly those at risk from damage and destruction, which should be prioritised for further archaeological investigation as well as heritage management activities. The aim of this thesis is, therefore, to provide a new framework by which students and researchers in Hittite historical geography can approach similar research questions, where sites have not been satisfactorily identified due to a lack of archaeological or textual evidence, and in the process add a new perspective to the question of Tarḫuntassa's location and provide a resource for the management of the region's archaeological assets.

2. Literature Review

2.1 - Tarḫuntassa in Context

The Hittite city of Tarḫuntassa played a pivotal role in the final century of the Hittite Empire, acting briefly as capital of the empire and subsequently as the seat of power for a powerful vassal kingdom and a rival dynasty for the title of Great King of Hatti. However, while many suggestions have been made for its location, the precise whereabouts of the city of Tarḫuntassa is still unknown, as neither textual sources nor archaeological evidence have been able to provide a definitive answer to this question. It is for this reason that Tarḫuntassa has been chosen as a case study for this research, as a site which may benefit from a fresh approach in attempting to locate its possible whereabouts.

However, regardless of the methods used, no further study into the location of the city can be properly attempted without first examining the previous studies undertaken regarding this period in Anatolian history, the geography of the region controlled by Tarḫuntassa and the archaeological evidence in that region known thus far. By examining the wider context of the history and socio-political situation surrounding Tarḫuntassa and the area in which it was situated, this background knowledge could help not only to shed further light on the question of where the city of Tarḫuntassa might be, but also identify further questions regarding the historical geography of this area and the relationship between the Hittites, the local populations of the region and the landscape in which they lived. Furthermore, by examining how previous studies into the location of Tarḫuntassa were carried out, it will be possible to identify the flaws in these attempts, and avoid making the same mistakes or working under the same misconceptions when developing the new methodological approach.

There are three key areas that require contextualising - firstly, it is necessary to cover the historical and political context in which Tarḫuntassa was built and occupied. This includes the place of Tarḫuntassa in the historical narrative of this period of Anatolian and Near Eastern history and the situation leading to the establishment of the new city, as well as the more in-depth discussion and academic debate surrounding the political instability that defined the final years of the Hittite Empire and what this meant for Tarḫuntassa as a site of continued relevance. It will also be relevant to examine more broadly the nature of the historical periods immediately preceding and following the presence of the Hittite Empire in this part of Anatolia, so as to fully appreciate the extent to which they may have brought about changes in the political and social organisation of the region, and the effects of these changes on the nature of human settlement in this area.

Secondly, the geography of the area in question must be discussed, in order to place the city of Tarḫuntassa in the context of the physical and political landscape . Again, this will follow two strands - a discussion of the historical geography of the territory of Tarḫuntassa and the treaties that established its borders, and an examination of the topographical features that define the area, as well as studies of the environmental and geo-archaeological record, which will help establish the physical geography and past climate of the study area. Again, with regard to the broader historical picture, it will also be useful to examine how fluctuations in the climate, the environment and both the physical and political geography affected the relationship between humans and the landscape in which they were living throughout the Bronze Age and into the

Iron Age. With all of this in mind, it will be possible to appreciate the specific environmental and geographical context in which Tarḫuntassa was built, and how these might have played a part in the choice of its location.

Thirdly and finally, it is necessary to consider the settlements and monuments present in the study area, including the academic debate surrounding those sites that have specifically been identified as potential locations of the city of Tarḫuntassa, as well as the significance of the numerous Hittite monuments in the study area. This will encompass some further discussion of topography and geography as factors in the likelihood of these suggestions being correct, but will also cover some of the more intangible factors such as religion and expressions of socio-political and military power. It will also be necessary to examine some of the common features of Hittite cities that are known from previous excavations both within and beyond the study area, and the theories that have been proposed regarding the relationship between Hittite urban sites and both the local and wider landscape.

2.2 - Historical and Political Context

2.2.1 - Muwatalli's new Hittite capital

The city of Tarḫuntassa arguably reached its political zenith immediately after its foundation. The name Tarḫuntassa is not mentioned in any textual sources, Hittite or otherwise, before its creation by King Muwatalli II (1295-1272 BC) as a new capital city for the Hittite state (a family tree of the Kings of the Hittite Empire, and the roles they played in the history of Tarḫuntassa is shown in figure 2.1). The exact date of Muwatalli's wholesale transfer of the Hittite seat of royal power from its traditional location at Hattuša in the Hittite 'Upper Lands' (the area of modern Turkey that sits within the loop of the Kizilirmak River), to the 'Lower Lands', south of Cappadocia in the area roughly equivalent to classical Cilicia, is unknown. We can, however, be certain that it took place before the Battle of Kadesh in 1274/5 BC. Our knowledge of Muwatalli's reforms and relocation comes entirely from later sources, and primarily from the autobiographical propaganda text of his brother Hattusili, who would later become Hattusili III following a coup d'état. This text, known as the 'Apology', is a justification of Hattusili's actions in claiming the throne, and an attempt to defame the actions of his predecessor Muwatalli. Assuming events are listed in chronological order, Hattusili's account of Muwatalli moving the capital to Tarḫuntassa comes before the Battle of Kadesh, Muwatalli's famous battle against Ramesses II of Egypt in 1274/5 BC. However, this still leaves us with a window of twenty years during which the city could have been established, and it could have been capital of the empire for as little as three to four years, if the capital was built just before the battle of Kadesh, or as many as 23 if Muwatalli established the city within his first year on the throne.

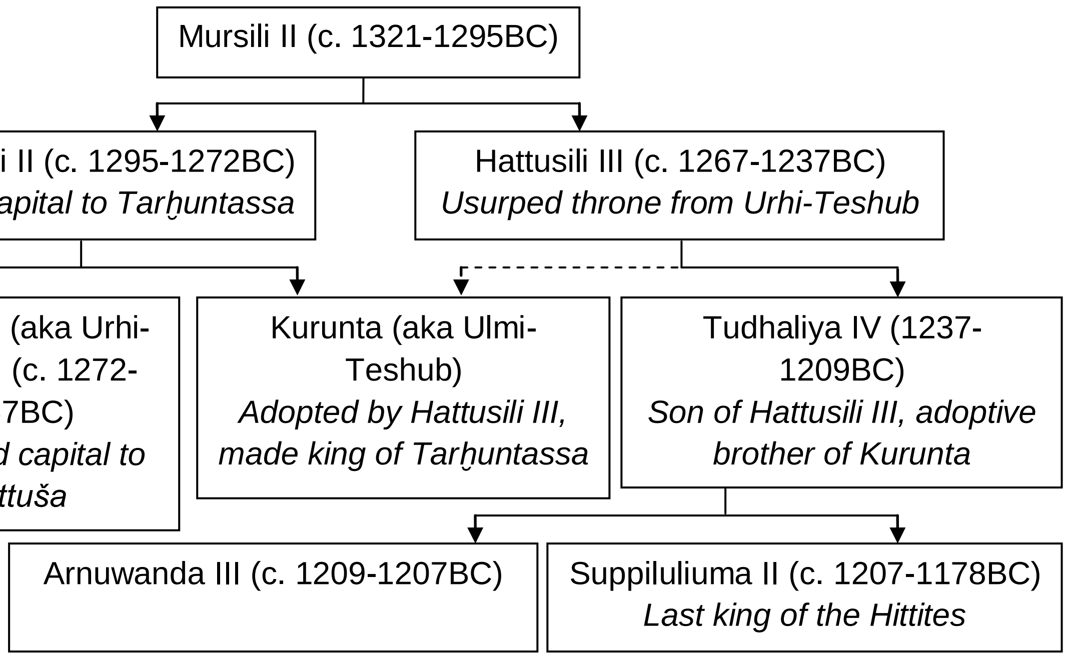

Figure 2.1. Diagram of the Hittite Kings under discussion, their familial descent, dates of their reigns in short chronology and key relevant information.

Parallels have been drawn between the actions of Muwatalli II and the Egyptian pharaoh Akhenaten (Singer 2006), in particular with regard to his apparently religious motivations. In the Apology, Hattusili tells the reader the following:

> "When my brother Muwatalli, *at the word of his deity,* went down to the Lower Land, he left behind Hattuša. [My brother] took up [the gods] of Hatti and the Dead Ones, and he [car]ried them [down] to the [Lower] Land." (Apology of Hattusili III, §6, i75-ii1, translated by Knapp, 2015.)

The important phrase here is 'at the word of his deity' (*IŠTU AMĀT* DINGIR-*LIM-ŠU,* literally 'from his deity's word'). After an initial period of stability, Muwatalli began to give preferential treatment to a particular epithet of the Hittite Storm God in his seals, prayers and treaties - *pihassiss Tarhuntas*, the Storm-God of Lightning. This is a derivation of the name of a key member of the Hittite pantheon, the Great Storm-God of Heaven, in the Luwian language (*Tarhuntas*). It also includes an additional descriptive element to his name, an adjectival form of the Luwian word for 'luminosity' (*piha*-), referring to lightning (Singer 2006). The addition of the Luwian element might give an indication of Muwatalli's reasons for moving the capital to the Lower Lands, as this is where the Luwian-speaking population lived.

Unlike Akhenaten, however, Muwatalli did not abandon the established pantheon - instead, he took the idols of the gods with him to the new capital, along with the 'Dead Ones'. This refers to the ancestral cult of previous Hittite kings, and may even mean their physical remains, as opposed to mere idols (Singer 2006).

While the religious reforms initiated by Muwatalli may have been the official reasoning behind the moving of the capital, there may have been further ulterior motives. Muwatalli's father, Mursili II, had transgressed into Egyptian territory in Syria, and begun a war over the border between the two empires. Concurrently, the Hittite heartland of Hatti had been suffering from plague for years prior to Muwatalli's accession to the throne, which may have been seen as divine punishment for Mursili's actions. Therefore, not only would Muwatalli's movement of the capital on divine orders be a convenient and legitimate way of leaving the 'tainted' capital and appeasing the gods who had brought the plague upon them in the first place, but also a way of moving the centre of Hittite political power closer to the border with Syria and the conflict zone with Egypt. The area of southern Anatolia to which Muwatalli chose to move would have reduced the travelling distance for Hittite troops on military campaigns, and controlled access to the Cilician Gates, the important natural route through the Taurus Mountains between the coastal plateau of south-eastern Turkey (known to the Hittites as Kizzuwatna) and the highlands of the Konya plain and central Anatolia. The new location was also closer to the western borders of Hittite territory with the lands of Arzawa in south-western Turkey, which Muwatalli's father Mursili II had recently subdued. Singer (2006) compares the move to the establishment of Brasilia as the new capital of Brazil in 1957. Another potential motivation for the move could have been the continued incursions into Hittite territory near Hattuša from the north by the Kaskan tribes. Hattusili's exploits against the Kaskans in his role as military governor of the 'Upper Lands' during Muwatalli's reign make up a significant portion of his apology (Knapp 2015). Singer (2006) does not consider this to be a dominant factor in the move, however, remarking that 'there was nothing exceptionally critical in their activities at this point in time' (p39).

Muwatalli had two sons, whose given names were Urhi-Teshub and Ulmi-Teshub. The former remained with his father in Tarḫuntassa as his appointed successor, while the latter was sent to Hattuša to be raised by his uncle Hattusili. Shortly after the Battle of Kadesh (the result of which was claimed as a victory by both sides), in 1272 BC, Muwatalli II died and was succeeded by Urhi-Teshub, who took the throne name Mursili III. Muwatalli had previously appointed Hattusili as governor of Hatti's northern territories, from a power base in the city of Hakpis, although the city of Hattuša itself was administrated by his Chief Scribe. On Urhi-Teshub's accession, however, he swiftly returned both the capital and the Gods of Hatti to Hattuša, removing Hattusili from his post in Hakpis. This angered Hattusili, who saw this as a move to strip him of his power and authority in the northern territories. In the inevitable conflict that followed, Urhi-Teshub marched against the rebellious Hattusili, but was defeated and exiled in 1267 BC, along with his supporters. Hattusili duly took the throne as king Hattusili III. Urhi-Teshub's reign lasted only five years (Hattusili's apology records it as being seven years, but this could be literary and artistic licence on Hattusili's part - alternatively, Muwatalli and his son may have co-reigned in the old king's final years). However, by returning the capital to Hattuša and entering into the conflict with his uncle, he initiated a split in the Hittite dynastic and political establishment that would continue throughout the final century of the empire's existence - and Tarḫuntassa would remain at the heart of these events.

2.2.2 - The Tarḫuntassa treaties

One of Hattusili's first acts as king was to establish Tarḫuntassa as a vassal kingdom, with its ruler second only in importance to the king himself and his crown prince. This put the king of Tarḫuntassa on a par with the ruler of the city of

Karkemish in the south-east. Our knowledge of the boundaries of the vassal state of Tarḫuntassa, its rulers and continuing importance comes primarily from two treaties drawn up between the kings of Hatti and Tarḫuntassa. The first of these to be discovered was a treaty between Ulmi-Teshub, king of Tarḫuntassa, and an unnamed king of the Hittites. This treaty is known as CTH 106. The second is the more complete Bronze Tablet (Bo 86/299), a treaty between Tudhaliya IV of the Hittites and Kurunta of Tarḫuntassa, discovered buried beneath a paved area at Hattuša in 1986 and first translated by Otten (1988). English translations of both of these texts are available in Beckman (1999). Since it is unclear precisely which Hittite king composed CTH 106, this has led to a lengthy scholarly debate over the chronology of these treaties and the identities of the recipients, particularly since the discovery of the Bronze Tablet. Depending on which order the treaties were drawn up in, the identity of both the author and recipient changes. Van Den Hout (1989) argues that CTH 106 follows the Bronze Tablet - if this is the case, then the author is Tudhaliya IV, the same author as the Bronze Tablet. The recipient, Ulmi-Teshub, is therefore the successor of Kurunta as king of Tarḫuntassa, and the two are separate individuals. The argument proposed by Gurney (1983 and 1993) and supported by Klengel (1991) and Sürenhagen (1992), is that CTH 106 is in fact the earlier treaty. If this is the case, then the author is Tudhaliya IV's father, Hattusili III, and the recipient, Ulmi-Teshub, is identical to the later Kurunta. For kings to have two names was not uncommon (Laroche 1966) - in this case, Ulmi-Teshub was the prince's Hittite given name, while Kurunta was a Luwian throne-name taken on his appointment to the throne of Tarḫuntassa. Luwian was an Indo-European language used alongside (and closely related to) Hittite, native to southern Anatolia - Tarḫuntassa was likely located in a Luwian-speaking area (Bryce 2005). Luwian hieroglyphs were frequently used for royal seals and inscriptions in the Hittite empire period and later, such as the SUDBURG inscription of Suppiluliuma II at Hattuša. Another example of a Hittite king who took a Luwian throne name was Kurunta's brother Urhi-Teshub, who took the throne name of Mursilli III, and from whom the throne was usurped by Hattusili III.

This second theory is accepted by Beckman (1999) and Dinçol et al (2000), and certainly seems the more convincing. Van Den Hout (1989) has to attempt to explain away several glaringly obvious contradictions in order to make his theory fit the textual evidence. Where CTH 106 (obv. 22'-23') says, "... now I, the great king, have made Santimma the boundary for him", the Bronze Tablet reads, "my father himself came and made Santimma the boundary for him". This would seem to fairly obviously suggest Hattusili III as the author of the first treaty and Tudhaliya IV as the author of the Bronze Tablet. However, Van Den Hout (1989) argues that this was the result of scribes using an earlier copy of a now lost tablet of Hattusili as the basis for a 'new' treaty between Tudhaliya IV and Ulmi-Teshub. There is evidence within the text of the Bronze Tablet for there being a third, earlier treaty in which Hattusili establishes the initial borders of Tarḫuntassa. However, in the passages where these earliest borders are mentioned, Tudhaliya clearly states that while these original borders were more generous, his father's treaty pushed them back, and Tudhaliya is re-establishing the former borders. This clearly identifies Hattusili as the author of the CTH 106, with its less favourable borders. Van Den Hout stretches the interpretation of the texts to breaking point to fit his theory, where a more straightforward reading of the texts supports Gurney (1993).

Furthermore, in the Bronze Tablet, Tudhaliya IV abolished the 'levy for the gods', *sahhan luzzi*, as it was excessive and Kurunta could not afford the cost of enlisting the required troops. It also states that Hattusili had previously abolished the requirement to appoint further soldiers to perform garrison duties (Bronze Tablet §22). Van den Hout (1989) points out that in the treaty with Ulmi-Teshub, the king solves the problem of the *sahhan luzzi* by redeploying the troops from the abolished garrison duty (§6). However, if Tudhaliya himself had already abolished the levy in the Bronze Tablet, his father having abolished the garrison in an even older treaty, how could he possibly put such a measure in place when the garrison no longer existed (Gurney 1993)? The more obvious interpretation is that in CTH 106, Hattusili abolished the garrison duty in order that Ulmi-Teshub could afford to fulfil the *sahhan luzzi*. Subsequently, in the Bronze Tablet, his son Tudhaliya IV gave Kurunta even more favourable terms by simply cancelling both requirements. This also fits with the overall theme of the Bronze Tablet, in that Tudhaliya makes the treaty even more favourable to Kurunta by expanding Tarḫuntassa's boundaries. A further, much shorter and incomplete text (CTH 97/ABoT 57), an edict of Hattusili III, can be thought of as a re-drafting of Hattusili's abolition of the garrison requirements in §6 of CTH 106. This text explicitly refers to Kurunta, not Ulmi-Teshub, as the treaty partner, but the contents of the edict bear a clear resemblance to the terms established in CTH 106 §6, and not those of the Bronze Tablet §22. With this additional evidence on top of the logical interpretation of the two texts addressed above, we can conclude that not only must the actions of Hattusili III referred to in the Bronze Tablet §22 be the same as those drafted in CTH 97/ABoT 57, but also that these actions are the same as those referred to in CTH 106, making Hattusili III the author of this treaty.

Furthermore, CTH 97/ABoT 57 must have been drawn up *after* CTH 106, after the name change from Ulmi-Teshub to Kurunta.

Finally, the word '*kinun*', usually translated as 'now', is used in many other Hittite treaties and letters as a contrast to a statement of how things were in the past. It is used in CTH 106 obv. 42' within the clause about the military levy. The contrasting statement comes earlier in the text, referring to when the levy was imposed under the regime of Muwatalli II after he had moved the capital of the empire to Tarḫuntassa. Therefore, this passage is to be read as one narrative, ending with 'the king and queen have made this treaty with you' - the king and queen in question being Hattusili III and his queen Puduhepa (Gurney 1993). Van Den Hout (1989), under the assumption that the text is being written by Tudhaliya IV, maintains that the shift from the third person to the second person pronoun *nu-ut-ta,* 'you', has to refer to a second, distinct individual, namely Ulmi-Teshub, as one would not refer to the same person in the third then the second person, especially if Kurunta were now dead. However, this must, under the circumstances, be put down to a scribal error arising from the transition from a narrative of past events to the present establishment of the new treaty (Gurney 1993).

If Van Den Hout (1989) were correct, and CTH 106 followed the Bronze Tablet and was drawn up between Tudhaliya IV and Ulmi-Teshub was a different individual who had succeeded Kurunta as king of Tarḫuntassa, this would have profound implications on our attempts to understand both the history and geography of the final decades of the Hittite Empire. Firstly, it would suggest that, rather than expanding its territory as a result of concessions given in the Bronze Tablet treaty, Tudhaliya would in fact have shrunk the vassal kingdom and implemented harsher terms on the new king. Secondly, it would make the suggested timeline discussed below, including Kurunta and Tarḫuntassa's role in the decline of the empire, incredibly unlikely. Given the numerous linguistic and chronological flaws in Van Den Hout's argument, however, it seems far more likely that CTH 106 is the first treaty, chronologically, and the Bronze Tablet the second, both being made with the same king under different names.

2.2.3 - Two cities, two dynasties - Tarḫuntassa and the decline of the Hittite Empire

Having established the chronology of the treaties, we can continue to summarise the history of Tarḫuntassa and its crucial role in the final century of the Hittite Empire. One of Hattusili's first actions upon becoming king was to establish a vassal kingdom around the short-lived capital established by Muwatalli II. On the throne of this new polity, he placed his nephew Ulmi-Teshub, brother of the recently deposed king Urhi-Teshub and younger son of Tarḫuntassa's founder, Muwatalli II. Ulmi-Teshub had become like a foster-son to Hattusili, who had raised him from a young age, and the young prince had also formed a close bond with Hattusili's own son and heir, Tudhaliya (Bryce 2005). The move to put Ulmi-Teshub on the throne of Tarḫuntassa was therefore a political one on the part of Hattusili, to ensure that Ulmi-Teshub, as the son of a king himself and a potential claimant to the throne, was both kept loyal to Hattusili and simultaneously put as far away from Urhi-Teshub's remaining supporters in Hattuša as possible (Bryce 2005). Furthermore, by placing Tarḫuntassa under the direct rule of a royal prince, it ensured that this strategically located territory would remain politically important.

Soon after becoming king of Tarḫuntassa, Ulmi-Teshub took up the Luwian throne name of Kurunta. With Hattusili already in his fifties at the time of his accession, Kurunta outlived his uncle, although Hattusili did, during his reign, reach an important peace agreement with Egypt, which included the marriage of one of his own daughters to the Pharaoh, Ramesses II. Hattusili's successor was his son Tudhaliya IV. Tudhaliya was in fact the younger of Hattusili's sons, but the older son, possibly called Nerikkaili, was removed from the succession, and Tudhaliya took the throne. Tudhaliya had a good relationship with his foster-brother Kurunta, as attested in §13 of the Bronze Tablet:

> "While I, Tudhaliya, Great King, had not yet become king, the god even then brought Kurunta and myself together in friendship, and even then we were esteemed and beloved by one another. We were sworn allies: "Let one protect the other." At that time my father had placed my elder brother in the office of crown prince, while he had not yet designated me for kingship. But at that time Kurunta protected me and swore as follows concerning my person: "Even if your father does not install you in kingship, I will protect you alone in whatever position your father does install you, and I will be your subject." I swore to Kurunta as follows: "And I will protect you." (Bronze Tablet §13 as translated by Beckman 1999).

Perhaps as a result of this relationship, and to keep Kurunta loyal to himself and his father's dynastic line, Tudhaliya gave further concessions to Tarḫuntassa and Kurunta in the Bronze Tablet treaty. Borders that had been pushed back by Hattusili III were re-established, and new territories were given in addition. Towns, fields and labourers not handed to Tarḫuntassa in the earlier treaty were explicitly given to it.

The *sahhan luzzi* levy was entirely abolished. Kurunta was given the right to choose his own successor, and Tudhaliya formally acknowledged that Kurunta's power was equal to that of the king of Karkemish. Finally, Kurunta was given control of the 'Eternal Rock Sanctuary', a site of cultic importance built by Muwatalli at Tarḫuntassa from which he had previously been denied entry by Hattusili III.

There is plentiful evidence to suggest that these concessions were still not enough to keep Kurunta from breaking his oaths with his childhood friend and claiming a right to the throne of the empire. In his monumental inscription at Hatip, on the northern edge of Tarḫuntassa's territory south-west of modern Konya (for further discussion of Tarḫuntassa's border see the sub-chapter below), Kurunta refers to himself as 'the Great King, son of Muwatalli, the Great King'. The epithet 'Great King' is only used by the king of the Hittite empire. This assertion of kingship is repeated in seal impressions discovered at Hattuša itself, with the full string of the Hittite king's epithets found within the royal aedicula - 'Kurunta, Great King, Labarna, My Sun'. While these titles may have simply been another concession granted to Kurunta by Tudhaliya, the circumstances of the Bronze Tablet's discovery suggest otherwise. The tablet was buried beneath a pavement inside the Yerkapı Gate at Hattuša, underneath reconstruction work that is known to have been carried out by Tudhaliya (Beckman 1990). Neve (1987) interpreted this, along with some signs of a destruction layer in the archaeological stratigraphy at Hattuša, as proof of Kurunta overthrowing Tudhaliya briefly, before the latter reclaimed his throne and ceremonially de-sanctified the Bronze Tablet treaty by burying it face down. However, the archaeological evidence for this destruction layer during Tudhaliya's reign has been rejected in subsequent re-interpretations (Seeher 2006, Klinger

2007). Singer (1996), believes that Tudhaliya may have accepted Kurunta's use of the 'Great King', if begrudgingly, for the sake of an *entente cordiale* in which each refused to accept the other as rightful king, but continued to cooperate in military and economic matters. Giorgieri & Mora (2010) go one step further and suggest the title was deliberately bestowed upon Kurunta as part of a systematic devolution of power to 'improve management of the unwieldy territory' (p144). If this were the case, however, why deliberately bury the Bronze Tablet if the friendship between the two kings was holding steady? Astour (1997) and Van Den Hout (2001) suggest a third scenario, in which Kurunta's coup took place after the death of Tudhaliya, during the one-year reign of his successor Arnuwanda III - however, the burial of the Bronze Tablet underneath Tudhaliya's undisturbed renovations of the city provide a *terminus ante quem* that makes this latter scenario more unlikely, or at least shows that Kurunta had already made some incursions during Tudhaliya's reign, if not launched his full scale coup.

What is known for certain is that during the declining years of the Hittite Empire, under its final emperor, Tudhaliya IV's second son Suppiluliuma II, Tarḫuntassa was one of a number of vassal kingdoms subject to a military campaign as the king attempted to stabilise the weakening empire, suggesting that by this point Tarḫuntassa was openly rebelling or even seceding. Suppiluliuma records his campaign against the city in the Sudburg hieroglyphic inscription from Hattuša - however, whether this was a direct military attack on the city or not has been cause for debate. Hawkins (1995), in his original interpretation of the inscription, saw the campaign as Suppiliuliuma punishing Tarḫuntassa for failing to assist Hatti in military matters during the reign of Tudhaliya IV, while Jasink (2001) and Bryce (2005 and

2007) suggest that the ruler of Tarḫuntassa was the leading antagonist of the campaign, having taken the lands listed by Suppiluliuma in an act of open rebellion. Singer (2000), on the other hand, argues that the campaign was one against the infamous 'Sea Peoples' who were a contributing factor in the collapse of several Late Bronze Age civilisations of the eastern Mediterranean, while Melchert (2002) argues the campaign was one against rebellious local chieftains, ending in the re-settling of the sacked city's population to Adana. In both of these latter interpretations, Tarḫuntassa was not rebelling or seceding from Hittite authority, but being liberated by Suppiluliuma from invaders.

Suppiluliuma is the last recorded king of the Hittites - after two tablets recording his naval and military exploits against the island kingdom of Alasiya, and the campaigns recorded in the Sudburg inscription, the historical record abruptly ceases. Archaeological evidence from Hattuša suggests that the city was gradually abandoned, first by its elites, and finally by its remaining population, who razed it to the ground only when it became clear that the empire had collapsed, the city having been looted of valuables and left derelict (Seeher 2001, Bryce 2005). Whether Tarḫuntassa's story ends at the same time, however, is uncertain. This is due to the debate surrounding another 'Great King' whose inscriptions have been found at the site of Kizildağ, in the Konya plain - the enigmatic Hartapu, son of Mursili.

Stylistically, the inscriptions are very similar to those of Tudhaliya IV at the Yalburt ceremonial pool complex, not far to the north-west. However, the accompanying relief-carved images appear to be of a much later Iron Age date, in the 8th century BC. Who was Hartapu, and when did he rule? Singer (1996) argues convincingly that the stylistic features of the inscriptions date them to the final years of the Hittite empire, before its collapse. This could feasibly suggest that Hartapu was Kurunta's successor as king of Tarḫuntassa - even as early as 1976, Melchert had suggested that the Mursili referred to was Mursili III, throne name of the usurped and exiled Urhi-Teshub, making Hartapu Kurunta's nephew. If Urhi-Teshub was sufficiently elderly when he fathered Hartapu, then Hartapu could have ruled from the death of his uncle Kurunta until Tarḫuntassa's re-conquest by Suppiluliuma - but there is nothing to rule out Hartapu having further successors whose inscriptions have yet to be discovered (Bryce 2007). By openly stating his familial descent from the overthrown Urhi-Teshub/Mursili III, who had been exiled but never accepted his usurper Hattusili III as the rightful king, Hartapu appears to be making a statement about his, and his father's, legal claim to the Hittite throne (Bryce 2005). A further inscription of Hartapu, with the same title and familiar descent, exists at Burunkaya, further to the north-east near modern Aksaray. This signals a definite incursion by Hartapu into Hittite territory, beyond the borders agreed in the Bronze Tablet (more on which below).

As already discussed, however, Singer (1996) favoured a theory of peaceful cooperation between two simultaneous 'Great Kings', a system that could have continued into the last days of the empire. The evidence for such a state of co-regency, however, seems slim in the face of the aggressive nature of the locations of monuments built by both Kurunta and Hartapu, in close proximity to, and then beyond, the borders imposed by the Bronze Tablet. The burial of that same treaty by Tudhaliya (or his successors) also suggests a breaking of its terms. On the basis of this evidence, along with an interpretation of the Sudburg inscription as a direct military campaign against Tarḫuntassa, it seems more likely than not that

Tarḫuntassa engaged in open hostilities against the collapsing Hittite state in the late 13th and early 12th centuries BC, certainly from the reign of Suppiluliuma onwards, if not earlier. As such, after its re-conquest by the empire, the history of the kingdom of Tarḫuntassa would have ended concurrently with that of its parent and rival, the Hittite empire. The re-use of the site of Kizildağ in the Iron Age, however, and the addition of the relief carving of a later Neo-Hittite ruler to Hartapu's inscriptions, shows that the kingdom and its rulers were still remembered and regarded with respect centuries later.

2.3 - Geographical Context

Having established the historical context in which Tarḫuntassa was built, occupied and was politically important, we must now turn our attention to the geographical context on which this project will focus - not only the location, physical geography and topography of the study area, but also its present and past environment, as well as the attempts that have been made to reconstruct the borders of the vassal kingdom of Tarḫuntassa from the list of cities, natural features and monuments listed in the treaties discussed above. These reconstructions will be critically assessed based on their relationships with other known ancient settlements, political territories and the identification of ancient toponyms with their modern counterparts. This will allow us to define the study area for this project, as well as provide a basis for some of the analyses that will be performed as part of this research.

2.3.1 - Southern Turkey - a modern context

It is clear from contemporary textual sources, primarily the border treaties (which will subsequently be analysed in detail in this chapter), that the area in which the city of

Tarḫuntassa and its territory were located equates to the area in Southern Turkey now occupied by the southern part of Konya province and all of Karaman province, as well as parts of Mersin, Antalya, Isparta and Burdur provinces. It is bordered by the Mediterranean Sea to the south. This modern context can be seen in Figures 2.2 and 2.3.

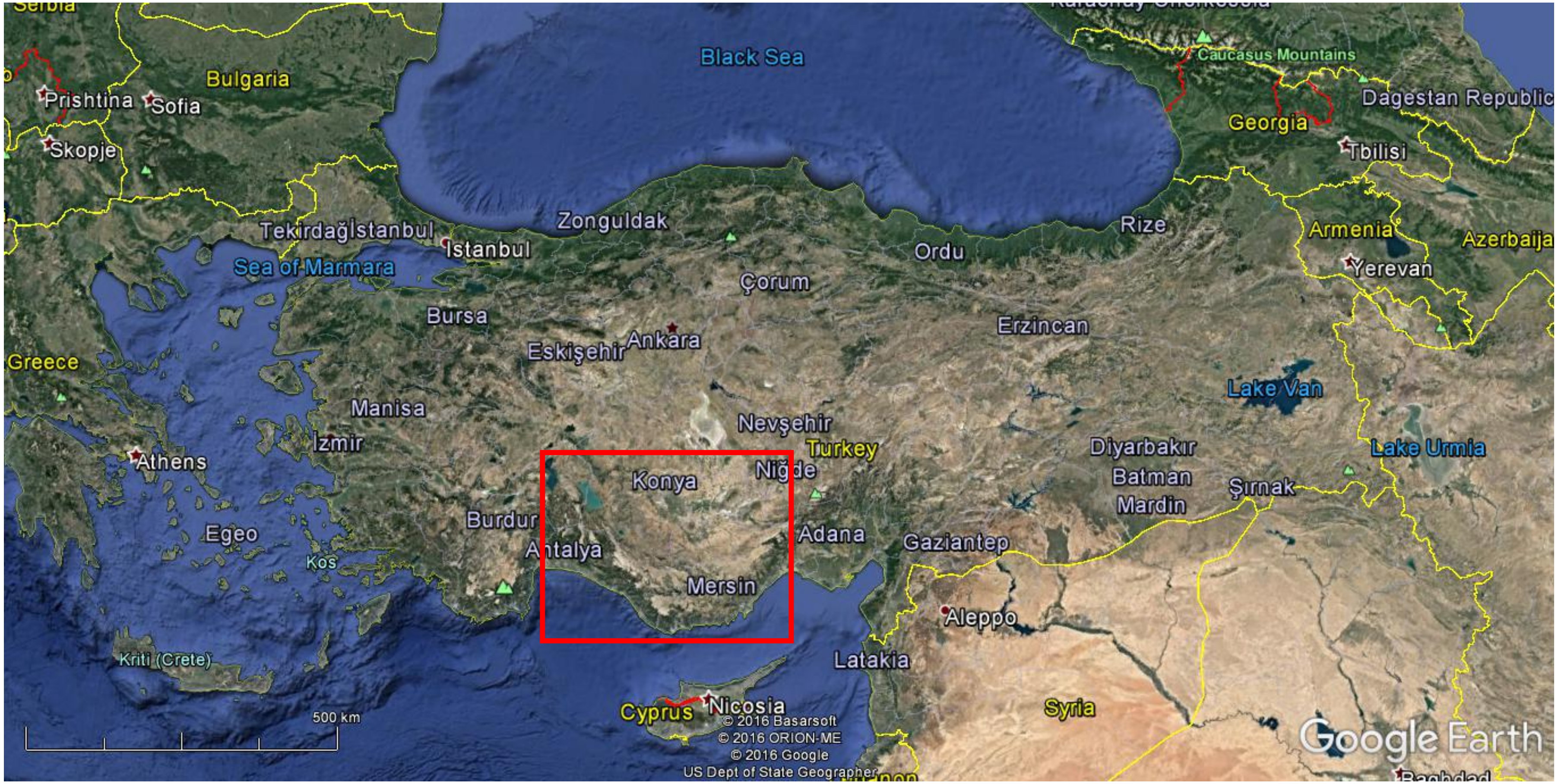

Figure 2.2 The area of modern Turkey where Tarḫuntassa is likely to be found, with names of key modern provinces. Basarsoft/ORION-ME/Google Earth 2016.

Figure 2.3. The part of southern Turkey where Tarḫuntassa may be located, with important geographical features highlighted. Basarsoft/Google Earth/Landsat 2016.

This region is defined by a number of key topographical features. The most northerly part of the region is occupied by the southern half of the Konya Plain. This plain was once the bed of a great palaeo-lake in the Upper Pleistocene, between 21,000-15,000BC, before entering a marshy phase, the end of which coincided with the last phase of occupation of the famous Neolithic settlement at Çatalhöyük, around 4500BC. The lake partially reformed at the very lowest point of the plain, near Karapınar, until the onset of a severe drought from 3000-2500BC, after which the plain has remained in an arid or semi-arid state. The plain is incredibly flat, much of it lying at a consistent altitude of between 1000-1020m. The modern cities of Konya and Karaman lie at the western and southern peripheries of the plain, respectively, at altitudes of around 1120-1140m. Rising out of the plain, southeast of Konya and north of Karaman, is the Karadağ massif, a large extinct volcano and a series of smaller cones running to the north and north-east of the main peak. At the north-eastern edge of the region is another large volcanic mountain range, the Karacadağ massif.

The Konya Plain is watered by the Çarşamba River system, which has its source in the rocky hills that separate the valley of Lake Beyşehir from the Konya Plain. The river flows south past Lake Beyşehir (the modern canalised river takes its water directly from the lake), through another, smaller lake, the Suğla Gölü, before turning east and passing through a narrow gorge through the foothills of the Taurus Mountains. Here, the river is joined by a tributary coming in from Bozkır to the south. It turns north-east and emerges onto the Konya Plain near the modern town of Gökhöyük. This part of the river has been hugely altered in recent years as a result of the creation of the Apa hydroelectric dam. From here, the river flows north-northeast, past the town of Çumra, before branching out across the plain as an alluvial fan and evaporating. A great number of ancient settlements in this area are based around this river system, as the many small streams that make up the alluvial fan can easily be used to irrigate the fertile soils of the plain.

The southernmost part of the region is the coastal region, bordering the Mediterranean Sea. There are two narrow strips of rich agricultural land, one to the west around modern Alanya and Manavgat, extending as far west as the mouth of the Aksu river, and one to the east stretching from the mouth of the Göksü river at Silifke, out towards Mersin and, eventually, Tarsus and Adana. These two coastal regions are separated by the lower reaches of the Taurus Mountain range, which extends all the way to the coast in the central part of the region. These coastal regions were extensively occupied in classical times. In the Classical period, the region including the Taurus mountains and the fertile plains to the east was known as Cilicia (more correctly, the mountainous area around the Göksü valley was known as 'Rough Cilicia', while the fertile plain to the east was known as 'Smooth Cilicia'), while the land to the west was known as Pamphylia.

Between the Konya plains and these coastal regions is the Taurus Mountain range. These mountains sweep in an arc from the southern-eastern shore of Lake Eğirdir, south-east towards the coast past the western shore of Lake Beyşehir, reaching the coast east of Alanya and surrounding the valley of the Göksü river. Here, they form a near impenetrable barrier between the Anatolian plateau and the Mediterranean Coast and coastal route to Syria to the east. From near Mersin, the range then arcs back up in a north-easterly direction, passing south-east of the modern city of Ereğli, and continuing on to the east, where it forms the watershed of the Euphrates in south-eastern Turkey. There are very few routes through the Taurus range, making those that are navigable of critical importance throughout history. The most well known of these passes is the Cilician Gates, located east of Ereğli, near the modern town of Pozantı. However, this cannot have been the only route used in antiquity - the Göksü River rises as two separate rivers in the western Taurus Mountains, converging near the modern town of Mut and reaching the Mediterranean at Silifke. The valley of the Göksü forms another important break in, and communication route through, the Taurus range, and falls squarely in the heart of the Tarḫuntassa region. A natural route between the Anatolian plateau and the river exists near modern Sertavul, and it would seem that this route connecting the Anatolian interior to the Mediterranean would have been of great strategic importance to any political entity controlling this territory.

2.3.2 - The borders of Tarḫuntassa

In both CTH 106 and the Bronze Tablet, the borders of the vassal state of Tarḫuntassa are described in great detail, which is incredibly useful for students of Hittite historical geography. As we have established, there can be little doubt that CTH 106 is the earlier of the two treaties. The Bronze Tablet treaty expands the borders that were listed in CTH 106, but in some cases they are returned to places that had been given as the borders in an even older, thus far undiscovered, treaty of Hattusili III. An example of this can be seen below (translations from Beckman 1999):

> §3 (obv. 19-20) In the direction of the border district of the land of Pitassa, his frontier is the sinkhole of the city of Arimmatta, but Arimmatta belongs to the land of Pitassa.

> §4 (i 22-28) Previously, in the direction of the land of Pitassa, his frontier was the city of Nahhanta. My father pushed back his frontier, and on my father's treaty tablet the sinkholes of the city of Arimmatta are made the frontier. Now I, My Majesty, have reestablished the earlier frontier for him. In the direction of the land of Pitassa, in the direction of the border district of the city of Arimmatta, his frontier is the cities of Nahhanta and Hauttassa, but Nahhanta and Hautassa belong to the land of the Hulaya River.

There has previously been some debate as to how exactly Tarḫuntassa and the Hulaya River land are related. Throughout both treaties, cities that mark the frontiers of Tarḫuntassa are repeatedly given as belonging 'to the land of the Hulaya River', rather than as belonging to Tarḫuntassa. This would seem to suggest that the Hulaya River land is a separate political and geographical entity, and that these cities are not within the borders of Tarḫuntassa. However, at the end of the section of the Bronze Tablet relating to the frontiers, Tudhaliya remarks that

> §9 (i 84-90) Whatever *sarikuwa*-squads, craftsmen, and men under service obligation are in the land of Tarḫuntassa and the land of the Hulaya River - my father gave him these cities with their bare walls. He did not give them to him together with their inhabitants. But I myself, Tudhaliya, Great King, interceded already in the reign of my father, so that he gave them to him together with their inhabitants.

This would suggest that the cities of the lands of Tarḫuntassa and the Hulaya River land were both granted to Kurunta (Ulmi-Teshub) by Hattusili III, thereby making the Hulaya River land either a part of Tarḫuntassa or synonymous with it, as was suggested by Forrer (1926) who originally translated CTH 106, and by Gurney (1993). Furthermore, the fact that the Hulaya River land is repeatedly mentioned as the owner of cities on nearly every frontier in both CTH 106 and the Bronze Tablet suggests that Forrer and Gurney may be correct, at least in part - it would seem unusual for Tarḫuntassa to be completely surrounded by the same country on every side, especially when this country is clearly distinguished from the lands which the border is facing.

However, further doubt over the designation of the Hulaya River land arises in the first line of Bronze Tablet §11.

> §11 (ii 4-5) That which is the border district of the land of Tarḫuntassa - it is the land of the Hulaya River - even a goatherd shall not enter (Beckman 1999).

Hawkins (1995) transliterates the phrase KUR ÍD*Ḫu-u-la-ia-aš* on the Bronze Tablet §11 (ii 5) as KUR ÍD*Ḫulaya=aš*, meaning 'it is the land of the river Hulaya'. He takes this to mean that the Hulaya River Land is a part of Tarḫuntassa, but exists as a 'frontier zone', as opposed to 'Tarḫuntassa proper', which he suggests is to be found further south in the Goksü valley area. This translation is accepted by Beckman (1999), as shown above. Gurney (1993) also accepts the translation but suggests that the line is a subordinate clause relating to Tarḫuntassa, not to the border district, and therefore that the Hulaya River land is another name for Tarḫuntassa as a whole. Regardless of which of these theories is accepted, however, the important conclusion is that the Hulaya River land does not lie outside Tarḫuntassa, and the cities that are listed as frontier towns but belonging to the Hulaya River Land therefore also belong to Tarḫuntassa.

With this in mind, we can begin to examine the course of the borders themselves by reading straight from the two treaties and attempting to locate the markers listed. In the Bronze Tablet, the western boundary is given quite explicitly at §8 (i 61-64); 'In the direction of the border district of the city of Parha, his frontier is the Kastaraya River. And if the King of Hatti goes on campaign above it (the Kastaraya River) and seizes the land of Parha by force of arms, then this too will belong to the King of Tarḫuntassa.' Melchert (2007) suggests that in this case, 'in the direction of' should be replaced with 'from', given that the frame of reference is the river, not a direction in relation to Tarḫuntassa. Parha can be identified with the classical city of Perge in Antalya Province, near the modern city of Antalya itself. The Kastaraya is therefore the modern river Aksu (classical Kestros) which runs past Perge and into the sea to the south-east. The border followed this river along its course to the north, through the western Taurus mountains, and through Antalya, Burdum and Isparta provinces, before reaching its headwaters at Lake Kovada and, north of that, Lake Eğirdir.

The northern border is a cause for more debate. We can say with some certainty that the north-western extent of the borders is the point at which the list begins in both treaties, with the borders facing in the direction of the land of Pitassa. This area has previously been identified as being in the region around modern Ilgin (Hawkins 1995). From here, things become more uncertain. Melchert (2007) seems to think that there is 'broad consensus on the basic position and orientation of the northern boundary' (p507). However, he then contradicts himself by proposing a very generalised version of what had earlier been suggested by Dinçol et al (2000), despite referencing them in his description of the border. Melchert suggests that the border ran roughly east-southeast, from the vicinity of Lake Eğirdir to the Bolkar Dağı ('the high mountain') near Ereğli. Dinçol et al (2000), in contrast, follow a very specific list of mountains given, from north-west to north-east, in the Bronze Tablet. These are Mount Hawa, Mount Huwatnuwanta, Mount Arlanta (a mountain with water on it), Mount Lula and the Sphinx mountains, Mount Sarlaimmi (and the sinkhole of water) and finally, 'the high mountain'. As with Melchert (2007), Dinçol et al identify the high mountain with the Bolkar Dağı, but extend the north-eastern limit of the boundary closer to the modern city of Pozantı in Adana province. Other translations of the text, for example Beckman (1999), Otten (1988) and Hawkins (1995), identify Mount Sarlaimmi as the Bolkar Dağı, and translate "*pargawaz* HUR.SAG-*az*" as 'from the height of the mountain', not 'from the high mountain', meaning there is only one mountain, not two. However, if the high mountain is to be identified with the Bolkar Dağı (which is, indeed, the highest mountain in the area), then Mount Sarlaimmi is more likely to be Karacadağ, northeast of the modern town of Karapınar. This translation is rendered more convincing when one considers that Mount Sarlaimmi has a 'sinkhole of water', ^{d}KASKAL.KUR *watar hinnaruwaš*, which could be identified with the volcanic lake Meke Gölü on Karacadağ's southern slopes.

Mount Arlanta, from which waters rise, is identified by Dinçol et al (2000) with Çal Dağı - the May River flows from this mountain and continues to the southeast. The remaining mountains are identified as follows; Mount Hawa is the south-eastern tip of the Sultan Dağı range; Mount Huwatnuwanta is Erenler Dağı; Mount Lula is Osmancık Dağı. Presumably, although not stated by Dinçol et al, the Sphinx Mountains associated with Mount Lula could be the foothills of Karadağ, or the volcanic cones strung out between Karadağ to Karacadağ. However, there is a significant problem with this series of identifications. The Bronze Tablet states that the waters of Mount Arlanta belong jointly to Hatti and the Hulaya River Land (i.e. Tarḫuntassa). This implies that this river forms the border. However, if Arlanta is Çal Dağı, and the river in question is the May River, then the border would appear to take a drastic turn to the south-east before following a north-easterly route to the next identified peak, Osmancık Dağı. This results in Tarḫuntassa losing a vast swath of land (as compared to Melchert's (2007) simpler straight line border), including almost the entirety of the Çarsamba alluvial fan, along with a number of hugely important 2nd millennium/Late Bronze Age sites, including the höyüks at Zoldura/Lystra, Bayat, Çomakli and Domuzboğazlıyan, among many others. In order to mitigate for this, Dinçol et al (2000) do not apparently follow their own series of identifications when mapping out their border interpretation. Despite the fact that they have not identified any other landmarks for the border to follow between Çal Dağı and Osmancık Dağı, and despite having explicitly said that the May River could have formed the border, the dotted line on the accompanying map turns northeast from Çal Dağı, includes Domuzboğazlıyan within the Tarḫuntassa border (something not even Melchert's border manages) before heading east-southeast towards Osmancık Dağı. As such, Dinçol et al (2000) contradict themselves, and though their method of trying to identify the mountains listed in the text is a sound one, their identifications should be taken with a pinch of salt. What is certain is that the border stayed south of the city of Konya, as it has been identified with the Hittite area of Ikkuwaniya, which in other texts, including the border treaty with Kizzuwatna, is listed as bordering the Hulaya River Land. and therefore lies outside Tarḫuntassa.

There is general consensus that the north-eastern section of the border, from the Bolkar Dağı, followed the northern side of the Taurus mountains, which form a natural boundary. However, the south-eastern and southern boundaries present more of a difficulty. Firstly, the vague description given in the earlier treaty, CTH 106, makes identifying these boundaries in this treaty near impossible. Beckman's (1999) translation of CTH 106 reads 'In the direction of foreign territory, his <frontier> is the city of Walwara and various dependencies(?) of Walwara - Mata, Sanhata, Surimma, Saranduwa, and Tattassi. In the direction of the city of Saranduwa, to whatever locality his armed force should reach - that belongs to the land of the Hulaya River.' Van den Hout (1995) and Hawkins (1995) assume that these cities are related to Parha, which we know to be to the west. That would mean that the treaty jumps from the north-eastern border at 'the high mountain' and Saliya, all the way to the far western border, with no mention of the eastern or southern borders. De Martino (1999) interprets CTH 106 as giving Tarḫuntassa no coastal border at all, as unlike the Bronze Tablet, there is no explicit mention of the sea as a border. She reads *araḫzenaz,* translated by Beckman as 'foreign territory', as 'the outer side', and identifies these cities as following the line of the Taurus mountains in a complete arc from the Bolkar Dağı in the east all the way round to Lake Suğla in the west. This would explain the 'jump' noticed by Hawkins (1995) and the lack of mention of a border with Kizzuwatna to the east.

However, with the translation of the Bronze Tablet, these borders are made much more explicit. The Bronze Tablet goes into significantly more detail, giving a full list of cities following Walwara that might correspond to 'the dependencies of Walwara', followed then by a similar list of cities to those given in CTH 106 preceded by the description 'in the direction of the sea'. From Saranduwa, Beckman (1999) translates as follows; 'In the direction of the border district of the city of Saranduwa, his frontier is the sea. In the direction of the border district of the city of Parha, his frontier is the Kastaraya River'. Here, the jump from east to west is explicitly from Saranduwa, via the sea, to Parha and the Kastaraya (Aksu) River. Hawkins (1995) attempts to preserve the sudden jump from east to west, and suggest that the wording 'in the direction of' could mean that the border merely faces the sea rather than reaching it - in this case, the border would run from the aforementioned Walwara, and follow the Taurus Mountains all the way round to Lake Suğla, before heading west to the Aksu River. However, it is more simple, and more logical, to read the treaty as a complete clockwise circle, starting and ending in the north-west, and to assume that the cities from Walwara to Saranduwa form the eastern and south-eastern borders 'in the direction of the sea-coast' - that is, between the Taurus Mountains and the sea, as suggested by De Martino (1999). Furthermore, Melchert (2007) argues that 'In the direction of' should be translated instead as 'from', as here the points of reference are the sea and the river respectively. Therefore, the border in the Bronze Tablet certainly reaches and follows the coast from Saranduwa, its southeast terminus, to Parha in the southwest. This would be another of the territorial concessions granted by Tudhaliya IV to Kurunta compared with the treaty of his father. This interpretation is leant further credence by CTH 106 §3 obv 31, which reads: 'In the direction of the city of Saranduwa, to whatever locality his armed force should reach - that belongs to the land of the Hulaya River.' (Beckman 1999). This would explain the territorial expansions to the south-west as far as Parha by the time of the writing of the Bronze Tablet. However, there is still the question of the precise course of the eastern border

- in other words, where is Saranduwa, and what course does the border follow to get there?

The location of the south-eastern terminus of Tarḫuntassa's borders hinges on the location of an important Hittite port city in classical Cilicia called Ura. This city is attested in numerous sources, including a legal case adjudicated by Hattusili III between the traders of Ura and the people of Ugarit, and was clearly a major port allowing for the Hittite Empire to trade overseas with both the Levant and Egypt. It seems absurd that this city would be included within the borders of Tarḫuntassa, especially as that would give the vassal state an unprecedented amount of leverage and power. The city is not mentioned at all in either text, and neither is Tarḫuntassa mentioned in the aforementioned legal case. This would suggest that Ura is not within the boundaries of Tarḫuntassa (De Martino 1999). Beal (1992) argues otherwise, saying that if the treaty used the sea as its southern boundary marker from east to west, there was no need to mention the names of cities, and that as the legal case was an international one, it had to be dealt with by both sides mutual superior, the Hittite King. Furthermore, as the king in question is Hattusili III, the legal case may well predate the writing of the treaty with Ulmi-Teshub. Dinçol (1998) challenges this position, pointing out that if Ura were within Tarḫuntassa, it should still be mentioned in the treaties, not necessarily as a border location, but in a clause safeguarding the Hittite Empire's merchants and economic interests. Melchert (2007) also rejects the idea of Ura being within Tarḫuntassa, and claims that the most likely position for this city is at modern Silifke (following Lemaire 1993), on the mouth of the Göksü River. Dinçol et al (2000) place Ura even further east at Kızkalesi.

This leads us to conclude that Saranduwa, and therefore the southeastern terminus of the borders given in the Bronze Tablet, must be west of the mouth of Göksu River. Gurney (1997), Dinçol et al (2000) and Melchert (2007) all suggest Gilindere (classical Kelenderis) as the site of Saranduwa on both philological and topographical grounds. De Martino (1999), however, places it much further west, assuming that the monument of Tudhaliya IV at Ermenek, on the lower branch of the Göksu River, was an indicator that the stretch of land to the south of the Taurus Mountains here was still Hittite territory and that the border had not yet turned toward the coast. It can be assumed that the list of cities given as 'in the direction of the sea' form the border between the Taurus mountains and the coast at Saranduwa. Dinçol et al (2000) interpret this as being a straight line of sites from the where the Pusatli Dağı mountain range ends, straight across the Göksu and southwest to Saranduwa via the modern town of Gülnar (see Figure 2.4). Melchert (2007), however, considers it more likely that the border would follow the natural breach in the Taurus Mountains by turning southeast and following the Göksu river up to a certain point, whereupon it would turn back to the southwest and traverse the low-lying coastal plain to Saranduwa (see Figure 2.5). He considers the monument to Tudhaliya IV at Keben to be a potential border marker showing this departure from the river. In this way, the border was kept away from the mouth of the river, and therefore from Silifke/Ura.

Figure 2.4. The borders of Tarḫuntassa as described by Dinçol et al (2000), in blue as depicted on the map included in the article, with red line following May River as described in the text. Mountains and other features named in the Bronze Tablet and their modern counterparts are labelled. Landsat/Basarsoft/Google Earth 2016.

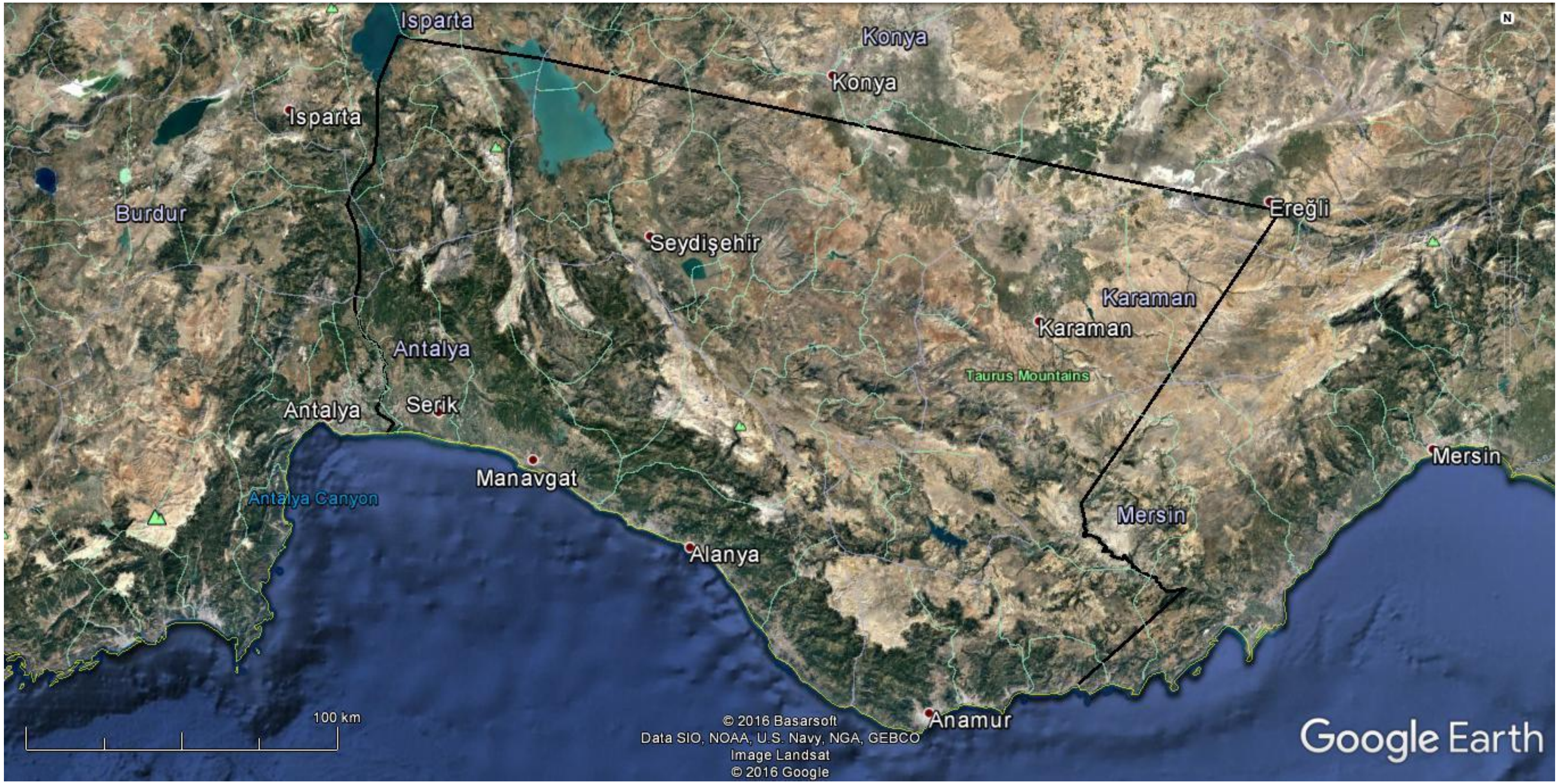

Figure 2.5. The borders of Tarḫuntassa as described by Melchert (2007) in black. Note the straight northern border, which passes through the monuments at Eflatunpınar and Hatip, before turning south-west at Ereğli and, on reaching the Göksü valley, following the river as far as the Keben monument before heading to the coast at Sarunduwa. Landsat/Basarsoft/Google Earth 2016.

This completes the circuit of Tarḫuntassa's borders - however, it must be noted that between the writing of CTH 106 and the Bronze Tablet, and again after the writing of both treaties, the borders of Tarḫuntassa may have been pushed back in light of territorial expansions by Kurunta, who was, at the time of the writing of the Bronze Tablet, in favour with Tudhaliya IV. In a more recent article, Yakar (2014) affirms the possibility that the line of Hittite royal inscriptions including Emirgazi, Koylutolu, Yalburt and Eflatunpinar would originally have demarcated the southern extent of Hatti, but with the granting of extra territory to Tarḫuntassa in the latter treaty, Eflatunpinar and the quarry at Fasillar further south became part of Tarḫuntassa's territory, hence why the relief carving at Eflatunpinar is unfinished. He also believes that Kurunta may have led a coup and briefly wrested control of the empire from Hatti (as discussed above), and during this time further expanded Tarḫuntassa's borders to include a swath of territory as far north as the rock inscription of his possible successor Hartapu at Burunkaya, near modern Aksaray. This may have led to Tarḫuntassa controlling territory around Konya. However, for the purposes of this study, the borders will be as described in the Bronze Tablet, and will not include any hypothetical later expansion north of the monument at Hatip.

For the purposes of this investigation, the interpretations of both Dinçol et al (2000) and Melchert (2007) have been considered to be the most viable, due to their inclusion of the Hulaya River Land in Tarḫuntassa's territory and their locating Saranduwa at Gilindere . However, it is important to consider both Melchert's method of defining the northern border by the location of significant monuments, and Dinçol et al's attempt to identify the geographical features listed in the border treaties.

Therefore, both of these borders are included in the analysis of the dataset as possible interepretations of the textual, archaeological and geographical evidence.

2.3.3 - Environmental Record

As well as studying the socio-political geography of southern Anatolia during the late Hittite Empire, it is important that we gain a more in-depth understanding of the physical geography and climate at this time. Any differences in the climate, and any dramatic impacts this may have had on the landscape in the Bronze Age in comparison to today, must be taken into account when assessing the relationship between settlement sites and the landscape. Furthermore, the environmental record, as studied through the organic materials and geo-archaeological data represented in core samples taken from a variety of sites, both wetland and upland, can tell us much about the climatic context in which Bronze Age settlement took place in Southern Anatolia. This can provide some meaningful context when considering the changing agricultural and economic regimes of the Bronze Age, and the impact this may have had on the changes in settlement patterns throughout this period.

The most comprehensive environmental study of the Konya Plain to date was the geo-archaeological work conducted by Boyer et al (2006), as a part of the comprehensive remote sensing surveys carried out by Baird and his team from the University of Liverpool. This research concentrated heavily on the Çarsamba alluvial fan, the river system that waters the heart of the Konya Plain, and its patterns of flooding and deposition of alluvial material. It was established that these patterns differed depending on the area of the fan, resulting in two separate chronologies. In the 'central fan', the area surrounding the famous Neolithic site of Çatalhöyük and modern Çumra, there were two phases of alluvial deposition separated by a dryer phase - a 'lower alluvium', deposited between 8000-4800BC, and an 'upper alluvium' beginning in 2800BC and continuing until the present day and the beginning of industrialised hydrological works, such as irrigation systems and canals. In the 'fan periphery', however, around modern Karkın and Hayıroğlu, there was only a single alluvial phase, dating to between 6800-2400BC. The end of this alluvial deposition corresponds to the onset of the third and final phase of the Early Bronze Age (EBA III), when the number of settlements in this 'fan periphery' area begins to decline sharply. As such, it can be assumed that the lack of alluvial deposition in the periphery from this point onwards also indicates a dryer climate and less predictable flooding patterns, leading to a decline in settlement in this area as farming would have become more difficult. This conclusion is matched by the findings of Rosen et al (2013) who, in their study of the impact of environmental change on communities in South-Eastern Anatolia, point to the high water tables and building floodplains of the Chalcolithic and Early Bronze Age being followed by a 'pronounced dry period', which had already begun by the start of the 2nd Millennium BC. This led to 'water tables dropping substantially and streams beginning to incise their beds in Northern Syria and Southeastern Turkey' (p233-4).

Tellingly, even with the resumption of a regular pattern of flooding in the central fan from 2800BC onwards, dense settlement did not resume in this area in the Middle or Late Bronze Age. Boyer et al (2006) conclude that this must be because "either social or political conditions did not favor resettlement, or the alluvial and climatic regime remained unfavorable" (p696). With the ending of the farming regime favoured by the settlers of the Early Bronze Age, perhaps due in part to this change of climate and flooding pattern, the population of this area clearly turned to alternative socio-economic structures, resulting in a much changed pattern of settlement.

Another significant environmental study pertaining to this area was that conducted by Eastwood et al (1998). Their study of the pollen records of a series of upland sites in southern and south-western Anatolia resulted in the idea of the 'Beyşehir Occupation Phase'. The pollen record for this phase, dating from 1450BC-600AD shows a decrease in woodland species such as oak, juniper and cedar, and an increase not only in cereals, but also species including vines, olives and walnuts, indicating extensive organised system of arboriculture and viticulture. The sample taken from Beyşehir itself revealed the possibility of the very earliest beginnings of this new upland agricultural regime dating to 1800BC, the tail end of the Middle Bronze Age, but for the rest of south-western Turkey, dates of 1450-1250BC, the heyday of the Hittite Empire, occurred in a significant proportion of samples. In nearly all cases (except Beyşehir itself), the Beyşehir Occupation Phase pollen samples post-dated the layer of tephra deposited by the eruption of Santorini (1640BC), suggesting that this may have had some bearing on the shift towards farming upland terraces, as opposed to the alluvial plains of the Çarsamba fan - though whether this was a cultural or climatic repercussion is unclear. What is certain is that the Beyşehir Occupation Phase is also represented in the alluvial deposits studied by Boyer et al (2006), who noted an increase in topsoil, and a corresponding decrease in bedrock, in alluvial deposits from 1500BC onwards, suggesting woodland clearances and increased usage of uplands for agricultural purposes.

These environmental findings suggest that there was a noticeable shift in the agro-economic regime, from low-lying alluvial farms irrigated by the Çarsamba fan to a more mixed regime involving the clearance and use of upland sites, not only for cereal agriculture but also the growth of fruit and nut trees, viticulture, the grazing of herd animals and the use of these clearances as a source of timber. Therefore, we may expect this shift to be reflected in the changing settlement patterns through time, and if this is the case, it may contribute toward a greater understanding of Late Bronze Age settlement choice, and ultimately where the capital of Tarḫuntassa may be found.

2.4 - Archaeological Context

In this section, the archaeological record in the study area will be discussed, with particular attention paid to key sites that have previous been suggested as possible locations for Tarḫuntassa. However, to focus only on settlement sites would be a very narrow definition of archaeological context, and would provide a limited picture of the Hittites and their use of this landscape - therefore, it will also be necessary to gain some further understanding of the nature of Hittite urbanism, in terms of their position in the landscape and topographical situations, as well as how the organisation of cities reflected the Hittite worldview and the inter-connectedness of their politics, administration and religion. Furthermore, there will be some discussion of the monuments present in the study area - their forms, who constructed them and their meaning and purpose in terms of politics, geography and religious expression.

The archaeological record in this area has been constructed mostly from the results of field surveys and site visits, conducted over many decades between the 1950s and the present day. Therefore many of the known sites are those visible above ground - precious few have been excavated, and remote sensing has been used only sparingly in recent years, particularly by Baird (1999-2001a) as part of the Konya Plain Regional Survey. As a result, the vast majority of sites are either 'höyük' sites (settlement mounds formed as a result of the continuous construction of new buildings directly on top of the destroyed remains of older settlements) or, as is particularly the case in later periods, hilltop settlements, often with some evidence of fortification or monumental stone architecture. There are also a number of monumental sites, including inscriptions, relief carvings and sacred springs - the nature and importance of these sites will be considered separately and in more detail.

2.4.1 - Previously suggested locations of Tarḫuntassa

The question of the city of Tarḫuntassa's location has attracted speculation in academic discourse since its erroneous identification as 'Datassa' by Götze (1940) and in Garstang & Gurney's landmark publication 'The Geography of the Hittite Empire' (1959). A number of sites have been proposed as the location of the city (see Figure 2.6), many of which are still in contention, but some with better credentials than others.

Figure 2.6. Map showing locations of all sites under discussion in the context of the borders discussed by Melchert (2007, black line) and Dinçol et al (2000, blue/red line). Basarsoft/Google Earth/Landsat/Copernicus 2016.

Kızıldağ

Kızıldağ is a steep-sided volcanic hill, approximately 13.5km to the northwest of the summit of its parent peak Karadağ (Figures 2.7 and 2.8). Its summit is 105m above the surrounding plain, and therefore serves as a very prominent location. It is also surrounded by a significant number of 2nd Millennium sites, and inscriptions found at the summit of Karadağ suggest that the larger mountain could have been the religious sanctuary for the new capital, serving a similar purpose to the Yazılıkaya sanctuary near Hattuša.

Figure 2.7. Location of Kızıldağ in context of surrounding landscape and 2nd Millennium, Late Bronze Age and modern settlements. Note the Karadağ massif to the south, Lake Hotamiş to the north, the nearby settlement at Süleymanhacı Höyük and the proposed border of Dinçol et al (2000) running roughly west to east at the top of the image. Basarsoft/CNES/Astrium/Google Earth/Digital Globe (2016).

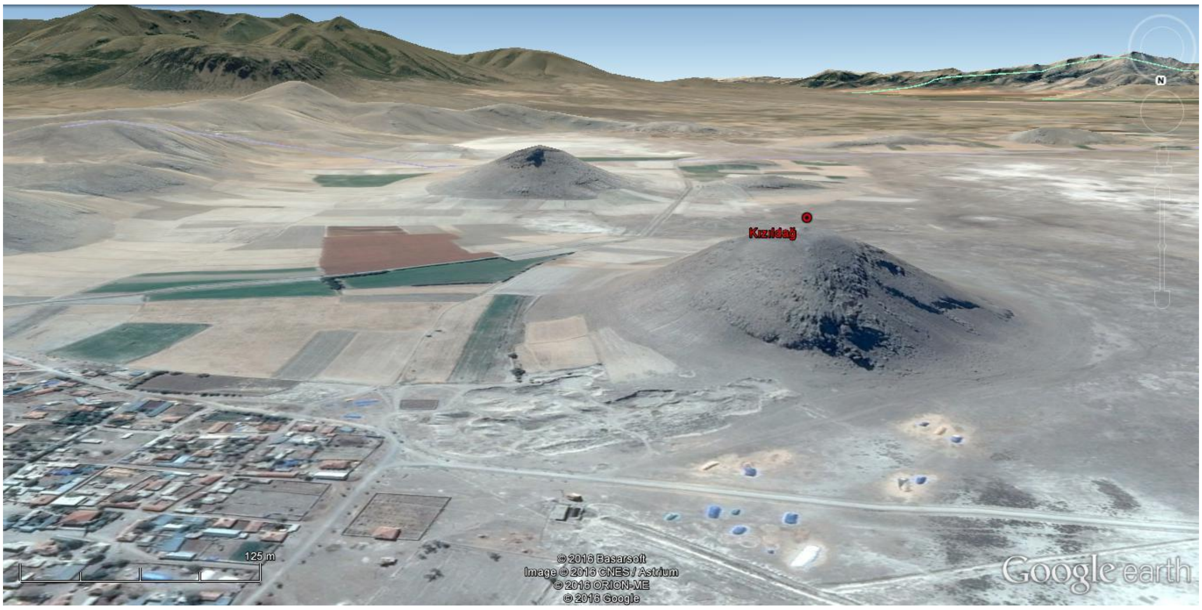

Figure 2.8. The volcanic cone of Kızıldağ viewed from the north. In the foreground on the left is the modern town of Adakale, and Karadağ can be seen on the left in the background. Basarsoft/CNES/Astrium/ORION-ME/Google Earth (2016).

Five enigmatic Luwian hieroglyphic inscriptions belonging to an unattested king named Hartapu have been found at Kızıldağ. In all of these inscriptions, Hartapu is given the traditional Hittite epithets of 'Great King', and in some he is given other Hittite royal epithets, 'The Sun' and 'Beloved of the Storm-God'. In two of the inscriptions Hartapu is recorded as being the son of another Great King, Mursili (Hawkins 1992). Three of the inscriptions were found on or around a rocky outcrop on the western flank of Kızıldağ's summit, which has been carved to resemble a 'throne' (Figure 2.9). Two of the throne inscriptions were destroyed some time before 1980. The fourth inscription, from the eastern side of the mountain, has not been seen since it was first reported in 1963. The fifth and final inscription is found at the top of a stone staircase south-east of the throne (Hawkins 1992). Accompanying the surviving inscription on the throne is a relief carving of seated man, presumably a king, holding a cane in his left hand and a bowl in his right.

Figure 2.9. The 'throne' and its relief carving and inscription (Bilgin 2009, http://www.hittitemonuments.com/Kızıldağ/)

There is some debate over the dating of these inscriptions. The Mursili in question could be the short-lived Hittite monarch Urhi-Teshub, son of Muwatalli II and nephew of Hattusili III. Singer (1996) puts forward a strong argument for Hartapu reigning at Tarḫuntassa during, and shortly after, the last years of the Hittite Empire. This is based on the use of the 'Great King' epithet and winged sun-disc aedicula, both characteristic of the later Hittite Empire period. His inscription also closely mirrors the style used by Suppiluliuma II in the Südburg inscription at Hattuša. Furthermore, in the Kızıldağ 3 inscription, Hartapus uses an epithet of the storm-god that was last used by Muwatalli II, Tarḫuntassa's founder - "Beloved(?) (of) the Storm-God, The Sun, Great King, Hartapu, son of Mursili, Great King, hero, built this city" (Hawkins 1992). It is unclear who it is suggested built the 'city' - Hartapu or his predecessor.

The identification of Kızıldağ as Tarḫuntassa was proposed by Alp (1995) and accepted by Dinçol et al (2000) and Melchert (2007). However, Bittel (1986) dated the throne relief to the later Neo-Hittite period, the late 9th/early 8th century BC, due to their Syrian-influenced style and the Urartian-style bowl held by the figure in one of the reliefs. He also found a very limited amount of Late Bronze Age pottery, a finding backed by Karauğuz et al (2002).

At Kızıldağ's summit, there is a Late Iron Age fortress, of a similar date to the relief, measuring 90m in diameter, with 11 towers of between 3.2m and 4m in diameter and walls 1.7m thick (Karauğuz et al 2002). Such hilltop fortresses are a common feature of the Iron Age in this area, and similar structures can be found at Hatip, Seçme Kalesi and Harmanpınar Yuğ Tepesi.

Kızıldağ's location is also of questionable suitability for a capital - it lies on the shore of the now dry Lake Hotamiş. Even though it is has not been inundated since around 2700BC, until very recent industrialised drainage and hydraulic works it remained a marshland, thanks to the nature of the bedrock and sub-surface drainage (Roberts et al 1999). Environmental evidence suggests that during the Middle and Late Bronze Ages, the lake had already dried up, but went through several marshy phases, as a result of irrigation systems being established and then collapsing (Fontugne et al 1999). Furthermore, the environmental evidence collected at the earlier Chalcolithic site of Pinarbasi on the shores of the former lake by Asouti (2003) contained some species "identified with submerged marshes and riparian forests growing around the freshwater spring-fed pool and the shallow saline lake depressions receiving seasonal runoff from the volcanic uplands of Karadağ" (p1198). The freshwater pool is Süleymanhacı Gölü - a small lake south of Kızıldağ and between it and Süleymanhacı Höyük - and the saline lake depression is Lake Hotamiş. The former marsh and lake bed covers a large area to the north of Kızıldağ, for which there exists no settlement evidence at all, suggesting it remained marshy and uninhabitable throughout the Bronze Age. It also separates Kızıldağ from settlements further to the north and making it more difficult to access. Therefore, there are some grounds for doubting Kızıldağ's identification as Tarḫuntassa.

As the most popular suggestion for the location of Tarḫuntassa, studies which have supported this hypothesis are also the best source of criteria, both spatial and cultural, influencing the capital's location. Dinçol et al (2000) suggest that the density of 2nd Millennium settlement and proximity to important trade routes and communications networks might have an influence on the city's location, as well as the need for the site to have the potential to expand. Singer (2006) suggests that the site of Tarḫuntassa should be one built on 'virgin ground', given the lack of references to the name in earlier textual sources, and uses this hypothesis to justify the identification of Kızıldağ. What is concerning is that none of these criteria, in particular the spatial ones suggested by Dinçol et al (2000), are tested in any way - they are all observations made from site visits and field surveys, but in no case have these assertions been critically analysed or assessed to see whether they are reflected when compared with the evidence offered by the available archaeological data. The doubts already outlined regarding Kızıldağ's identification as Tarḫuntassa, alongside this lack of rigorous assessment of the criteria on the basis of which it has so frequently been suggested, form a significant part of this project's *raison d'être.*

Karaman

The modern city of Karaman and its peripheries are home to four Bronze Age sites - one of Early Bronze Date (Akyokuş), two 2nd Millennium (Karaman Kalesi and Hüyük Degirmende) and one, lying on the outskirts of the city to the south-west, of definite

Late Bronze Age date (Hamza Zındanı Höyük) (Figure 2.10). Gordon (1967) suggested that Tarḫuntassa might be near the city of Karaman, without naming a specific site. This suggestion is picked up by Hawkins (1995), who notes the presence of the large Late Bronze Age Site of Hamza Zındanı Höyük, pointed out to him by David French. However, he rejects the identification of this site with Tarḫuntassa on the grounds that this area was within the Hulaya River Land, the frontier zone of Tarḫuntassa, as opposed to Tarḫuntassa 'proper' which lay further south. However is a somewhat flawed assumption, as there is nothing to suggest that the Hulaya River Land extended this far south or east - the Çarsamba river lies some 58km to the west-northwest of Karaman, at its closest. This site can therefore be brought back into contention.

Figure 2.10. Modern Karaman, with the Late Bronze Age sites of Hamza Zındanı Höyük and Hüyük Degirmende/Karaman Gavur Höyük. Note the string of 2nd Millennium and Late Bronze Age sites to the west, and the topographic transition between the Konya Plain and the Taurus Mountains (Google Earth/Basarsoft/Digital Globe/CNES/ASTRIUM 2016).

Hamza Zındanı Höyük is situated on a high bluff with commanding views overlooking the modern city of Karaman and a stream to the east, and Karadağ across the plain to the north (Figure 2.11). It stands at a potential crossroads of two ancient routes of communication, with other 2nd Millennium and Late Bronze Age sites indicating the possible presence of one route heading in a north-south direction from the settlements south of Karadağ, through Karaman and south towards the Göksü valley via Mut, and the other coming in from the west along the northern edge of the Taurus mountains, then heading east/north-east towards Ereğli and the Cilician Gates. However, while 'Hittite' pottery and "some architectural traces" (Karaman İl Kültür ve Turizm Müdürlüğü 2014) found on the mound, there is no evidence of the grand monumental architecture one would expect of a Hittite capital, and indeed can find at Kızıldağ and Hatip. Furthermore, the site is now very difficult to investigate due to the presence of the Governor Hakkı Teke Memorial Forest and its associated tourist complex, and has, according to the Karaman Province Cultural Inventory, been largely destroyed, with only scattered pieces of pottery visible on the lower slopes (Karaman İl Kültür ve Turizm Müdürlüğü 2014).

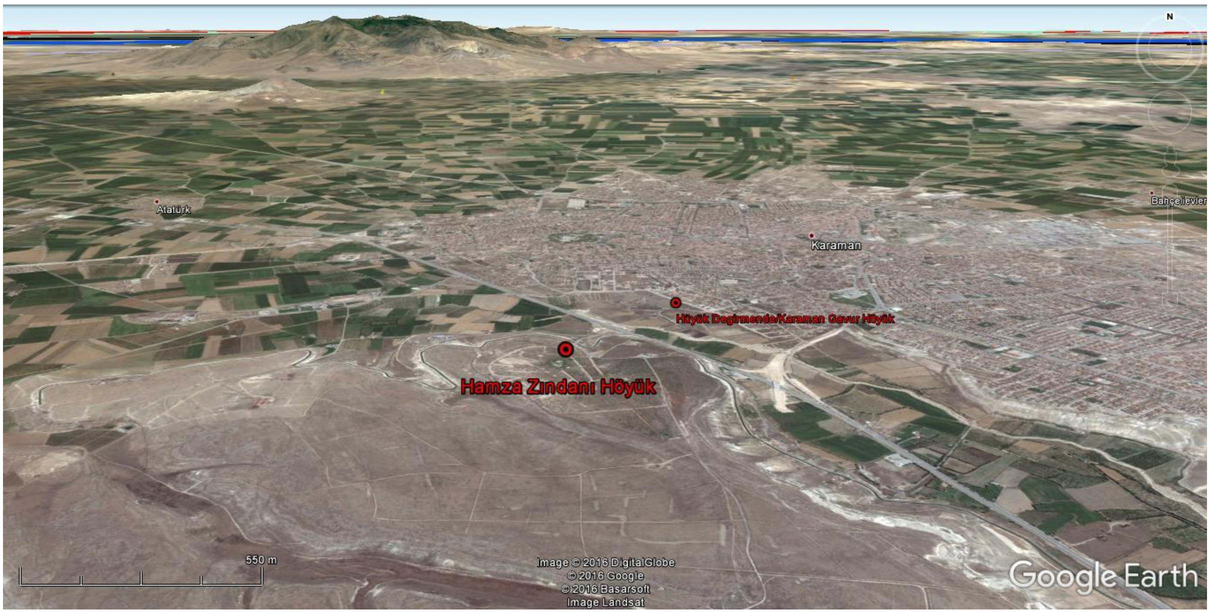

Figure 2.11. View of Hamza Zındanı Höyük from the south, with modern Karaman and Hüyük Degirmende/Karaman Gavur Höyük in the foreground and Karadağ in the background. Between the promontory on which Hamza Zındanı Höyük sits and modern Karaman is a river emerging from the Taurus foothills, which has since been diverted into man-made canals. Digital Globe/Google Earth/Basarsoft/Landsat 2016.

<u>Kilise Tepe - or another site in the Göksü Valley</u>

Hawkins (1995) suggests that Tarḫuntassa should be found at 'a site with strategic control of the Calycadnos (Goksü) valley... linked by the sea to the Levant through the important port of Ura at the river's mouth.' While he does not openly suggest Kilise Tepe (Figure 2.12), as Postgate's excavation project was in its infancy at the time, this would certainly be one of the sites that come to mind given this description. While Postgate does not mention the possibility of this connection, it is site of considerable size with a library of administrative tablets.

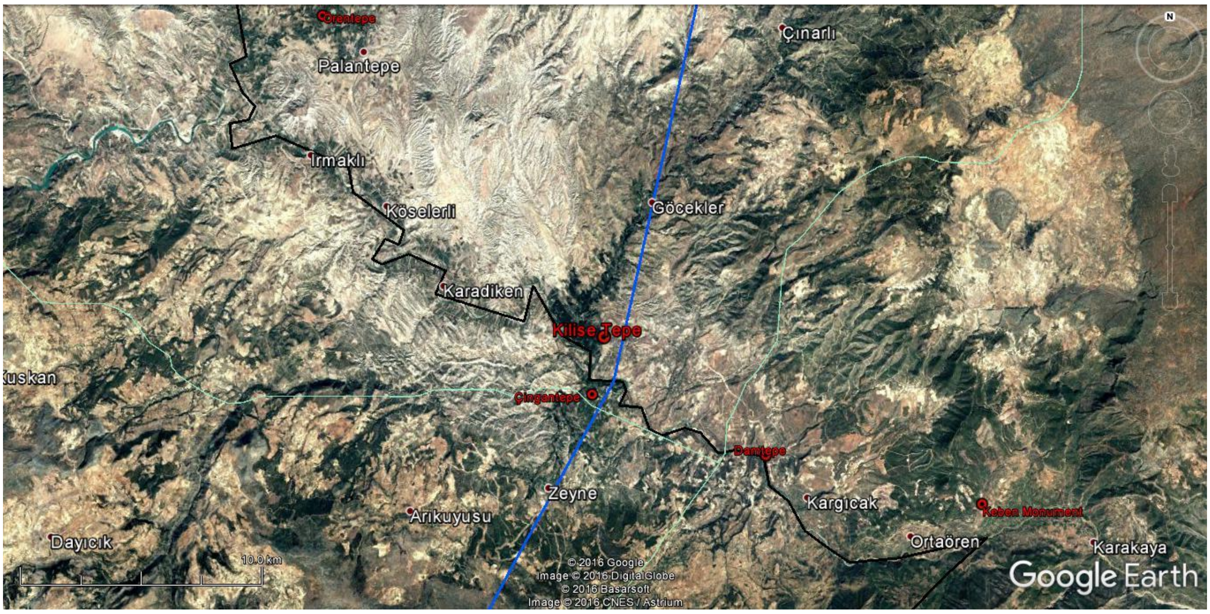

Figure 2.12. Location of the site of Kilise Tepe, in the Göksü valley. Note the nearby Late Bronze Age settlements of Çingantepe and Damtepe, as well as the settlement at Örentepe up the valley to the north-west, near Mut, and the monument at Keben downriver to the east. The borders of both Dinçol et al (2000) and Melchert (2007) run straight past the site. Google Earth/Digital Globe/Basarsoft/CNES/Astrium 2016.

The site has been interpreted as being 'situated to oversee the last descent to the coast' (Gates 2011) along the Göksü valley, a route which Symington (2001) asserts would have been a key conduit for transporting trade products from the Mediterranean into Central Anatolia. However, its location on the very periphery of the borders of Tarḫuntassa according to both Melchert (2007) and Dinçol et al (2000) surely puts it out of consideration - it would, however have been an important border crossing for traders coming up the Goksü valley, which would account for the importance of administration at this location. It may also be worth considering the site further up-river at Örentepe. It's position near the modern city of Mut is of strategic importance, a factor also exploited by the Ottomans, who later built a castle at Mut. It overlooks the point at which the two branches of the upper Göksü meet, as well as the route from the Konya plain descending through the Taurus mountains from the north.

<u>Zoldura/Lystra and Hatip</u>

Both of these sites have been suggested as locations for Tarḫuntassa by Bahar et al (2005 and 2007 respectively). Zoldura Höyük (considered to be the site of the classical city of Lystra, visited by St. Paul according to the Book of Acts (Acts 14:6-21) is a large site, well situated on the May river (Figure 2.13). Following this river downstream to the east leads to another large Large Bronze Age site, Alibeyhöyüğü, while upstream to the north-west is the site of Mula Höyük. It is also at the entrance of a route through the mountains to the west, leading to the area around Lake Beyşehir. It is surrounded by a large number of 2nd Millennium and Late Bronze Age sites. As part of this study, Bahar puts forward the suggestion that the Hittite favoured "mountainous and sloping areas, for security reasons" (p2) when choosing their settlement locations.However, Zoldura Höyük's location in a flat valley, rather than on any kind of prominent topographical feature such as an outcrop or promotory, and the lack of visible monumental archaeology or fortifications, makes its identification as Tarḫuntassa less likely - it should also be noted that Bahar (Bahar et al 2005) was, at the time he made the claim, trying to get permission to excavate the site.

Figure 2.13. Location of Zoldura Höyük, on the May valley on the western edge of the Konya plain. Note the neighbouring site of Hatunsaray, and Mula Höyük upriver. Dinçol et al's (2000) border runs along this valley - if interpreted from the text, and not from their accompanying map. Google Earth/CNES/Astrium/Basarsoft/Digital Globe 2016.

Hatip, on the other hand, can be considered a potential site for Tarḫuntassa due to the presence of an inscription and relief belonging to Kurunta (Bahar 2007) and a fortress on the high cliff overlooking the modern town (Figure 2.14). The location is also close to a major natural routeway, still used by the modern motorway, that crosses the mountains to Lake Beyşehir. However, the fortress is Iron Age in date, rather than Late Bronze Age, and the small mound in the village itself is of an Early Bronze Age date, and nowhere near large enough to be considered a capital city. Furthermore, the site is at the very edge of Tarḫuntassa's borders (or outside them, according to Dinçol et al (2000)). Therefore, the monumental inscription could be considered a border marker, rather than a sign that the city of Tarḫuntassa was located here - although the precise nature and purpose of these monumental inscriptions is a subject of some debate, and will be revisited later in this chapter.

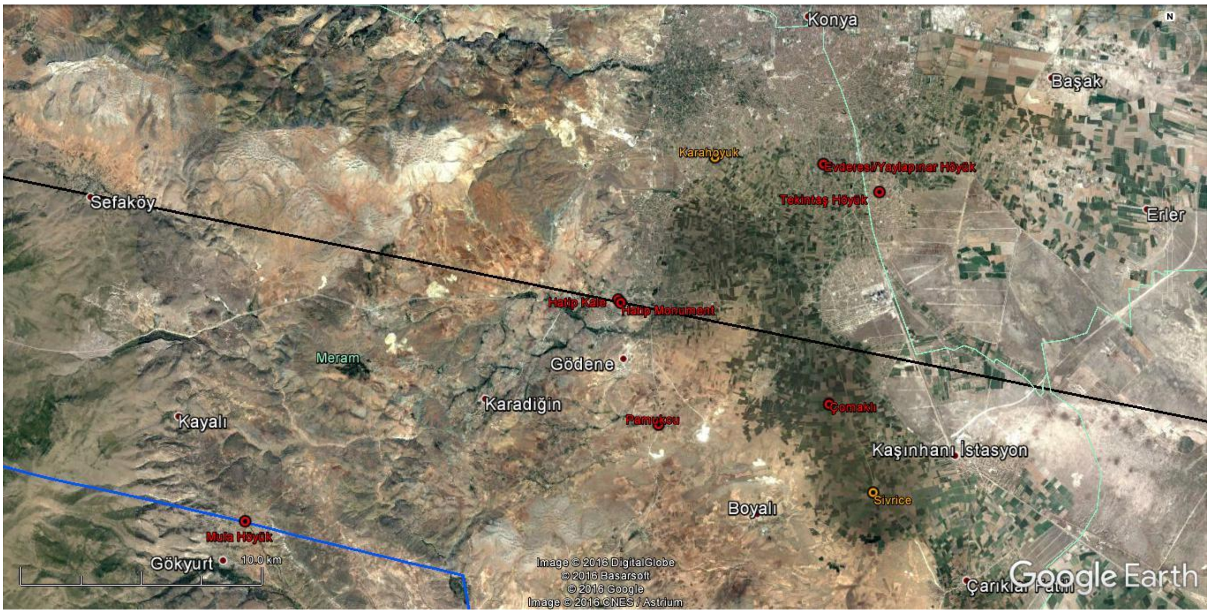

Figure 2.14. The location of Hatip Monument and Fortress. Note the border of Melchert (2007), which uses the monument as a border marker, and the border of Dinçol et al (2000) much further south - putting Hatip at or beyond the border. The modern city of Konya (Hittite Ikuwaniya) can be seen to the north. Digital Globe/Basarsoft/Google Earth/CNES/Astrium 2016.

<u>Meydancık Kale</u>

The fortress of Meydancık, near Gülnar in Mersin province (Figure 2.15), has been identified as the 1st Millennium BC city of Kiršu, capital of the Neo-Hittite kingdom of Pirandu which was sacked by Babylonian emperor Neriglissar in the 6th century BC. However, an earlier date for the castle has been suggested - Laroche (in Mellink 1972) claimed to have discovered a stele inscribed with the cartouches of both Muwatalli II and Kurunta. The identification of Meydancık Kale as Tarḫuntassa was also proposed by Freu (1990). On visiting the site, however, neither Güterbock nor Hawkins (1995) could see the supposed inscription at the site, despite the former being in Laroche's company at the time. The fact that the site is so isolated from any other contemporary settlements or trade routes makes it difficult realistically to consider the site as that of Tarḫuntašşa, but this may be as much due to the lack of thorough archaeological survey work done in this more mountainous and difficult-to-traverse region of the study area in recent years than a true lack of Bronze Age archaeology. However, this was certainly a site chosen for its defensive properties, ahead of any considerations of communication routes, proximity to contemporary sites or potential religious significance.

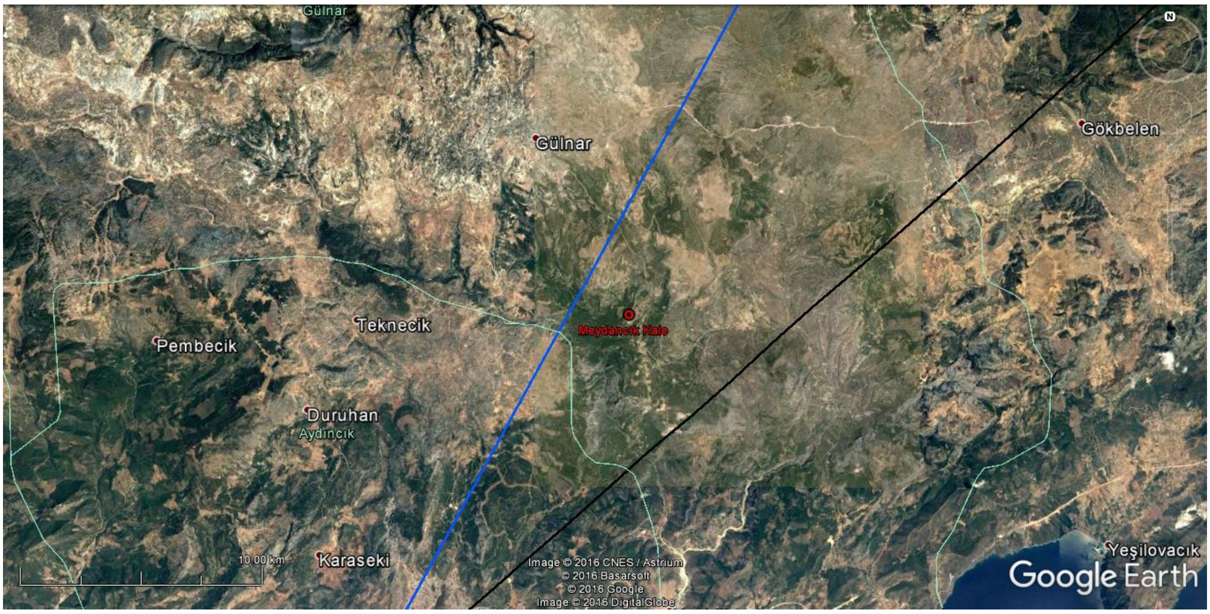

Figure 2.15. The very isolated site of Meydancık Kale. Note the borders of Dinçol et al (2000) and Melchert (2007), the inaccessible mountainous terrain and the proximity to the coast. CNES/Astrium/Basarsoft/Google Earth/Digital Globe 2016.

2.4.2 - Characterising Hittite Cities

There is very little literature that defines the specific features that constitute a 'typical' Hittite city. There has, until recently, been a general consensus that newly constructed settlements in the Hittite period tend towards being 'mountain cities' - fortified, stone built settlements on hilltops - as opposed to the 'höyüks' of earlier periods occupying the flatter plains (for very broad overviews, see Bittel 1976 or Masson 1995). However, a pair of recent studies by Dirk Paul Mielke (2011a and

2011b) have called for, and started the process of, a more vigorous study of Hittite urbanism, using elements of modern urban geography as well as basic topographical and physical definitions. In his paper 'Hittite Cities - Looking for a Concept', he characterises Hittite cities in the context of the 'social and political structures of the community' (2011a, p154), rather than purely by their location and architectural preferences. After examining the few Hittite cities that have been at least partially excavated and named, he notes that a number of the assumptions about 'mountain cities' versus 'höyüks' are in fact untrue, and need to be reassessed. An example of this is the well-known and excavated site of Ortaköy-Šapinuwa which, in spite of being a newly-built Hittite city and royal residence (albeit one dating to the earlier Hittite Empire, and abandoned by the 14th century BC), is situated on level ground by a river, rather than on a hilltop, and yet still retains many of the expected features of a 'mountain city', such as a palatial complex, some fortifications, religious buildings and storage pits (Mielke 2011b).

Importantly, Mielke also analyses the location of Hittite cities based on their position within the wider context of the landscape. He concedes that there is 'no standardised layout', and that size as well as function needs to be considered. Smaller sites situated along communication routes will have had 'strategic functions', while larger cities such as Hattuša and Sarissa are found in 'a peripheral position in larger valleys, where mountain passes reach the plains' (Mielke 2011a, p184). Furthermore, sites on important communication routes that had been previously occupied would simply have been re-occupied by the Hittites on existing höyüks - an example of this can be seen from the excavations at Kayalıpınar in Sivas province, as well as, it would appear, a number of sites in the study area for this project, including

Alibeyhöyük and Seydişehir Höyük. However, Mielke goes no further in pursuing this intriguing area of analysis, as 'a systematic study of the topographical positions of Hittite cities with respect to the geographic characteristics of the Anatolian highlands is still lacking' (Mielke 2011a, p185). Similarly vague statements about increasing tendency for Late Bronze Age settlements to favour mountains and more steeply sloping areas for 'security reasons' are made by Bahar et al (2005) in their discussion of Zoldura/Lystra as a potential location for Tarḫuntassa, but no attempt is made to link this conclusion to any available archaeological data. Since Bahar had been carrying out his annual survey of the Konya plain for a number of years by this stage, he should have been in a position to put forward even a basic form of spatial analysis to justify this claim, but instead leaves this claim to be accepted at face value.

Mielke concludes with some general statements about the inter-connectedness of the administrative and religious functions of Hittite cities, reflected in the similarities between the architecture of palatial and temple complexes. It is worth noting that even though the idea of the 'mountain city' is by no means an accurate reflection of all Hittite cities, Mielke still concludes that palatial complexes are nearly always found on the most topographically prominent areas of Hittite cities (2011a). This consideration should play some role when examining potential sites for Tarḫuntassa.

Dinçol et al (2000), in their appraisal of the borders and territory of Tarḫuntassa, begin by outlining a number of criteria that they believe ought to be fulfilled for any site that should be identified as Muwatalli's new capital. The first criterion is that the site should have 'potential to expand and allow the construction of a palace compound' (p1), and that the location and topography should be suitable for religious edifices.

They go on to suggest, as has already been mentioned in the assessment of the site of Kızıldağ, that the site should be 'sought in a densely settled area easily connected to other parts of the central plateau and the Mediterranean region by a network of roads' (p16). This provides two criteria by which this study can analyse and assess the known sites within the study area - site density in the 2nd Millennium and Late Bronze Age, and proximity to natural routes of communication. Since they do not perform any analyses to calculate site density or identify potential ancient road networks themselves, Dinçol et al (2000) rely instead on an approach of 'broad-brushstrokes' observations, making assumptions about such networks from the topography, and in fact pay the subject of roads very little attention after having established it is a criterion. Therefore, there is a need for a new, more rigorous approach to their criteria regarding settlement density and communication networks, which can provide a more complete picture of Middle/Late Bronze Age settlement patterns and potential communication routes, and the place of key Late Bronze Age sites in the context of those networks.

Dinçol et al (2000) fairly swiftly identify Kızıldağ as their preferred option for the site of Tarḫuntassa (in fact, no other options are even considered), noting that 'the topographical features of the site and its immediate surroundings would have provided Muwatalli with a natural setting not fundamentally different from that which existed at the much larger Hittite capital at Hattuša' (p16), presumably referring back to their earlier criteria that the site should have a suitable location and topography. This is another statement given with no evidence or analysis to support it - is this in fact true of Kızıldağ, and do other sites in the study area in fact share greater similarities with the topographical situation at Hattuša, as identified by Mielke

(2011a)? Do the other hypotheses identified, assessed and applied in this study also apply to Hattuša, or are the two landscapes too different to compare? Which sites have both the necessary room for expansion and the prominent topographical points suitable for palatial and temple complexes that both Mielke (2011a) and Dinçol (2000) consider a key part of any important Hittite city? It should be noted, however, that some of these questions will prove difficult to answer through analytical processes, particularly with regard to direct comparisons between key sites in this study area and Hattuša. Therefore they will have to be considered retrospectively in the context of the results of other analyses.

These hypotheses regarding the archaeology, architecture and location of Hittite cities provides a number additional areas where this project may provide some insight with regard to those broader questions regarding the nature of Hittite urban archaeology. For example, it has been possible to fill in some of the gaps in the broader picture of the topographical context of Hittite settlements that Mielke found lacking, as well as going some way towards identifying the networks of trade and communication routes that linked those settlements.

However, it should also be considered whether or not the Late Bronze Age settlements of the Lower Lands can truly be considered culturally 'Hittite', given its distinctly Luwian character and its close contact with non-Hittite territories which were only conquered by the empire later in their period of dominance, such as Kizzuwatna and the Lukka Lands. This is particularly true of the coastal region beyond the Konya plain, to the south of the Taurus mountains. As such, some form of comparison between the settlement patterns of the Hittite heartland and the region currently under consideration will be essential in developing a full picture of the historical geography of the region and how Tarḫuntassa fits into it. If the spatial criteria suggested by previous hypotheses regarding the location of the new capital are not reflected by the available archaeological data in this study area, and if those patterns that are visible are not comparable to those visible in the Hittite heartland, then it must be considered a possibility that not only was the new capital city constructed in an area that still maintained its own distinct regional character, but that the new capital city would therefore display spatial, cultural and archaeological characteristics in complete contrast to, rather than in sympathy with, those of the surrounding settlements. This would significantly alter the interpretation of the spatial analyses, the nature of the new hypothesis put forward as a result of this case study, and any overall conclusions regarding the value of the methodology developed and tested in this thesis. It is therefore imperative that all results are considered in this context - do they offer a picture of a cultural landscape bearing the hallmarks of Imperial influence, or of a region still expressing its own identity through its relationship with the landscape and a continuation of local trends established in earlier periods?

2.4.3 - Monuments in the Region

As well as settlements, monumental inscriptions are also key to answering questions of historical geography in this area, as they are, in one way or another, expressions of control over a territory. Precisely how this was achieved, however, is a matter of some debate. Within the region, monumental inscriptions of potentially Hittite date can be found at Eflatunpınar, Hatip, Kızıldağ, Karadağ, Ermenek and Keben, as well as a Hittite stone quarry with incomplete monuments at Fasıllar.

The monuments at Kızıldağ have already been discussed in some detail, but the monuments at the summit of nearby Karadağ are also of note, due to the mountain's prominence in the landscape and its likely religious significance. Like the inscriptions at Kızıldağ, the Karadağ inscriptions refer to 'Great King Hartapu', suggesting a similar date at the very end of the Hittite Empire period. They can be found at the summit of the highest peak of the Karadağ massif, known as Mahalaç. The site was undoubtedly occupied by a cultic building, but the ruins of a Byzantine chapel now occupy the spot, suggesting an ongoing respect for the sacredness of the site well after its relevance to the Hittites (and almost certainly those who came before them). The only remaining structural remnant of Hittite date is a rock-cut corridor on the eastern side of the chapel ruins. This would have led to the building which now lies under the church. In this corridor is a 2 metre long Luwian hieroglyphic inscription (Figure 2.16), translated by Hawkins (1992) as "In this place (to/for?) the celestial Storm-God, the divine Great Mountain (and) every god, the Sun, Great King, Hartapu ..., who conquered every country, (to/for?) the celestial Storm-God and every god...". Presumably this would have been followed by a verb form regarding the dedication of the building or honouring of the gods, but the collapsed ruins of the Byzantine church block the rest of the inscription from view. A second inscription, simply reading 'Great King Hartapu', can be found on the diagonally opposite wall of the corridor. This mountain was almost certainly of great religious importance to Muwatalli II, the founder of Tarḫuntassa, as part of his favoured 'Storm God of Lightning' cult, and continued to be important to his descendants, including Hartapu. It has been inferred, therefore, that if Kızıldağ was the location of the city of Tarḫuntassa, then the Karadağ sanctuary would have been equivalent to Yazılıkaya, the cultic sanctuary near Hattuša (for example, Yakar 2014). Certainly the presence of Hartapu's monuments at both suggest the two are inextricably linked in some form, in the final years of the Hittite Empire at the very least, though whether they are linked in the manner suggested is still up for debate.

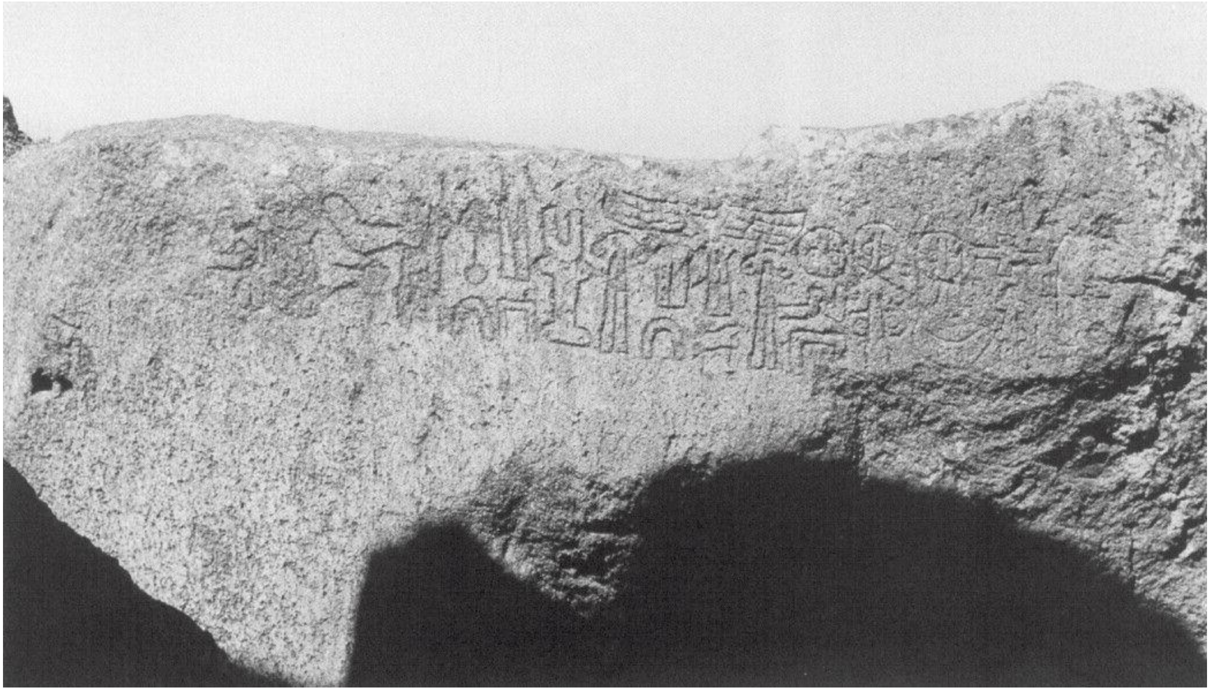

Figure 2.16. Karadağ inscription (Hawkins 2000 via http://www.hittitemonuments.com/Karadağ/)

Possibly the most well known monument in the study area is the sacred pool and carving at Eflatunpınar, on the western shores of Lake Beyşehir (Figure 2.17). This monument dates to the reign of Tudhaliya IV, as part of a campaign of monument building on the western and southern fringes of the empire. He also appears to have concentrated on building monuments that doubled as structures for controlling or containing water, such as sacred pools, dams and ritual basins. As well as the quarry at Fasıllar within the study area, which may well have been the source for the limestone used for the Eflatunpınar monument, there are a number of similar monuments of Tudhaliya IV just outside the study area, such as the sacred pool at

Yalburt, north of Konya, the nearby ritual basin at Köylütolu and the dam at Karakuyu in Kayseri province, northeast of the study area. Five inscribed altars of Tudhaliya IV were also found at Emirgazi, just north of Karapınar and the northern edge of the study area. These were found in a secondary context, but since they refer to the 'divine Mt Šarpa', they are assumed to have been recovered from the nearby Arisama Dağ (Hawkins 2006). Little excavation has taken place at Eflatunpınar, but recent surveys as part of the Fasıllar project (Erbil 2014 & 2016), as well as the earlier surveys of Bahar and Mellaart, have shown Eflatunpınar to have been part of a fairly well settled landscape in the Late Bronze Age, with Hittite pottery having been recovered from the small mound next to the spring and the nearby sites of Kocadere, Sadıkhacı-Bayat Höyük and Beyşehir Höyük C, all within 5km of the monument. There is a fairly high likelihood, given its position near the borders outlined in the Bronze Tablet, that the Eflatunpınar sacred pool is the '^{D}KASKAL.KUR of Arimmatta' mentioned in that text as having been a border marker under Hattusili III, the lands beyond which were returned to Tarḫuntassa by Tudhaliya IV (Dinçol et al 2000). The Sumerogram ^{D}KASKAL.KUR literally translates as 'Divine Road of the Earth', and was interpreted by van den Hout (1995) as a 'spring pool', but could also translate as any natural feature with links to the underworld, such as springs, sinkholes or caves. If this is true, this would identify the mound immediately next to the monument as the town of Arimmatta (Dinçol et al 2000). There is some evidence to suggest that the monument is unfinished, and it has been suggested by Mellaart (1962) that the carved and abandoned monumental statue found at the quarry site of Fasıllar around 25km away was intended for use at Eflatunpınar (see also Bachmann 2006 for a thorough architectural study of the monument, though its meaning is of more importance than its functionality for the purposes of this study). However, an analysis of the structure and compatibility of the two stone monuments by Varlik et al (2016) has shown this is unlikely have been the case. Nevertheless, the fact that the monument at Eflatunpınar was left unfinished by Tudhaliya IV fits into the chronology of the border treaties suggested earlier in line with Gurney (1993), assuming that the expansion of Tarḫuntassa's borders meant the monument was no longer in Hittite territory, and therefore no longer served a purpose as an expression of Hittite territorial control. It is, however, unusual that if the ^{D}KASKAL.KUR of Arimmatta was a border marker under Hattusili III, it was only later monumentalised by his son - this is perhaps worth considering before this identification can be completely certain.

Figure 2.17. Eflatunpınar Monument and sacred pool (image from Wikimedia Commons, author Noumenon (2007), shared under the terms of the Creative Commons Attribution-Share Alike License 3.0)

Two of the more enigmatic monuments in the study area are those in the Göksü valley at Ermenek and Keben. Neither monument has an accompanying inscription to date the carved human figures, and unfortunately the Ermenek monument was already badly damaged in 1983 (Kohlmeyer), and has now in all likelihood been completely destroyed by recent building work. The Ermenek monument portrayed a standing male figure in a short tunic, with an arm outstretched (Figure 2.18). It's discoverer, Bittel (1939) tentatively dated the carving to the 13th century BC, but it is now impossible to know for certain. What is intriguing is its location - this branch of the Göksü river valley has no other known settlements of Late Bronze Age or even 2nd Millennium date. The presence of this monument, however, surely suggests that this area should be more thoroughly surveyed before more sites like Ermenek are lost. The Keben monument, while still in existence, is more questionable in its dating. Carved into a cliff-face in the lower Göksü valley, 27km from the coast at Silifke, it depicts a standing female figure with both arms extended and possibly holding a tree branch or similar object, wearing a head covering, a cape and a long dress, interpreted as religious, ceremonial garb (Taşyürek 1973). On the basis of the Hittite domination of the area and the lack of Aramaic features, Taşyürek is happy to date the relief to the Hittite Empire period, but Ehringhaus (1995) dates it to the Neo-Hittite period, in the 8th century BC, based on the style of clothing.

Figure 2.18. Ermenek monument - Bittel (1939) via http://www.hittitemonuments.com/ermenek/

The monument at Hatip, west of Konya, discovered by Bahar in 1996(a), is the only monument that names Kurunta in its inscription, and this dates it squarely to the period of Tarḫuntassa's occupation and political importance (Figure 2.19). It also puts this monument in direct competition with those of Tudhaliya IV at Eflatunpınar, Fasıllar and Yalburt, suggesting, if not a border, than at least competition over territory. Kurunta's use of the epithet 'Great King', and reference to his father Muwatalli, also a Great King, suggests further antagonism towards the regime at Hattuša. Dinçol (1998) suggests that the relief of the male figure, with short-sleeved tunic, bow, short sword, spear, conical hat and pointed shoes, is an image of a god, rather than the king himself, as the conical hat has horns on the front, symbolising divinity. Again, the presence of a spring, as well as its political and geographical relevance on Tarḫuntassa's frontiers, may have influenced the choice of the site.

Figure 2.19. Hatip Monument - Bilgin (2009) via http://www.hittitemonuments.com/hatip/

It is also worth mentioning two further monuments beyond the study area that add to the political picture in the late Hittite Empire period. The first is a monument of Muwatalli II at Sirkeli, east of the study area near Ceyhan, Adana Province (classical Smooth Cilicia). Monumental relief carving was a phenomenon of the later Hittite Empire, and this monument is the oldest known royal Hittite rock relief. The monument, along with a second, much more worn carved relief of a similar or later date, overlooks the Ceyhan river, one of the major waterways that snakes through the coastal plains of Smooth Cilicia. Across the river to the north is the Yılankale, a 13th century AD Armenian castle on a prominent rocky hill. A settlement mound rich in Bronze and Iron Age finds, known as Sirkeli Höyük, is situated next to the monument, with a substantial stone building (the final phase of occupation of which is dated to the Late Bronze Age) having been erected against the rock outcrop into which the monument is carved. This building has been interpreted by both Hrouda et al (1997) and Dinçol et al (2000) as a royal tomb, possibly that of Muwatalli II himself. The höyük was certainly an extensive site which was occupied to some extent in the Late Bronze Age, and has produced a great volume of material from the Middle-Late Bronze Age and Middle Iron Age, with the Late Bronze Age pottery indicating Central Anatolian contact (Novak & Kozal 2013). The presence of Muwatalli's monument has led to suggestions that the monument is the ^{NA_4}*he-kur SAG.UŠ* ('permanent rock sanctuary') mentioned in the Bronze Tablet as having been returned to Kurunta, and that the city of Tarḫuntassa must therefore be nearby, or may even be the site itself (van den Hout 2002) - however, given the likely location of the borders, as discussed above, it seems incredibly unlikely that the city itself would be this far east, or that that this monument would be mentioned in the context of the borders described in the Bronze Tablet. It is more likely that Muwatalli II established the monument to mark an important crossing of the river, or to commemorate his campaign against the Egyptians in Syria, as this site is on the route from Anatolia to the Levant. Ünal (2002) suggests that the monument is more a geographical marker than an indication of settlement, and that if there were an important Hittite city here, it is not at Sirkeli Höyük at all, but on the rocky hill across the river, where the Yılankale stands.

Another important monument to mention in the context of Tarḫuntassa is the third known monument bearing the name of Hartapu, at Burunkaya in Aksaray province. This inscribed stone block currently lies upside down on the slopes of the hill, and must have at some point fallen from its original position nearer the top. This monument is much further north than the study area and the borders mentioned in the Bronze Tablet. Hawkins (2000) translates the Burunkaya inscription as 'In this place did Great King Hartapu, beloved of the Storm God, [son] of Mursili, Great King, He[ro...] he did/will smite.' Bryce (2012) suggests that this monument is Hartapu's most direct expression of his line's legitimate claim to the Hittite throne, in opposition to the kings based at Hattuša, who at this stage will have been either Tudhaliya IV or one of his sons, Arnuwanda III or Suppiluliuma II. It is known that Tudhaliya IV suppressed uprisings in the Lower Lands (the Luwian speaking region between Tarḫuntassa and Hatti), and Bryce (2012) suggests that Kurunta, and later his nephew Hartapu, may have gained support from these areas in their campaign to re-establish the line of Urhi-Teshub/Mursili III as the true kings of the Hittite Empire. This is echoed by Yakar (2014), who suggests that in the years following the establishment of the borders laid out in the Bronze Tablet, Hartapu may have gone on a campaign of expansion into territory controlled by an ever-weakening Hatti, and annexed the lands as far north as the Great Salt Lake, the Tuz Gölü. This may have resulted in the suppression of Tarḫuntassa by Suppiluliuma II, as recorded in the Sudburg inscription. However, as this study is concentrating on the known territory of Tarḫuntassa as recorded in the Bronze Tablet, and the aim is to find the location of that city, then to include these areas that may have been incorporated later on by Hartapu would be over-extending the reach and complexity of the project to no clear purpose. This is not to say, however, that the presence of Hartapu's inscription at Burunkaya is not worth noting as an important piece of evidence in the broader history of Tarḫuntassa and the final years of the Hittite Empire.

2.4.4 - The Purpose of Monuments

The royal monuments at Eflatunpınar and Hatip were almost certainly placed deliberately on the borders between Hatti and Tarḫuntassa at a time of political uncertainty. The relief-carved monument and ritual pool at Eflatunpinar are dated to the reign of Tudhaliya IV, cousin of Kurunta of Tarḫuntassa. The monument at Hatip, however, is one of Kurunta himself. Glatz & Plourde (2011), in their broader study of the purpose of Hittite monuments, use 'costly signalling theory' to hypothesise that monuments were used as 'signals of political competitive ability' (p58). These monuments would not necessarily be present near large population centres or even used simply to express imperial power, but were instead placed in areas far away from major political centres, closer to the populations and political entities to whom the messages were directed, and proving that the monument had been erected at great expense both in terms of travel and expertise in order to reach their intended target. Furthermore, these monuments would have been more common in areas 'where political conflict is most intense or precarious', for example in border zones, and where 'traffic between polities occurs most frequently' (p58).

Harmansah (2014a), on the other hand, argues that monuments were erected at sites of local spiritual importance. He uses the 'DINGIR.KAŠKAL.KUR' referenced in the Bronze Tablet as an example of this - while this has been translated as 'sinkhole' (Beckman 1999), it can be translated more literally as 'Divine Road of the Earth' (as per Hawkins 1995), suggesting a connection with the underworld. This could be just about any location with a spring, water source or, indeed, sinkhole. Eflatunpinar and even Kızıldağ, which once had a spring on its north-west slopes, would qualify as such locations. These sites were then monumentalised and drawn into political events such as treaty-signing and the declaration of borders. Settlements at these locations for priests and cult devotees would not be unusual.

Ullmann (2014) casts further doubt on the use of monuments as border markers or even expressions of imperial control, emphasising instead the deliberately hidden nature of many of these monuments - why conceal that which is meant to be seen? Instead, he argues that the monuments are deliberately placed at points of transition between different topographies - for example at Hatip where the plain meets the mountains - and served a purpose that combined the two most important characteristics of the Hittite Empire - the religious and the military. Monuments were, he argues, a place for armies to gather and for military leaders to consult the gods as to whether a military campaign was justified. The reliefs also 'merged the natural and constructed spaces of the Land of Hatti and created a place for ritual to be performed.' (p121).

Glatz (2014) further refines her argument for monuments as expressions of regional political discourse, and notices that, across all of Anatolia, very few monuments are directly put in place by Hittite kings, and those that aren't show no expressions of patronage from the centralised state. This suggests that the monumentalising of these sites of local importance was in fact a regional expression of their political engagement with a wider, multi-regional entity.

It is important for the wider study of Hittite geography, as well as for the particular case of locating Tarḫuntassa, that the meaning of these monuments and the relationship between them and the locations of borders, roads and settlements is fully taken into account. Therefore, these monumental sites have been included alongside the settlements in the database, and it will be necessary to examine how these sites are connected (or indeed not connected) to Hittite settlement patterns and networks of communication. The meaning of these monuments, and their dual purpose as expressions of both Hittite religion and political power, is also something that will have to be considered as an influencing factor in the location of the borders and the city of Tarḫuntassa, although this is not something that can be analysed as a criterion for the city's location, and instead must be discussed after the fact.

2.5 - Addressing the Problems

By reviewing previous studies into the history, geography and archaeology of this region, it has been possible to place the question of Tarḫuntassa's wherabouts in its wider context. It has also highlighted some of the serious flaws in previous attempts to locate the city, both in terms of the sites suggested and the means by which these suggestions have been made. Furthermore, it has helped identify some of the criteria which may, according to the hypotheses put forward in previous studies, have influenced the Hittites to choose a site for their new capital, ranging from the previous occupation of the site, the relationship between the site and the surrounding topography, the influence of the predominant agricultural regime and the interaction between the settlements themselves and the networks which connected them.

What is clear from the literature review is that, without firm textual or archaeological evidence, there has not yet been a sufficiently rigorous methodological approach to the question of the location of Tarḫuntassa. Sites have been chosen on the basis of the quantity and quality of archaeological remains, particularly monumental architecture, and hypotheses regarding how these sites fit into wider patterns of settlement location have been suggested with little or no statistical evidence to show that this is indeed the case. This suggests that these hypotheses are little more than post-rationalisation, an attempt to justify the choice of a site based on unproven observations. This shows that there is a need for a methodology which can not only assess the criteria used to support these hypotheses through rigorous analysis of the available data, but also apply the results of these analyses in a way which actually identifies which sites truly fit into the wider patterns of settlement location.

For this study to provide such a methodology, which can provide a new approach to the study of the historical geography not only of this region of Anatolia in the Late Bronze Age, but to all of ancient Anatolia and even the Ancient Near East as a whole, the next step must be to outline the structure of the project so that this new methodology can be constructed. This will include outlining the key aims and objectives of the project, identifying the criteria used to back up the hypotheses for Tarḫuntassa's location suggested in the literature review, giving an overview of how these criteria and can be assessed and analysed using the available archaeological and spatial data, using the outcomes of these analyses to generate a new hypothesis for how to locate Tarḫuntassa, and using this process as a case study for the viability of this methodology as an adaptable, repeatable and quantifiable approach to studying ancient historical geographies.

The outcomes of this process of identifying criteria, analysing them, and producing a statistical model based on the results of these analyses, will help to identify the strengths and shortcomings of this new methodological approach that it is hoped will be the key outcome of this project.

3. Aims, Objectives and Approach

3.1 - Study Aims

Chapter 2 provided a review of the existing literature regarding the history, archaeology and historical geography of southern Anatolia, particularly within the area outlined in the border treaties of Tarḫuntassa, and has shown that that the location of the city itself can still not be identified with any degree of certainty. Perhaps more significantly, is has shown more broadly that a new method for identifying ancient cities and investigating historical geographies is required where traditional techniques, namely finding direct physical archaeological evidence and the study of toponyms, have failed. Furthermore, the literature review has also highlighted a number of criteria which previous studies have used to form hypotheses about the location of Tarḫuntassa, or about the nature of Hittite historical geography in general. These have not previously been verified, and may or may not turn out to be truly applicable in narrowing down which sites have the potential to be Tarhuntassa. As such, there is a clear need for this project to undertake such a process, and in doing so, to create a methodology which can not only help to provide a new perspective on the location of Tarhuntassa, but can be adapted, repeated and applied elsewhere in the study of ancient historical geographies.

By using the search for Tarḫuntassa as a case study for the development of a new methodology which is not only rigorous and methodical, but also adaptable and repeatable, this study will have a significant impact on our understanding of, and our approach to, Hittite history and landscape archaeology, both in the specific case of Tarḫuntassa and in terms of future research across the region, and the wider study of ancient historical geographies. Understanding how the location of the city was chosen and how it fits into the wider geographical context of the Hittite empire and neighbouring regions has the potential to shine further light on Muwatalli II's motivations in moving the capital in the first place. Furthermore, by identifying the spatial criteria which were applied in previous suggestions of the location of Tarḫuntassa and testing whether these criteria are actually reflected by the available data, it will be possible to use the outcomes of these quantitative analyses to come to some broader conclusions about the relationship between Late Bronze Age settlements and the natural landscape, as well as how this relationship differed from earlier periods, and what it might reveal about whether local patterns were maintained or changed by Hittite imperial influences.

Incorporated into this understanding of regional Anatolian settlement patterns in the Bronze Age will be a greater knowledge of other elements of the landscape archaeology of the Hittites and their contemporaries in Late Bronze Age Anatolia, including trade routes and agro-economic regimes. Finally, identifying sites and areas of high archaeological importance will also be of crucial importance in protecting the heritage assets and historic environment of this region from further damage, especially since this region is being heavily altered by hydrological projects such as the construction of dams, reservoirs and canals.

In summary, this project provides a new methodological approach to the study of ancient historical geographies by assessing the validity of previous hypotheses and generating new hypotheses which may be used to locate ancient sites, investigate ancient geographies, both known and unknown, target future research and fieldwork and protect important sites and landscapes. However, the case study will also provide important outcomes in and of itself, re-examining the question of why and where Tarḫuntassa was constructed, and how it fits into the wider picture of human interaction the landscape in Late Bronze Age Southern Anatolia.

The most important outcome of this project is not only that the question of Tarḫuntassa's location is approached from a fresh angle, furthering the debate around it, but that this is done through the use of a rigorous, adaptable and repeatable process based on the analysis of empirical data regarding Bronze Age sites and their context in the wider landscape. As already stated, the literature review has shown that previous studies have provided suggestions of spatial criteria for identifying the location of the city, but these have not been satisfactorily tested or applied in a direct manner - instead, they have often simply been stated after a conclusion has already been drawn as a post-justification, on the assumption that they would back up the conclusion if tested.

Therefore, there is a need for this project to try and locate Tarḫuntassa through a process of testing the criteria around which previous studies have based their conclusions, and using the outcomes of these and additional analyses to produce an accurate model of the relationship between Bronze Age settlement and the landscape, and what this means for the location of Tarḫuntassa. This hypothesis-testing process will produce two outcomes - firstly, it will assess the validity of these previous studies by showing whether or not the claims that underpin their conclusions hold true when taken at face value and tested against the available data. Secondly, where it has been shown that the criteria used to formulate these previous hypotheses are reflected in the data, and assuming therefore that these criteria are appropriate for use in suggesting the location of a Late Bronze Age civic and political centre, the results of these analyses are drawn together, and the resulting data can be used to build a model - an applied synthesis of those previously tested criteria, which will in turn will act as a new, overarching hypothesis for where Tarḫuntassa might be located.

This is the ultimate aim of this thesis - the development of a methodology for studying ancient historical geographies through a process of assessing the validity of the criteria on which existing hypotheses were formulated, and subsequently generating new hypotheses on the basis of those assessments. As such, the value of this metholodogy is not that it will provide a definitive answer to the question of where Tarḫuntassa, or any other undiscovered ancient city, might be located. Neither does it specifically aim to prove or disprove any given theory that has previously been put forward. Instead, the methodology will be able to assess the validity of those existing hypotheses, which were based on observation and generalisation, visualise and quantify these assessments, and bring together those spatial criteria which are reflected in the available archaeological data, to generate new, more data-driven and verifiable hypotheses for the study of historical geographies. This process, which forms the heart of this thesis and the new methodology it seeks to test, is outlined below in diagramatic form (Figure 3.1).

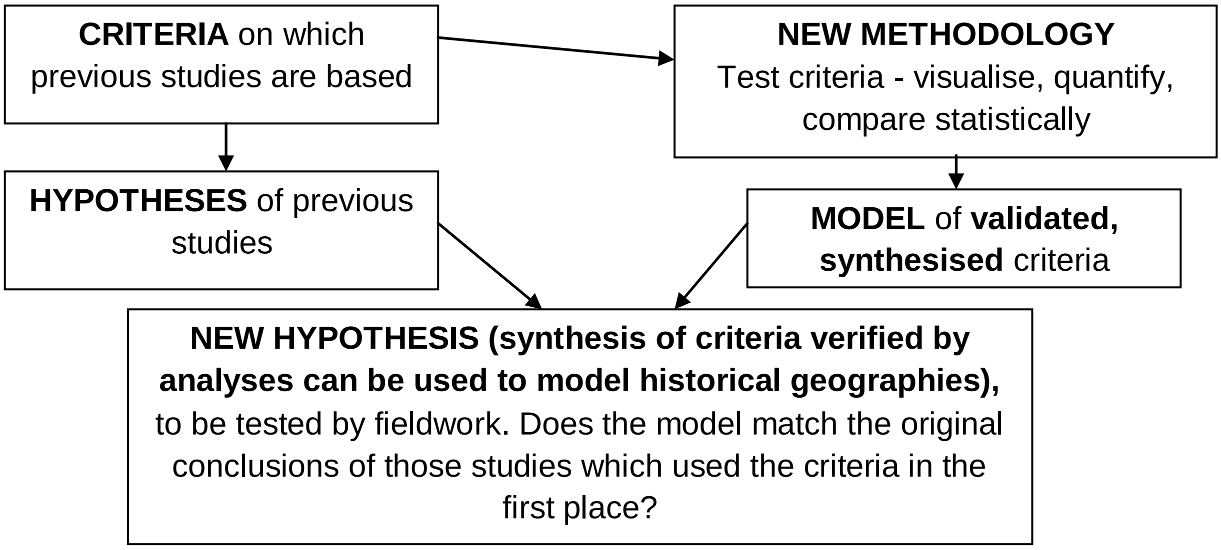

Figure 3.1. A diagram outlining the new methodological framework being applied through this case study.

The criteria that will be tested as a part of this process have been drawn from a wide variety of studies into Hittite historical geography, urban, landscape and environmental archaeology. Some of them have been drawn directly from previous hypotheses regarding the location of Tarḫuntassa. These include the assertions of Dinçol et al (2000) that the city should be located close to important trade routes, within an area of dense 2nd Millennium occupation, and would have been a large site with room for expansion, as well as Singer's (2006) claim that the city was probably founded on 'virgin ground', and therefore must only have produced archaeological evidence dating to the Late Bronze Age. Other criteria are taken from broader studies of Hittite landscape archaeology and historical geography - for example, the conclusions of Glatz (2011) that Late Bronze Age sites may have been smaller than the Middle Bronze Age trading colonies, of Mielke (2011a) that larger Hittite cities would have occupied peripheral positions in river valleys, and of Bahar (2005) that Late Bronze Age settlements preferred steeper sloping sites at higher altitudes, which were more easily defended. Furthermore, some criteria have resulted from drawing together several studies on the landscape and climate conditions in Bronze

Age Anatolia. The idea that Late Bronze Age sites might be situated further from rivers and flood plains has not been outright stated as such in any of the literature reviewed, but a testable criteria to this effect can be inferred from the 'Beysehir Occupation Phase' hypothesis, which indicates that from the mid-to-late 2nd Millennium, upland farming and clearances began to play a greater role in agriculture and land usage, while environmental evidence in the Konya Plain suggests that the flooding regime in the Carsamba fan would no longer have been favourable for farming. However, what links all of the above criteria is that some element of them is inherently spatial. All of them make some claim about the spatial relationships between settlement and landscape which needs to be assessed against archaeological data, whether this is to do with altitude, slope severity, proximity to certain geographical features or interactivity within networks of trade and communication. If more targeted research is to be done on this landscape in the future, these criteria must be tested, and the results used to create a new hypothesis regarding Tarḫuntassa's location which can be tested through future fieldwork.

The criteria outlined above, which have been used, or could feasibly be used, to ascertain where Tarḫuntassa might be located fall into three categories, with varying degrees of abstraction from the raw data - 'Site Characterisation', 'Site Location' and 'Landscape Modelling'. The first category is that of 'Site Characterisation', which relate to the intrinsic qualities of the sites themselves. These are more immediately obvious, and will often have been directly recorded in the course of archaeological surveys. This category includes criteria that take into account the chronological phasing and duration of the occupation of the site (often evidenced through ceramics or other finds identified during survey and excavation), as well as its size. The criteria in the second category, 'Site Location', involve the relationship between the sites and the surrounding landscape. These criteria are not as immediately observable as those in the 'Site Characterisation' category - rather, some form of spatial analysis is necessary in order to both obtain and verify the necessary data. Criteria in this category include the relative density of sites across the landscape and their relationship to generic landscape features such as rivers and steep slopes, as well as the link between settlements and the specific topographical features of this region, i.e. the Konya Plain, the Taurus Mountains and the Göksü and Çarşamba valleys . With regard to both 'Site Characterisation' and 'Site Location' criteria, the analyses performed will test whether or not the criteria in the literature are accurately reflected by the data - though this will be particularly important in the case of the Site Location criteria, where it is impossible to observe the accuracy of these hypotheses without the analysis.

Beyond these two groups is a third category of criteria, 'Landscape Modelling'. These criteria are linked to the Site Location criteria, in that they involve assessing the relationship between the sites and the landscape. However, the analyses for these criteria involve a further level of abstraction from the original datasets, i.e. the data regarding known Bronze Age sites in the region, the digital terrain model of the area and key topographic features. For example, in order to analyse the relationships between Bronze Age sites and contemporary routes of communication and trade, these networks first have to be modelled using the available data, before these are in turn used to carry out further analyses. As such, the datasets used as the basis for assessing the criteria of proximity to roads are themselves models produced through a previous analytical process, and are therefore inherently hypothetical in nature. This category of criteria is therefore the most abstracted from the original data.

By their very nature, the results of Landscape Modelling analyses are more abstract than those of the Site Characterisation and Site Location analyses, and more difficult to validate or assess the potential for errors. However, this process of self-critique and reflection on the accuracy of this methodology has been incorporated into this project through a process of comparative analysis to more intensively studied Hittite landscapes, where there is a greater level of certainty on site location and more data available from previous attempts to map roads and routes of communication, and the results of the analyses performed here can be directly compared.

Since the primary aim of this project involves such a lengthy process of analysis leading into modelling, it was split into six specific objectives, with each objective building iteratively upon the outcomes of the last and forming the procedural structure of this research.

First and foremost, before any analysis of data or verification of criteria was undertaken, all of the archaeological data available in the defined study area was collated from all available sources (objective one). This task was made more difficult, however, due to the number of separate sources of data which had to be consolidated. Furthermore, in order fully to reveal the complexities of the historical geography of this part of Anatolia and to contextualise the Hittites and their use of the landscape, it was necessary to create a complete database not only of Late Bronze Age sites, but also of those from both earlier and later periods. Some of the criteria analysed had temporal, as well as a spatial, dimensions, relating to changing patterns of settlement over time. Therefore it was crucial to build a complete archaeological picture of how the Southern Konya plain changed, from the Early Bronze Age, through the Middle Bronze Age and Old Assyrian *kharum* periods, and beyond the Late Bronze and Hittite Empire periods into the Early Iron Age and, eventually, the period of the Neo-Hittite kingdoms. Adding this temporal element to the database also made it possible to come to more nuanced conclusions regarding whether or not the changes that occurred in settlement patterns in this region were continuations of existing local trends, or significant departures caused by the influence of the Hittite Empire.

Once this complete dataset had been assembled, the next three objectives were to test the criteria that had been drawn from the literature and past attempts to locate Tarḫuntassa, first through Site Characterisation analyses (objective two), then Site Location (objective three) and finally through Landscape Modelling (objective four). Analyses were performed using the available datasets in order to establish whether or not these criteria were reflected in the data, and whether they supported the previous hypotheses regarding Tarhuntassa's location. These analyses ranged from relatively simple statistical models of Site Characterisation through to the far more complex procedures involved in Landscape Modelling, and involved an increasing degree of abstraction from the raw data in parallel to this increased complexity.

Of course, these longer procedures were themselves subject to some critical analysis and comparison to existing projects, to ensure that their results were not flawed or taken at face value. For this reason, the subsequent objective was to carry out a comparative analysis, comparing the results of the analyses above to the more intensively studied landscape surrounding the Hittite capital of Hattuša (objective five). Obviously not all of the analyses were directly comparable due to the vastly differing topographies of the two regions, but nevertheless, some important conclusions were drawn from comparing these two datasets, particularly as many of the conclusions regarding Hittite urbanism and relationship to the landscape have been drawn from studying the particular landscape of the Hittite heartland. This comparison also helped address the question of whether the relationship between the Hittites and the landscape they occupied changed with the topography or remained constant across all of their territory, as well as helping to identify the extent to which such distant parts of Hittite-controlled territory can truly be considered culturally 'Hittite', rather than retaining their own distinct patterns of interaction with the landscape.

Finally, those criteria which, through the above spatial analyses, were reflected in the available data regarding the landscape and the archaeology, and were shown to have at least some influence on the locations of Late Bronze Age settlements, were then applied in trying to achieve the sixth and final objective - attempting to locate the most likely site for Tarḫuntassa, on the basis of the previously tested criteria, through the construction of a Predictive Model (objective six). However, this was not a simple question of looking at those sites already known to us and reapplying the spatial criteria which had been examined throughout this process in the same passive way as previous projects. The results of the analyses instead provided the statistical spatial data needed to prove not only which known sites best fit the relevant criteria, but also to highlight parts of the study area which have not yet yielded sites in previous surveys, and should perhaps be given greater attention in future fieldwork studies and protected from anthropogenic and environmental destruction.

3.1.1 - First Objective - Building a Database of Sites and Monuments

As outlined above, the first objective of this study was to assemble a complete picture of the archaeological record in the study area. Rather than simply being a means to an end, however, the creation of a spatial database proved to be an important outcome of the project in and of itself. Currently, no such comprehensive centralised database exists - each Turkish province keeps a register of archaeological sites, but these are purely textual documents with some accompanying photographs, compiled from survey data. There is a distinct lack of a coordinated approach between provinces, and spatial data is not downloadable. Other projects, such as the TAY Project, an independent survey and database project not linked to any institution, have attempted to maintain a publicly accessible online database with a browser-based searchable GIS utility, but this has not been updated since the mid-2000s, and the GIS sadly contains only a small proportion of those listed in the written database, which is itself almost, but not entirely, comprehensive. Therefore, to have a publicly accessible and comprehensive spatial database of all ancient sites across this region would be a new and important resource for researchers studying Southern Anatolian archaeology.

In order to reach this outcome, the first requirement was to assemble the available data from all known archaeological surveys, and to consolidate the information from across these numerous sources. In cases where sources appear to contradict each other, particularly with regard to the dating of sites, all the dates thus far assigned to each site were included in the database, as there was not time to conduct a more thorough study of the reliability of dating based on the available artefactual evidence - an issue which will be examined in more detail in Chapter 4. However, on some points, in order to have internal consistency across the database, some information, particularly on the dimensions of sites, was not be taken directly from survey reports, but instead gained remotely using satellite imagery. In the case of physically locating the sites and providing coordinates, many do not include this information at all, or record it inconsistently or innacurately, frequently rounding the size of settlement mounds to the nearest 10m or even 100m in diameter. This necessitated a more hands-on, although still remote, approach to finding sites, providing accurate coordinates and producing internally consistent measurements.

The database needed to include the following information in order to make many of the spatial analyses possible, to allow for greater interpretative depth and for it to be of greater use for guiding future fieldwork; the name of the site, the nearest modern settlement, the province in which it is found, its coordinates in both Universal Transverse Mercator and WGS84 Latitude/Longitude, the periods during which it was occupied, its diameter (both east-west and north-south) and its height.

3.1.2 - Second Objective - Site Characterisation analyses

It has been shown through the review of previous studies that many existing hypotheses on the location of Tarḫuntassa use inherently spatial criteria to back up their argument, without first testing these criteria through spatial data or analysis. A key aim of this project was to explore how such spatial criteria can be used to assess likely locations for ancient sites, through an accompanying framework whereby these criteria are first tested and then applied through spatial data analysis. Therefore, the second, third and fourth objectives of this research all revolved around assessing these criteria through analyses, and the first stage in this process is Site Characterisation analysis.

As already outlined above, Site Characterisation analysis involves looking at trends that are directly observable from the empirical data brought together as a result of the first objective, and relate to the nature of the sites themselves, including the number of sites, the time periods and span of time for which they were occupied, and their size.

The first criterion to take into account is that of time. As has already been touched upon, it is important to include sites from a range of periods, and not just the Hittite Empire period during which Tarḫuntassa was occupied. This is in order to investigate those criteria which involve changes in settlement patterns over time, and attempt to find reasons, whether topographic or social, why certain sites may have been consistently occupied, with numerous phases of settlement, where others have been abandoned after the Early Bronze Age or specifically established in a later period, as well as which settlements continued to be occupied after the collapse of the Hittite Empire. Chief among these is the suggestion of Singer (2006), who asserts that the lack of references to Tarḫuntassa before its establishment by Muwatalli II suggests that he built the city on 'virgin ground' (p46). Rather than contributing directly to the predictive model to locate Tarḫuntassa, this is a criteria that was applied retrospectively, once other analyses were completed. Once other criteria were tested, sites occupied only in the Late Bronze Age onwards were isolated simply by searching the database, and these sites can therefore be considered more likely to be Tarḫuntassa.

It has been asserted by numerous studies, such as Mellaart (1964), Dinçol et al (2000), Yakar (2001) and Baird (2001b), that there are two drastic declines in the number of settlements (but not necessarily in population) throughout the Bronze Age - one in the EBA III period (2300-2000BC) and another in the transition from Middle to Late Bronze Age (1600-1500BC). Interestingly, the early survey results of Bahar (2001) appear to contradict this hypothesis, but only with a complete database compiled from all available survey data can this be validated. This hypothesis was tested simply by completing the database to discover the total number of sites occupied in each period - although it should be noted that with the decline in the number of settlements, there may be a corresponding increase in the size of the remaining settlements, particularly in the Middle Bronze Age. However, the corollary to this decline in the number of settlements is the hypothesis that that Middle Bronze Age sites, while fewer in number than those of the Early Bronze Age, are larger, due to a shift from a more rural, agricultural economy to one of long-distance trade and urban settlement (Dinçol et al 2000, Baird 2001b). Glatz (2011) further suggests that these sites then shrink again in the Late Bronze Age, as established regional power bases were (possibly forcibly) depopulated in favour of new Hittite administrative centres. It was in order to test this hypothesis that it was important to record site dimensions in an internally consistent manner using Google Earth's path measurement tool, rather than relying on the survey reports which, as already noted, can be innacurate, contradictory or entirely lacking in necessary information. This information was then included in the database, and some basic statistical analysis of the average size of settlement sites in each time period would show whether the resulting data actually backed up this claim.

3.1.3 - Third Objective - Testing Site Location criteria through Spatial Analysis

The third objective of this research is to critically assess those criteria which consider the relationship between Bronze Age settlements and the surrounding landscape, particularly their location with regard to steep slopes and high or low altitude areas, their proximity to natural features such as rivers and to specific features such as the Konya Plain, and their relationship to each other (i.e. settlement density).

With regard to altitude and sloping ground, this criterion is based on the assertion of Bahar et al (2005) that there is a tendency from the Late Bronze Age onwards for sites to move towards "mountainous and sloping areas, for security reasons" (p2). If this observation is true, we should expect to see Late Bronze Age sites at higher altitudes, and on (or near) more steeply sloping ground, than those of the Early and Middle Bronze Ages. Some very simple spatial analyses were performed to investigate both the altitude and steepness of the sites within the database to see if this theory is true.

After assessing the factors regarding the 'local topography' of the sites in the database, the next criteria to be analysed were those regarding the context of the sites within the surrounding landscape, particularly their proximity to rivers and the plain edge.

The criterion for proximity to rivers was derived from the theory put forward in the environmental archaeology research performed by Boyer et al (2006), who observed a decline in the number of settlements around the central Çarşamba fan at the end of the Early Bronze Age due to the change in the pattern of alluvial deposition, but a lack of a subsequent re-settlement in the Middle and Late Bronze Ages due to either socio-political factors or a continued unfavourable climatic situation. Therefore, a Late Bronze Age Hittite capital would be more likely to be located further from this central river complex, if it was no longer relevant to the settlement regime of the time. A simple analysis of the data obtained was performed to ascertain whether this hypothesis was accurate.

The second criterion, that of proximity to plain edge, is similar to the aforementioned criterion regarding slope steepness, and is related to the above analysis regarding the Çarşamba fan, but is more specifically linked to a particular landscape - the Konya Plain and the mountains surrounding it to the south and west. As well as Bahar et al's (2005) assertion, mentioned earlier, regarding the move towards mountainous and sloping sites in the Late Bronze Age, there are two other sources that lend themselves to a hypothesis suggesting it is more likely that Tarḫuntassa will be found in this specific region. Firstly, there is the 'Beysehir Occupation Phase' hypothesis of Eastwood et al (1998), suggesting that a lowland agricultural regime was supplanted by one of upland viticulture and fruticulture, beginning around 1600BC. Indeed, Boyer et al's (2006) discovery of increased amounts of topsoil, rather than bedrock, in the Çarşamba's alluvial deposits from 1500BC, suggests an increase in upland deforestation, presumably for agricultural use. Where economic and agricultural regimes shift from lowland and upland, settlement patterns must surely follow. Secondly, there is Mielke's (2011a) characterisation of large Hittite urban centres as being more likely to occupy 'a peripheral position in larger valleys, where mountain passes reach the plains' (p184). While the Konya plain may be somewhat larger than the average valley, it still has a river system at its heart, and mountains at its periphery, and control of the locations where routes through these mountains emerged onto the plain would surely still have been of utmost importance. Taking all of the above into account, it is of utmost importance to critically assess the criterion of 'proximity to the plain edge' - again, a relatively simple analysis was used to isolate this specific topographic region, and determine whether or not Late Bronze Age sites are more likely to be found in close proximity.

3.1.4 - Fourth Objective - Landscape Modelling

The last criterion to be assessed was that of proximity to roads. This differs from the other criteria in that one of the necessary components for the analysis, i.e. the road network, did not already exist in the same way as topographical features such as slopes and rivers, or archaeological sites in the database such as settlement mounds and monuments. Before any analysis could be performed, therefore, a hypothetical network of roads was modelled, based on the natural routes through the landscape which are easiest to traverse, in conjunction with the existing settlements, on the basis that these settlements must have been integrated into a wider trade network in some fashion.

The hypothesis that Tarḫuntassa must be well connected within a road network is based on the study by Dinçol et al (2000), who assert that the city must have been 'easily connected to other parts of the central plateau and the Mediterranean region by a network of roads' (p16). Furthermore, Mielke (2011a) notes that earlier sites on major communication routes were frequently reoccupied by the Hittites. Bahar, in his assessments of the sites at Zoldura/Lystra (Bahar et al 2005) and Çiçek Höyük (Bahar et al 2007), claims that the position of these sites on potential ancient crossroads (particularly in the case of Çiçek Höyük where a road connecting the

Beyşehir/Şuğla region with the southern Konya plain may have crossed a road heading south toward the Göksü Valley) made them crucial Hittite settlements controlling these networks of communication and the roads that connected the Anatolian interior to the Mediterranean coast.

Therefore, in order to show whether or not Late Bronze Age settlements were well connected to trade routes, a hypothetical road network was modelled, and the resulting roads ranked according to the number of paths between settlements which follow the same route. A statistical analysis was then performed to show whether a statistically significant proportion of Late Bronze Age sites are situated within close proximity to the most important routes within this network, as well as highlighting which sites in the study area are well connected and which are not. This involved a new form of 'Total' Least-Cost Path analysis for an archaeological landscape, which is in itself a useful outcome of this project, and it is suggested that this approach can be applied elsewhere, not just in Anatolia but across the Near East and in any areas where archaeological and textual sources have not satisfactorily established the layout of the historical road network in relation to known settlements.

3.1.5 - Objective Five - Comparative Analysis

Having carried out all of the above spatial analyses, it would have been tempting to simply take all of their conclusions as read and apply them directly to the question of identifying the location of Tarḫuntassa. However, to do so without having first tested the viability of these methods would leave the approach developed in this thesis open to criticism as having been conducted using an unvalidated model. If the techniques used in this study can be shown to work effectively elsewhere, and the criteria which were reflected in this project's data can also be applied to a better understood landscape, then the model, and therefore the approach, can be validated. In order to go about critiquing the methodologies put forward in this study, therefore, they had to be applied to a more intensively studied Anatolian archaeological landscape, where questions of historical geography have already been, if not answered, at least pinned down with greater certainty.

No part of the Hittite Empire has been studied in greater depth than its heartland, surrounding its capital city (for the majority of its existence), Hattuša, in the Turkish province of Çorum. The historical geography for this region in the Hittite period is relatively well established, thanks to the extensive library of administrative and religious tablets found at Hattuša which document itineraries for numerous religious festivals and include names of several surrounding towns and cities. As well as the capital, there are several further Hittite cities within a 50km radius, many of which have been well excavated and some of which have been identified. These include Alacahöyük (possibly the Hittite cult city of Arinna), Ortaköy (solidly identified as Sapinuwa), Büyüknefes (Hittite Tawiniya, later the classical Galatian city of Tavium), Kuşakli Höyük and Çadır Höyük (both of which have been proposed as the location of the Hittite city of Zippalanda).

Obviously, topographically speaking, this region is very different to the project's main study area - there is no level plain like the Konya plain, nor a massive mountain range like the Taurus. Instead, the region is an undulating rocky plateau where flat, or even gently sloping land, is scarce, except for in the larger river valleys. Surrounding the region on three sides is the so-called 'Halys Bend', the course of the river now known as the Kızılırmak (the longest river entirely within Turkey). One of the Kızılırmak's major tributaries, the Delice, flows into the heart of the region, and these two rivers are in turn fed by a network of smaller tributaries flowing from the plateau's heights.

Despite not resembling the study area topographically speaking, there can be some conclusions drawn about the Hittite use of the landscape which can be applied to the study area, especially regarding their use of topographically prominent locations, control of river valleys and other natural routes of communication, and occupation of 'transitional' landscapes between flat and sloping ground, as pointed out by Mielke (2011a). The Hittite cities in this region, particularly Hattuša itself, provide crucial case studies in identifying how the locations for major Hittite urban centres were chosen, and whether any of these choices could equally apply to the Tarḫuntassa region.

Furthermore, an important project by Karl Strobel (2008) centred on Büyüknefes/Tawiniya/Tavium has aimed to identify Hittite road networks within this landscape, particularly those connecting Tawiniya to Hattuša to the north, and Kuşakli Höyük to the east. These roads have primarily been reconstructed using satellite imagery and on the assumption that later, more archaeologically apparent Roman roads may have followed pre-existing routes, as well as using Hittite textual sources, particularly the itineraries of religious festivals where the king travelled between a number of cities and holy sites. While Strobel's methods are not necessarily without flaws themselves, they provided the opportunity for results of the Least-Cost Path method used in this study to be compared to a pattern of reconstructed roads based on more solid archaeological and textual evidence. This made it possible to engage in some level of self-critical analysis on the findings of this study, showing where perhaps Least-Cost Path analysis in particular may not have been able to reveal a full or entirely accurate picture of Hittite geography. It also allowed for a closer examination of those cases where Hittite routes of communication did not match the route that is technically 'least-costly', and an assessment of why this may be the case and how these conclusions could be applied to constructing a historical geography of the Tarḫuntassa region.

3.1.6 - Sixth Objective - Predicting the Location of Tarḫuntassa

Having assessed all of the criteria for likely locations for a large Hittite city using spatial analysis, and tested the approach against the better studied and understood Hittite landscape of Hattuša, the final objective of this project was to use the results of those assessments to build a predictive model. The purpose of this model was twofold - firstly, it would be possible to assess the likelihood of those sites previously suggested in the literature as potential locations of Tarḫuntassa actually being the site of the city, on the basis of the modelled criteria used by those same past studies. Secondly, it would be possible to identify those parts of the study area which might benefit from further archaeological investigation, if they are highlighted in the predictive model as being likely areas for Hittite settlement.

In order to construct a predictive model, each of the spatial criteria that were modelled were used as component layers. Each of these layers had to use the same standardised range of values in order for the composite to work - the easiest way to do this was to express all results of the previous analyses in terms of the percentage of Late Bronze Age sites found in each particular area. For example, in the analysis regarding slope steepness, the cells making up the map were divided into five different categories based on the steepness of the slopes. Once the analysis had been completed, these same cells were then assigned a new score based on the percentage of Late Bronze Age sites which were found to occupy cells with the corresponding slope value. This then became a component layer of the predictive model.

Each component layer was then added together and used to form a single map, the predictive model, wherein every cell of the image was assigned a score, expressed as a percentage chance of being a preferred site for Late Bronze Age settlement - this percentage was a mean average of all the percentage values in the component layers used to create the predictive model. The values of these cells was then extracted into the database of settlements, based on the cells they occupy, giving each known Late Bronze Age site a 'score'. This score was used to show whether or not previous attempts to identify Tarḫuntassa were accurate, based on the criteria put forward in those same studies. Furthermore, the model could be used to identify other potential candidates within the database of known sites which had not previously been considered.

It was possible, using the results from the analyses performed in objectives two through four, and through the comparison carried out in objective five, to assess which, if any, of the hypotheses relating to possible candidates for Tarḫuntassa proposed from the original criteria gleaned from the literature were more likely to have been important to the location of a Hittite settlement, which hypotheses were not borne out by the modelled criteria but the models nevertheless provided results which were still relevant to the prediction of Tarḫuntassa's location, and which had no statistical significance whatsoever when applied to the data. In this manner, it was possible to discuss whether or not to weight the component layers used to construct the model, in order to give those criteria with greater significance in influencing Late Bronze Age settlement location greater priority in producing the final predictive model.

As its name suggests, the predictive model does not simply function as a means of assessing known archaeological sites. As well as assigning scores to known sites, the predictive model will also assign a score to every cell in the map, and this can be represented visually to highlight areas that score highly according to the criteria used in compiling the model. Therefore, the model itself will act as an important outcome of the project not just in terms of moving towards locating Tarḫuntassa, but also by aiding future researchers in prioritising areas of high archaeological value for future survey or excavation.

However, the model cannot accurately represent all of the available criteria - only those that can be assessed and represented as spatial data. As a result, some criteria had to be applied retrospectively to provide further context to the results of the model. Examples of this include continuity of occupation (assuming the new capital was built on 'virgin ground' as suggested by Singer 2006), considering the meaning of Hittite monuments and their relationship to urban settlements and places of power (especially in the context of the numerous inscriptions at Kızıldağ cited by Alp (1995) and Dinçol et al (2000) as being proof of its identity as Tarḫuntassa) and the relationship between the new capital and any features of the landscape that may have been symbolically relevant or of practical importance in Muwatalli II's cult of the Storm God of Lightning (Singer 2006). As well as these more cultural criteria that could only be applied in retrospect, the final predictive model was also critiqued on the basis of the outcomes of the comparison study on the region surrounding Hattuša. By examining the results of the predictive model in the context of the findings of the comparison study, it was possible to see where the predictive model produced unrealistic results, or lent itself to an interpretation that does not fit with the characteristics of the Hittite landscape at Hattuša. This then allowed for further discussion of the successes and failures of the methodology as a whole, and an examination of why such discrepancies may have appeared.

3.2 - Summary of Aims and Objectives

By addressing these six objectives, it is possible to produce a new overarching hypothesis for identifying the possible location of Tarḫuntassa and targetting areas for future archaeological fieldwork - that hypothesis being, 'if the spatial criteria used by previous studies to justify their attempts to locate Tarhuntassa hold true when quantified and methodically tested against the available archaeological and geographical data, a synthesis of those spatial criteria which have been reflected in the data as a result of analysis should be able to help identify likely hypothetical locations for the city and prioritise areas for future archaeological fieldwork'. The results of this hypothesis will take the form of a 'predictive' spatial data model, which can help to identify not only known archaeological sites which are more likely to be Tarḫuntassa, but also high-priority areas which scored highly in the model but where surveys have, as of yet, revealed no archaeological sites. This will fulfil the aim of this case study - to develop a methodology which can provide a new, data-driven hypothesis for Tarḫuntassa's location which can inform future fieldwork, the results of which will in turn act as a test of the hypothesis.

However, the overall aim of this project is not to simply locate this city, but to do so by developing a rigorous, repeatable methodological framework, based not on subjective observations and best guesses, but on a statistical analysis of the available data, grounded in the hypotheses generated by previous scholarship, and an observation of the trends and patterns these analyses reveal. It should be possible to subsequently re-use this methodology to assess ancient historical geographies in other landscapes and in relation to other cultures, with different spatial hypotheses to test and different datasets to analyse, generating a new and unique synthesised hypothesis for every circumstance in which it is applied. In essence, the methodology will act as a 'historical geography hypothesis generating toolkit'.

It was highlighted in the literature review that such a methodology has been sadly lacking in previous studies of Hittite and Bronze Age historical geography, not only in this area but across Anatolia (such as Bajramovic 2011). Studies of historical geography in this area have stuck resolutely to the tried and tested methods of toponymy, studying textual sources and evidence found in the course of archaeological investigations. It is therefore hoped that the methodology outlined in this project will provide future studies with another means of identifying ancient sites where these methods have been limited. However, it will also be necessary to address the shortcomings of this new methodology as and when they arise, and to assess whether or not the framework provides satisfactory results, or is suitably rigorous and repeatable, to be used in future research.

Furthermore, the six objectives that make up this research will each produce outputs which are, themselves, of value. As already noted, by using criteria suggested in previous studies to produce the hypotheses which in turn provide the basis for the analyses carried out, each outcome of this project will provide a critical assessment of these criteria, and highlight the problems associated with some of the assumptions made in previous studies, both about the nature of the sites in this particular landscape, and about the Hittites' relationship with the landscape in general. In particular, the first objective of this project, the production of an internally consistent database of Bronze Age sites within this area of Southern Anatolia, is in itself a valuable outcome of this research, and will be made publically accessible on the conclusion of this research, in the hopes that it will prove useful to future researchers.

3.3 - Approach

As has been ascertained from the literature review and the above discussion of the criteria used in previous scholarship to support the hypotheses relating to possible sites for Tarḫuntassa and broader studies of historical geography in this region, the main failing of previous attempts to locate Tarḫuntassa has been a lack of a systematic or testable approach. Observations have been made about the relationship between favoured sites and the landscape, or regarding wider Late Bronze Age settlement patterns, but these hypotheses have not been assessed in any quantitative or qualitative way, and even then, it has not been shown whether the sites suggested actually fulfil the stated criteria for being a likely location for Tarḫuntassa. In almost all of these cases, these criteria are spatial in nature, focussing on the relationship between sites and the landscape, or between sites themselves. As such, in order to improve upon previous studies, this project must be carried out in a manner which is not only systematic, but that also utilises a toolset which is able to deal specifically with answering spatial questions and performing complex modelling. Therefore, Geographical Information Systems (GIS) software was used in this study, as such programs are the perfect tool for such a purpose. Specifically, the analyses performed in this study were carried out using ArcGIS 10.0.

GIS software, at its most basic, allows users to perform a multitude of analyses using spatial data. All that is required of this data in order for GIS analysis to be carried out is information regarding its attributes (what it is) and location (where it is) (Worboys 1995). An example of such a dataset would be a series of points representing archaeological find spots. Each point would record a number of attributes regarding that particular find spot, such as its age, material, form, context and by whom it was found. However, each point must also record the location of the find, in the form of coordinates. Such datasets are often recorded in the form of individual points, lines or polygons (known as 'vector' graphics), stored within a database, with all of the attribute information accessible in a table. As long as the GIS workspace and the dataset use the same coordinate system, this is, in theory, all that is required in order to carry out GIS analysis. The ability to locate data, and perform analyses on the basis of this spatial factor, is what separates GIS from other database systems (Conolly & Lake 2006).

However, most spatial analyses require some further information regarding the context in which the data is located. This additional data is often in the form of an image file made up of a grid of cells (known as a 'raster') covering the extent of the study area, which is used as a background to the vector dataset. Like the individual records in the vector dataset, each cell in the raster image contains information, which can include both attribute and location. However, unlike the vector data, raster files often express some form of 'continuous' and highly variable data, such as altitude. Rasters which contain altitude data are referred to as Digital Elevation Models (DEMs), and are the basis of many spatial analyses. A basic example of a DEM can be seen in the figure below (3.2). However, they can also express any number of continuous attributes, and these are often derived from analytical processes. Again, the raster must share the same coordinate system as the GIS workspace and the vector dataset and in order for the analyses to work.

170	148	122	128	131
144	111	115	127	149
138	107	161	173	152
118	104	155	196	184
100	122	140	159	177

Figure 3.2. An example of a DEM. Each cell has a value expressing height above sea level in metres.

In procedural terms, GIS can be used to carry out tasks in five key areas; data acquisition (including tasks such as data entry, map digitisation and remote sensing); database management (the creation and maintenance of databases, metadata and data relations); spatial data management (including coordinate transformation, the georectification of aerial imagery and building of topological datasets); spatial data analysis (covering a vast range of tasks including everything from simple data queries by attribute or location to more complex procedures such as the modelling of movement and predictive modelling); and spatial data visualisation (the production of digital maps, thematic imagery and data visualisations in both 2D and 3D) (Conolly & Lake 2006). Within archaeology, the use of all of these functions of GIS is a well established practice, particularly in four disciplines - excavation recording, heritage management, landscape archaeology and the modelling of past human behaviour (Conolly & Lake 2006). Broadly speaking, the former two areas primarily involve those tasks relating to data acquisition and management, while the latter two build on those tasks to include more spatial data analysis and visualisation - though this is distinction is far from clean cut.

Given the unique functionality of GIS in collecting spatial data and performing analyses which utilise this spatial element, it is the perfect tool to use in answering the essentially spatial questions at the heart of this thesis - what were the primary motivating factors for the Hittites and their contemporaries in choosing settlement locations, how do these factors apply to this region of southern Anatolia, and how can answering these questions help to locate the city of Tarḫuntassa?

With regard to the criteria underlying the existing hypotheses that have been outlined above within each of the six objectives, there are GIS analyses which can be applied. This will serve two purposes, one a natural progression from the other. Firstly, by applying GIS analyses to these criteria (whether put forward in previous attempts to locate Tarḫuntašša or as a synthesis of broader climactic, political or economic theories which are applicable to this region), it can be ascertained whether or not these criteria hold true when applied to the available data. For example, in order to assess the spatial criteria underpinning the theory put forward by Bahar (2005) that Late Bronze Age sites are more likely to be found closer to steeper slopes, a simple GIS analysis can be performed to define how steeply sloping the terrain is across the study area, and then to calculate the distances of Bronze Age settlements of all time periods from those areas which are defined as steeply sloping. The results of this analysis can then be used to work out whether Bahar (2005) was correct in his theory. Those spatial criteria which are reflected in the data as being influential in the choice of Late Bronze Age settlement location, regardless of whether they back up the hypotheses originally put forward in the previous literature, will then become part of the model which will in turn be used to assess each of the known sites put forward as likely locations for Tarḫuntašša, and target areas for future fieldwork.

This leads into the second reason to apply GIS to these hypotheses - where GIS has shown the hypotheses to be true, allowing them to be used as criteria, the results can then immediately be reapplied in forming a model for assessing which sites within the database best fit those criteria.

The specific analyses which were carried out in the course of this study, and any previous comparable uses of GIS either in performing similar analyses or being used in the same study area, will be addressed in subsequent chapters, but each of them has been used in order to assess the veracity of a specific hypothesis. Some of these criteria have been drawn specifically from previous attempts to locate Tarḫuntašša, such as that of Dinçol et al (2000), who suggest that the city must have been close to 2nd Millennium trade routes and areas of dense settlement. However, other criteria have not previously been specifically applied in the search for Tarḫuntašša, but rather form a part of broader theories about Hittite or Late Bronze Age settlement patterns - for example, Mielke's (2011a) assertion regarding the position of Hittite cities at peripheral locations on the edges of valleys. Some further criteria are in fact original to this study, where theories regarding environmental or economic influencing factors have been identified in previous studies and new criteria for this thesis have been drawn from them. An example of this is the use of the 'Beyşehir occupation phase' theory to suggest a new criterion, that Late Bronze Age settlements may be situated further away from river systems.

There are further GIS applications that could be performed using the available data, but will not be applied in this project, as there are no criteria for analysis which justify their usage. For example, GIS is commonly used to perform 'viewshed analysis', to ascertain whether certain sites are intervisible with other sites or features of the landscape. However, since no hypothesis for the location of Tarḫuntaşşa, or for Hittite settlement choice in general, involves criteria relating to intervisibility with other settlements or specific landscape features, viewshed analyses have not been performed here. There is no need to perform GIS analyses for the sake of it, simply because they can be applied - there must be a specific question that needs answering, or, as in this case, a hypothesis that needs to be either tested or constructed, in order to help build a model of past use of the landscape. In this sense, GIS is being used here in a reflective fashion, simultaneously critiquing previous approaches to the Tarḫuntaşşa question, while also creating a new approach to this crucial issue of Late Bronze Age Anatolian historical geography and, hopefully, a new interpretation.

3.4 - Thesis Structure

As outlined above, the outcomes of this study are, in short, the construction of a database, the testing of the criteria used as justifications for locating Tarḫuntassa in previous studies using GIS-based spatial analysis, the comparison of the results of these analyses to more intensively studied landscapes, and the synthesis of the resulting data into a predictive model. This is a case-study for the application of a new systematic methodology for locating unidentified ancient sites based on the known characteristics of the landscape and sites of that period. These objectives form the main outcomes of the project in and of themselves, but more than this, each also provides the foundation for the next objective, in the sequence that has been outlined.

Therefore, rather than examining all of the methodologies for all six objectives, then all of the results and finally a unifying discussion, the thesis will be structured around these objectives. Firstly, the methodology for producing the database and the issues encountered in its construction (objective one) will be discussed, followed by the results of this phase of data collection and a full discussion of those statistical analyses that can be performed directly using only the empirical data available in the database (the Site Characterisation analyses, objective two). These will both be addressed in Chapter Four. Secondly, the details of the spatial analysis techniques used to assess the Site Location criteria within the GIS software will be discussed in Chapter Five, and the results compared to the original hypotheses proposed in the literature, to see if the criteria proposed in previous studies were accurate or useful in locating Tarḫuntassa (objective three). A similar process will then follow in Chapter

Six for the analytical techniques used to create a hypothetical Hittite road network, and an assessment of the relationship between the sites and this communication network (objective four). A comparison study with the Hattuša region, the differences and similarities between the two sets of results and what this says about both the usefulness of the results of this case study and the extent to which they reflect 'Hittite' patterns will be examined in Chapter Seven (objective five). Finally, the method for producing the predictive model and the subsequent applications of retrospective criteria will be outlined in Chapter Eight, and the results of this model and its implications will be discussed and critiqued, as well as compared both to the Hattuša comparison study and to previous studies (objective six). Once each of these outcomes has been fully explored separately, a full discussion (Chapter Nine) will bring together the results of all six outcomes and what these results mean for locating Tarḫuntassa and the broader study of Hittite historical geography, leading to the overall conclusions of the project and its implications for future work.

4. Collecting and Assessing Empirical Data

As outlined in Chapter three, the first two objectives of this study will be to bring together all of the available data regarding the archaeological record in the study area, from the Early Bronze Age through to the Iron Age, and subsequently to build a database recording the basic statistics of the sites themselves, including their age, location and size. This basic information will then provide the first set of observable results of this project, through only the most basic of GIS functions, 'queries by attribute'. These observations are referred to as 'site characterisation analyses', being results derived from the assessment of the character of the sites themselves, and not their relationship to each other or the surrounding landscape features. Included in the site characterisation analyses will be the number of settlements occupied in each time period, and the size of those settlements. These two analyses are interrelated, and observations regarding the general spatial pattern of settlements in the database as well as the fluctuations in the number and size of those settlements throughout the Bronze Age and into the Iron Age may lead to some conclusions being drawn regarding the factors that may have influenced these changes.

4.1 - Constructing a Database of the Archaeological Landscape

4.1.1 - Data collection

The first objective of this project was to construct a full database of sites in the study area, from the Early Bronze Age through to the Iron Age. Although the goal of this particular case study was to suggest a possible location for the Late Bronze Age city of Tarḫuntassa, it was necessary for the database to cover the preceding and following periods as well, so that those criteria which relate to continuation of occupation could be assessed, and in order to contextualise the socio-political and economic factors influencing Late Bronze Age settlement patterns. Without a full and consolidated dataset representing all occupation sites in this region of Anatolia throughout the Bronze Age, any further analyses would be of little use, so it was of vital importance for there to be a comprehensive exploration of the available sources of data, whether they had already been incorporated into an existing GIS project or other centralised record, or not.

The main sources of data were the provincial cultural registers, the TAY Project (2014), the Konya and Karaman surveys of Bahar (1996-1999, 2001-2011), Mellaart's earlier surveys of the Konya plain (1961/3), Güneri's Central Anatolian Mounds project (1987, 1989, 1990), the work of French (1965) and Solecki (1965), the Lower Göksu Archaeological Salvage Survey project (Şerifoğlu et al 2014), the Konya-Ereğli (KEYAR) survey (Maner 2014-16) and the Fasıllar survey (Erbil 2014 & Erbil et al 2016). Each of these sources was conducted with varying priorities, as well as varying degrees of accuracy - as such, these sources were first assessed and their usefulness discussed, before a standard method for assembling the database could be implemented that took the common features and unique flaws of these sources into account.

4.1.2 - Secondary Sources

Provincial Cultural Registers

The study area covers significant areas of five provinces of Turkey, each with its own register of archaeological sites. Only three of these are freely available - Karaman (Karaman İl Kültür ve Turizm Müdürlüğü 2014), Antalya (Antalya İl Kültür ve Turizm Müdürlüğü 2014) and Isparta (Isparta İl Kültür ve Turizm Müdürlüğü 2014). These registers of sites are in no way comprehensive or entirely useful in locating the sites in question - Karaman province's list of höyük sites (http://www.karamankulturturizm.gov.tr 2014), in particular, is a seemingly arbitrary selection, many of which they have simply obtained by referencing the relevant information directly from earlier surveys, but some of which they have surveyed and written descriptions of themselves. There are no coordinates to aid in the locating of these sites, only a rough description of the location based on nearby villages (a recurring problem through all the data sources), with a maximum of four photographs and very occasionally a small hand-drawn map to help with identifying the site.

TAY Project

Among the more helpful data sources was the TAY Project (TAY Project 2014), an ongoing inventory of archaeological sites, unaffiliated with any academic institution, that has been running since 1993, and has been online since 1998. The ambitious aim of the TAY Project is to create an organised catalogue of every archaeological site in Turkey, so that the country's cultural heritage might be properly available to individuals and institutions who wish to study it, and to facilitate a means of recognising sites that are in danger of destruction. There is a database of sites and an interactive GIS application, which proved moderately useful in locating sites.

However, there are several flaws in the TAY Project's data. Firstly, there is a severe discrepancy between the total number of sites they have in the database and the number on the GIS application (10,853 online but only 4,273 on GIS, as of 2013). As a result, there are a vast number of sites for which there are no photographs (photographs were obtained on an expedition between 2000-2004, so any sites added since then lack pictures) and no information as to location other than the nearest villages and proximity to landmarks such as canals and motorways. Furthermore, even within the GIS application, coordinates for site locations are only given to two decimal places in lat/long decimal degrees, meaning that it is necessary to search within an area close to 1km^2 for a site that could be as little as 100m across. In many cases, sites have been destroyed or flattened by farming and are not immediately visible in satellite photography. This leads to some difficulties in detecting sites. Finally, one of the most glaring flaws in the TAY Project's database is their vagueness in dating sites and their lack of a specialist staff member for Middle and Late Bronze Age archaeology. As a result, sites are classified as either 'Early Bronze Age' or 'Iron Age', with the only indication of a Middle to Late Bronze Age presence being in the site descriptions. These descriptions are often taken straight from previous surveys, including Bahar, for whom this is also a problem.

4.1.3 - Primary Sources

Surveys of Mellaart and Bahar

The TAY Project and the Provincial Cultural Inventories use academic surveys as the groundwork for much of their database, favouring the studies carried out by Mellaart (1961/1963) on the Early Bronze Age archaeology of Southern Anatolia, and the more recent surveys of Konya and Karaman provinces carried out by Hasan Bahar (1996-1999, 2001-2011). Mellaart's work focuses on the earlier occupation phases, from the Neolithic through to the Early Bronze Age, and uses pottery to date sites and make observations on cultural relations to the known pottery sequences, for example those at Tarsus-Gözlükule, Beycesultan and Mersin-Yumuktepe. Mellaart provides only a large, hand-drawn map in his articles to assist in locating the sites, although many of these sites are also included in the TAY Project database and could therefore be located via their GIS application. Due to the limits of his research to earlier periods, Mellaart's data is only of limited use to a project of this scope.

Bahar, on the other hand, takes a much broader approach, making annual survey tours to particular districts of the Konya and Karaman provinces. He lists the sites covered in the area with a brief description of their location, date (through pottery) and occasionally noting previous research. He often gives rough dimensions of the site, including metres in height and diameter - but the latter is only usually given to the nearest 50m. He sometimes goes so far as to make observations on the context of a site or its importance to a particular area or period of time, but primarily his aim appears simply to be to catalogue the sites. Unfortunately, there are, again, a number of familiar shortcomings in his methodology, notably the fact that he does not include coordinates for the locations of these sites until 2006, and that he dates sites in incredibly general terms. Often he simply classifies sites as 'Early Bronze Age' or '2nd Millennium', with no indication as to which part of the Early Bronze Age he means, or whether '2nd Millennium' means Middle or Late Bronze Age archaeology (although the differentiation between these periods in Anatolian archaeology on the basis of pottery sherds is notoriously difficult - see 4.2.1 for a more in-depth discussion of the problems of pottery dating). He occasionally makes a more explicit reference to a Hittite presence, mostly in relation to those sites where he does make a more in-depth assessment of its importance or its context within the landscape, or where the site is explicitly linked to the Hittite Imperial administration through the presence of monuments, inscriptions or tablets.

French, Solecki and Güneri

Both the TAY Project and the Cultural Inventories also make occasional references to the survey of Central Anatolian Mounds by Güneri (1987, 1989 and 1990), the surveys in the Göksu valley carried out by French (1965) and the survey of the Beysehir-Suğla region by Solecki (1965). As with all the other surveys, the main flaw in Güneri's work is his lack of accurate coordinates - he locates sites by distance to the nearest village, and his distances are often very much estimates. Furthermore, Güneri surveys a vast amount of Central Anatolia across just three 40 page articles, an ambitious project and one that was never likely to cover all the sites in the area given its allotted scope and time frame. In his article covering Karaman (1989), he fails to mention a number of key sites such as Kozlubucak, Susan Höyük and Kasoba Karren Höyük. French, on the other hand, focuses on such a small area and such a restricted time period (primarily Neolithic and Chalcolithic) that he provides little information that was not already covered by his contemporary, Mellaart. Solecki is rare, especially for such an early survey, in that he provides lat/longitude coordinates in degree minute decimal format. However, what he does not provide is sufficient dating - he only picks out those sites of Neolithic date, and says almost nothing about the others, rendering his data of little use for this project. Trying to find the sites he lists in Google Earth using his coordinates also yielded little success.

Other surveys since 2010

The more recent surveys conducted by Şerifoğlu et al (2014) in the Lower Göksü valley, Maner (2014-16) in the region surrounding Ereğli and by Erbil (Erbil 2014 and Erbil et al 2016) on the eastern shore of Lake Beyşehir and upper Çarşamba valley are also varied in the accuracy of their locating and recording the details of sites. Çiğdem Maner's ongoing Konya-Ereğli surveys (2014-16) have been covering the region around the towns of Ereğli, Emirgazi, Halkapınar and Karapınar since 2013, with the permission of the Turkish Ministry of Culture and Tourism and funding for a five-year project from Koç University. Much like Bahar's surveys, Maner only provides locations for the sites with reference to their distance in kilometres from the nearest modern settlements, along with a map, which while helpful, does not provide a very accurate location for sites, especially those consisting only of pottery scatters with no visible mound or standing remains. Maner does give fairly accurate measurements for the sites in metres, along with consistent dating, although often only the range of dates, i.e. the earliest and latest periods of occupation, are given for those sites occupied continuously over a long period. Şerifoğlu et al (2014) et al only provided the information for three sites in the lower Göksü, and only one of these was newly discovered and unique to the survey. Descriptions of the locations of these sites were sparse, with no coordinates provided, or even any distances from nearby settlements or landscape features. However, the map provided was accurate enough to subsequently locate the new site in Google Earth. The pottery finds were well described, giving accurate dating for the sites, but there were no attempts made to provide measurements for the sites. Finally, Erbil's surveys based around the Hittite quarry at Fasıllar and the surrounding landscape (Erbil 2014 and Erbil et al 2016) rovide some of the most accurate site locations across all of the sources used. Latitude/longitude coordinates (in degrees, minutes and seconds) are given for all site locations, along with fairly detailed site descriptions including dating evidence. However, Erbil fails to record the dimensions of the sites recorded.

4.2 - Method for building the database

4.2.1 - Difficulties in consolidating data

As is evident from the overview of the sources of data, there were some considerable issues with the integrity of the data itself, which may in turn have negatively affected the viability of the methodology. Therefore, it is important to understand these issues, so that they may be considered when assessing the success of this case study in demonstrating the usefulness of the methodological framework.

Making a complete database of Bronze Age sites in the study area proved particularly challenging as it required consolidating information from all of the above sources, each with its own methods and a different set of results. This would certainly not be the first time such issues have been encountered in a study of this nature, and the specific problems involved in collating data from numerous sources in studies of Mediterranean archaeology using GIS have previously been examined in detail by

Alcock & Cherry (2004). When viewed alongside each other, there is very little in the way of coherence between these surveys - each one seems to start from scratch, with only the vaguest of allusions to previous work done in the area. This leads to considerable confusion, especially with regard to the names of sites. There are a number of sites where different surveyors have given the same site different names or conflated two sites. For example, Mellaart (1963) lists two sites, Davda Höyük and Abdullah Höyük, which apparently lie very close to each other in an area to the north-northwest of Karaman and southeast of Yuvatepe. However, the TAY project (2002) only records one mound in this area, which they name as Abdullah Höyük, while the Karaman province cultural register names exactly the same mound as Davda Höyük. Either Mellaart was mistaken, or both the later surveys failed to find a second mound. It is impossible to tell either way, and since Mellaart provides no detailed location, map or photographic evidence for the existence of two separate mounds, it is necessary to err on the side of caution and only include the one mound in the database under both names.

Perhaps the most crucial flaw noticeable across all of the available sources, however, is that many of the sites are not particularly accurately dated, particularly with regard to differentiating between Middle and Late Bronze Age sites. However, this is not necessarily a flaw on the part of the surveyors, but rather an inherent difficulty in creating chronologies from pottery sherds which have collected from the surface, rather than having been firmly contextualised as part of an archaeological excavation.

There is a clear distrinction between the primarily hand-shaped, household-crafted pottery styles of the Early Bronze Age, sometimes featuring painted motifs, and the wheel-thrown, mass produced wares which begin to appear very quickly after the onset of the *kharum* period. However, there is no such clarity of distinction between the forms of the earlier and later 2nd Millennium BC. In fact, there appears to be a continuous, unbroken ceramic tradition from the *kharum* period straight through to the end of the Hittite period, with very few new forms emerging in over 600 years, and only a decline in fabric quality and surface treatments in the later Hittite Empire giving any indication of the massive socio-political and economic changes that took place over this timeframe (Schoop 2013, Glatz 2015). It has even been suggested that this lack of distinction, combined with a less-than-rigorous approach to stratigraphy, could make it necessary for the pottery chronology used at Hattuša/Boğazkale, which has been used as a comparison for other Bronze Age sites across the region, to be reappraised (Schoop 2003).

As a result, it may well be incredibly difficult, even impossible, to firmly state which sites are Middle Bronze Age and which are Late Bronze Age without a statistical reappraisal of the pottery record for the case study area, taking into account particular shapes and styles, as well as the quality of the fabric (Schoop 2003/2006). This also calls into question the dating of sites on the basis of existing field surveys. Earlier surveyors, such as Mellaart, may have been willing to assign such dates, before the pottery chronology was called into question, but for later surveyors such as Bahar to do so is questionable at best. For these surveyors to be able to firmly date a sate to the Late Bronze Age from pottery alone would require finding some very specific readily identifiable forms, which he would be very lucky to come across at multiple sites. Unfortunately, as this thesis is a methodological study which uses archaeological data that already exists, rather than generating new data to work from, a new in-depth statistical study of Middle and Late Bronze Age pottery forms is certainly not within the remit of this project.

Therefore, although for the purposes of this study, sites identified in the data sources as 'Late Bronze Age' will be labelled as such in the database, it should be noted that those sites simply designated '2nd Millennium' may well also have been continuously occupied well into the Late Bronze Age, and likewise, those sites that have been identified as Late Bronze Age on the basis of pottery alone should be viewed with a critical eye.

When consolidating dating evidence for entry into the database, sites were classified as belonging to one or all of the Early Bronze Age (EBA, 3000-2000 BC), 2nd Millennium, Late Bronze Age (LBA, 1600-1180 BC) and Iron Age (IA, 1180-600 BC), compiling all the available dating evidence found in the surveys. As a result of the difficulties in dating 2nd Millennium pottery forms mentioned above, the designation '2nd Millennium' may well cover any or all of the Middle Bronze Age, Hittite Old Kingdom or Hittite Empire Period. The LBA designation was given only to sites that were explicitly stated to be as such, or described as 'Hittite', as this broadly correlates to the same time period, although covers both the Old Kingdom and Empire periods (1600-1180 BC). Since the descriptor '2nd Millennium' could well include Hittite/LBA sites, for the purposes of GIS analyses which were specifically examining Late Bronze Age settlement patterns, sites belonging to these two time periods were grouped together. In those analyses, however, where changing settlement patterns over time were the focus, it should be made clear that while some settlements will only be designated '2nd Millennium' while others are specifically dated as 'Late Bronze Age', the boundary between these two periods in terms of dating evidence has the potential to be very fluid, and therefore conclusions regarding changing settlement forms between these periods will only be tentative.

4.2.2 - Locating and measuring sites in Google Earth

Due to the lack of consistency or accuracy in the details of (particularly) where sites are located or their size, a method had to be devised which meant that these details were consistent across the database constructed for this project. In some cases, these details were not provided at all. Without the time or resources to get direct access to the sites and take accurate GPS measurements, and with internal consistency across the database more important than accuracy (due to the data being used for further analysis for which inconsistencies would give flawed results), the best available method was to use Google Earth to locate the settlements and also provide measurements. All site locations are given using UTM (Universal Transverse Mercator) coordinates, as UTM coordinates are measured consistently in metres, allowing for a consistent relationship between coordinate and distance anywhere on Earth. This makes UTM coordinates more easily applicable internationally, easier to convert into other localised geographic projections, and it will be simpler to combine this dataset with those of possible future projects. However, lat/long coordinates in decimal degrees for all sites within the database (which can be found in full in Appendix 1) have also been supplied so that sites can be easily found within Google Earth, which cannot search for locations using UTM coordinates.

For much of the planet's surface, Google Earth's satellite imagery has a resolution of 15m which, while not very accurate, is still largely better than Bahar's rounding to the nearest 50m or 100m in terms of site diameter, and is certainly better than nothing.

However, it should be noted that the accuracy changes with the degree to which the image is zoomed in - therefore, all coordinates should be taken at a very close zoom to get a more accurate measurement. It also means that, if a coordinate is given for a site which has been located using Google Earth, that coordinate should be within at least 15m of the actual GPS reading for the point, and in many cases should be much closer. Since many of the sites recorded have a diameter of over 100m, this is accurate enough for the coordinates given in this project to give a satisfactory position for the site, not only for analytical purposes, but also if this database is to be used in the future. With regards to measuring sites, the path tool was used to draw both north-south and east-west lines across the sites and the surrounding landscape, and the 'view elevation profile' option used to isolate the change in altitude that defined the extent of the settlement mound. The mound could then be measured from east to west, north to south and in altitude (as shown in Figure 4.1). However, it should be noted that Google Earth's accuracy for height is lower than its horizontal accuracy, and so while heights were recorded, the usefulness of this statistic for analysis is debatable on grounds of accuracy, as well as on the grounds of whether the height of the present mound bears any relation to the size of the past settlement.

Figure 4.1. Using Google Earth to measure a site - a path is drawn across the mound at its highest point. Here, the East-West diameter is being measured using the 'Elevation Profile' to measure the distance between the points where the slope gradient becomes less than 5%, as this mound is over 10m in height.

4.3 - Raster imagery and DEM

As established in the previous chapter, the other key component in most GIS analyses beside a spatial database is a raster image expressing both coordinate data matching that of the spatial database, as well as altitude data - a DEM. For the purposes of this project, the primary DEM used was the 30m resolution Global Digital Elevation Model derived from the ASTER v2 satellite imagery collected by NASA and the Japanese Ministry of Economy, Trade and Industry (METI), released in 2011. This means that each cell within the basic raster image represents 30m on the ground. While this would be considered fairly low resolution for studies in smaller, more specific landscapes, considering the large scope of this project, it is useful to use lower resolution data, as it will cut down the time taken and resources necessary to carry out the more complex analytical processes. Furthermore, the ASTER 30m GDEM is freely available, while higher resolution data (particularly over such a large area as this) may prove costly, and the declassified CORONA satellite imagery used in other Near Eastern remote sensing projects (e.g. Ur 2003, Beck et al 2007) does not cover this far west.

The area covered falls within UTM zone 36 North, with a specific grid zone of 36S, although as both Eastings and Northings were recorded and the ArcGIS data frame properties require only the UTM longitudinal zone and hemisphere to be specified, this convention will be not be used. The raster image also extends well beyond the extent of the borders of Tarḫuntassa as recorded in the Bronze Tablet, and beyond the furthest outlying data points in the dataset. This is to prevent the GIS processing flaw known as 'edge effect', where the results of certain analyses, particularly those that create continuous data in raster formats, may appear to be artificially truncated by the limited extent of the study area. Extending the outer limit of the DEM well beyond the outermost data points should mitigate for this. The unaltered DEM used in this study, along with the borders of the modern Turkish provinces for geographical context, can be found in Appendix B, Figure B.1.

4.4 - Results of Data Collection

All of the above data sources were consolidated into the dataset shown below in Figures 4.2 through 4.5 on the following pages, each image showing all of the sites occupied in each time period, from the Early Bronze Age through to the Iron Age.

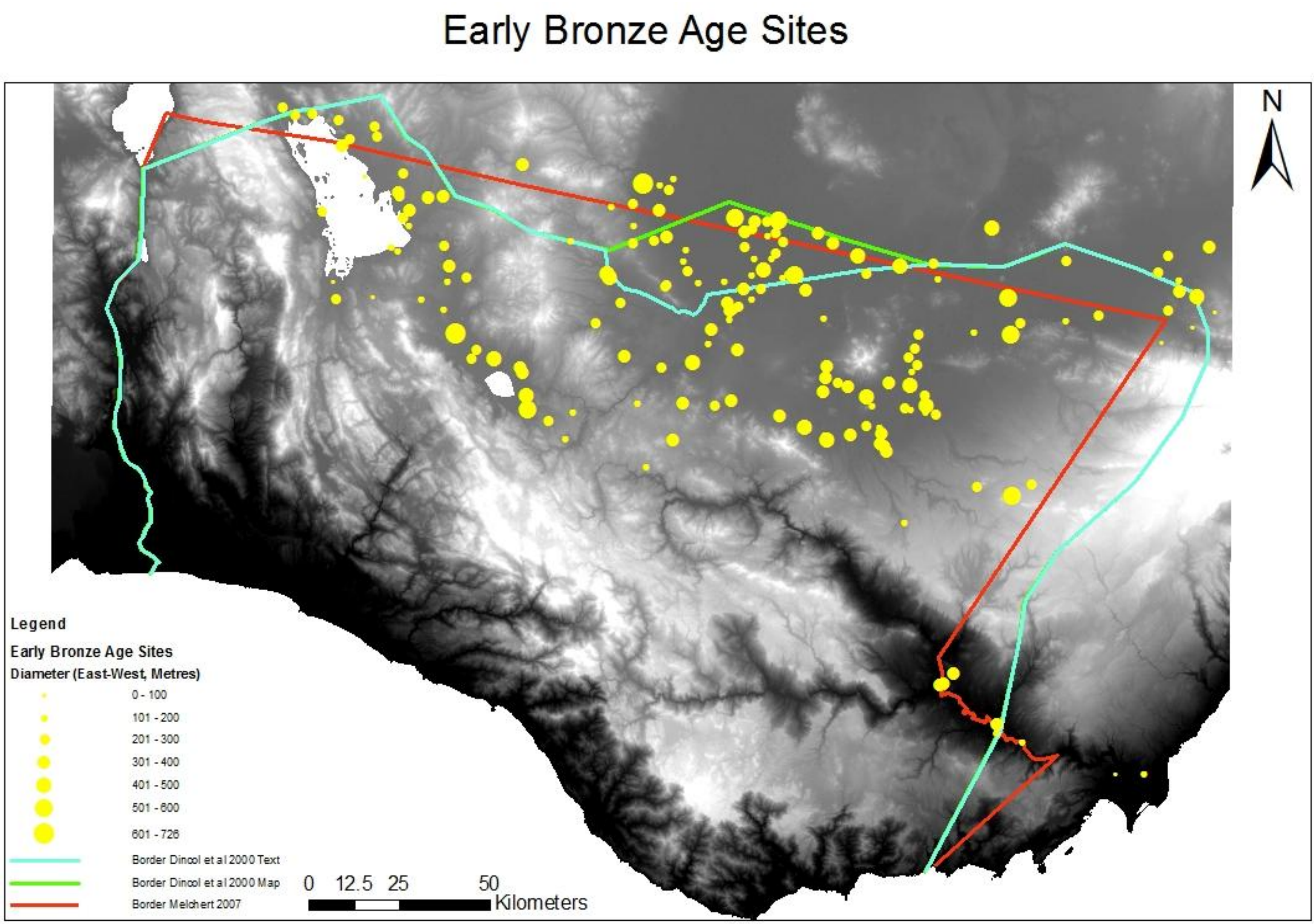

Figure 4.2. Sites of the Tarḫuntassa region occupied in the Early Bronze Age, with borders according to Dinçol et al (2000) and Melchert (2007)

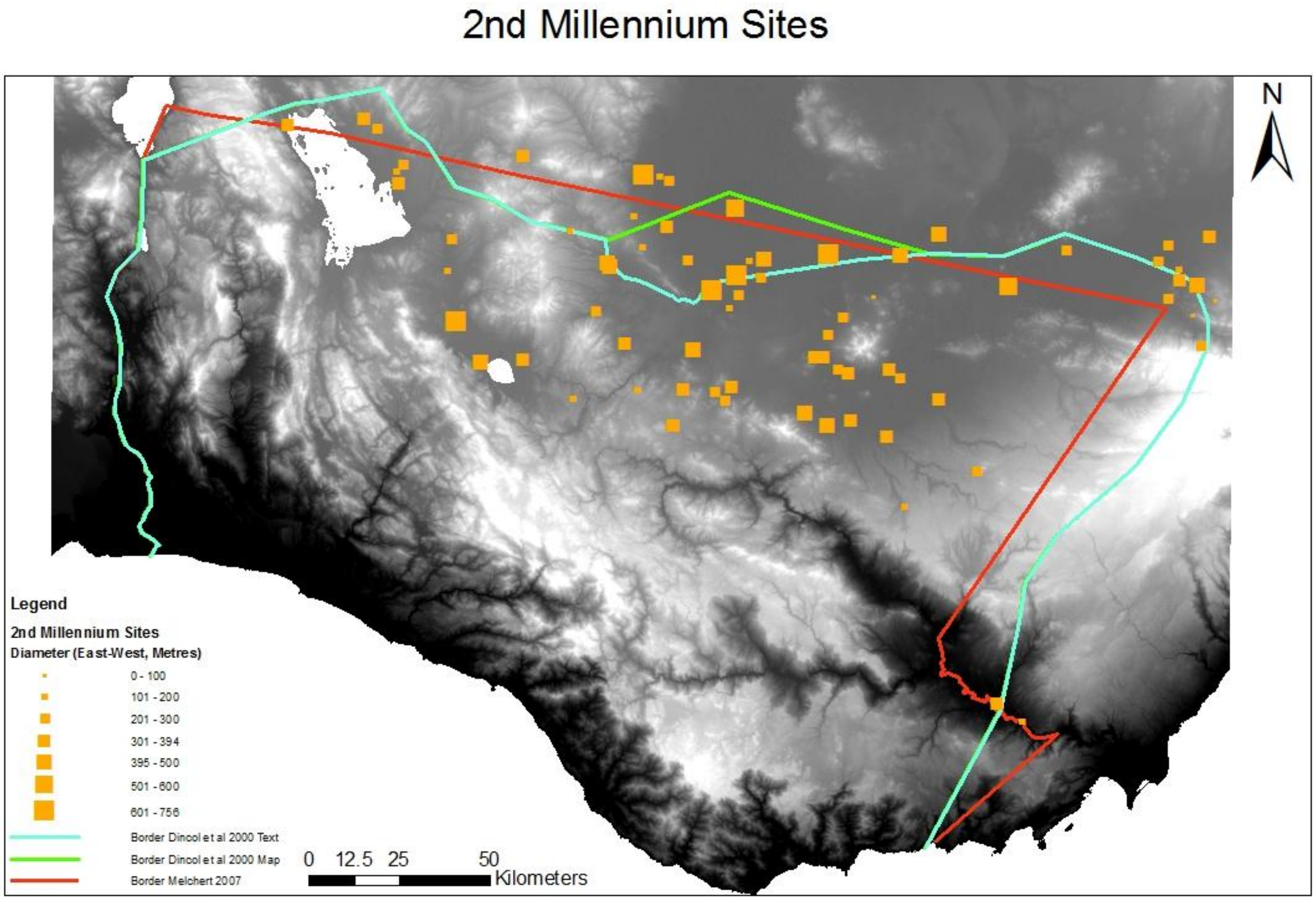

Figure 4.3. Sites of the Tarḫuntassa region occupied in the 2nd Millennium, with borders according to Dinçol et al (2000) and Melchert (2007)

Late Bronze Age Sites

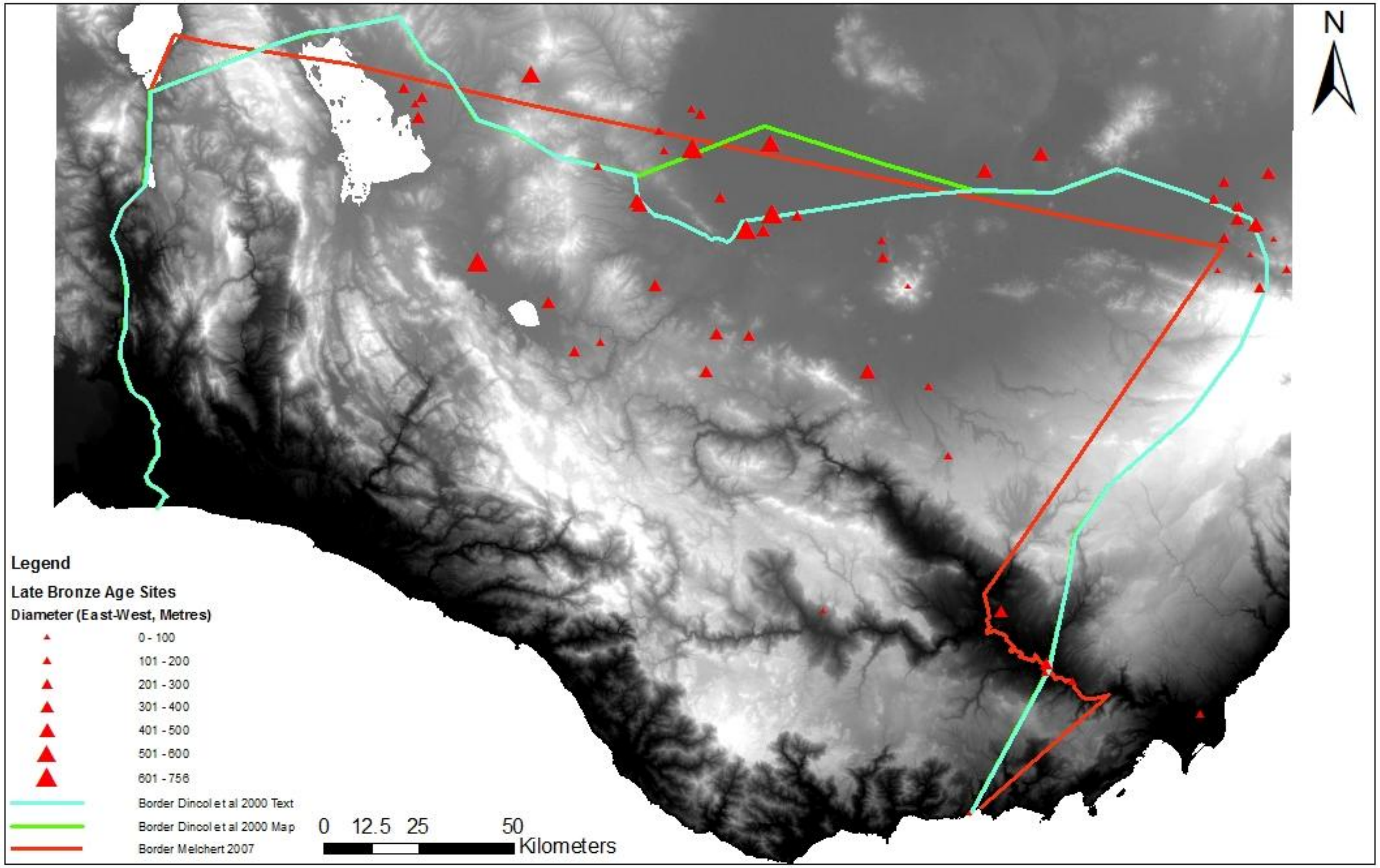

Figure 4.4. Sites of the Tarḫuntassa region occupied in the Late Bronze Age, with borders according to Dinçol et al (2000) and Melchert (2007)

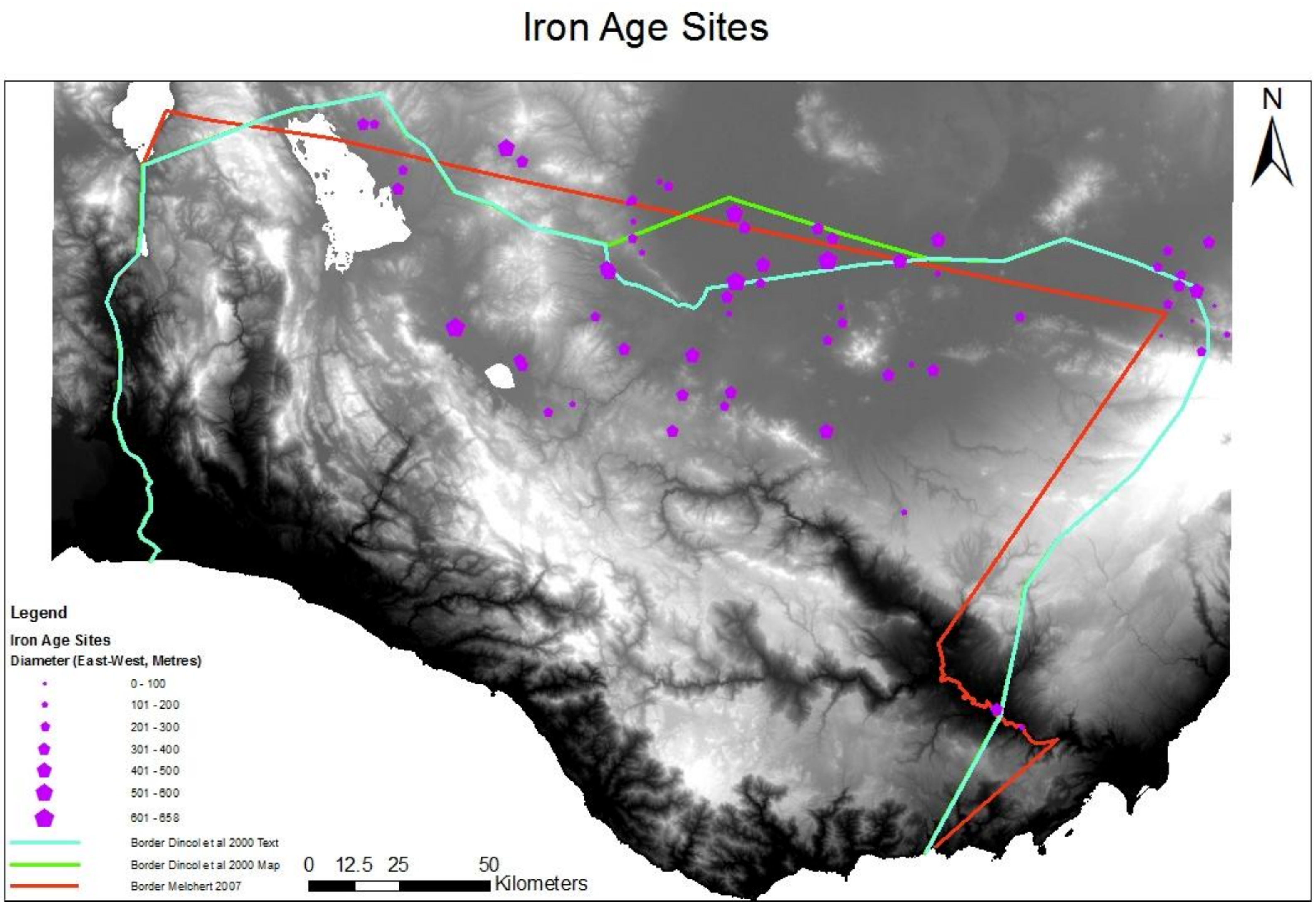

Figure 4.5. Sites of the Tarḫuntassa region occupied in the Iron Age, with borders according to Dinçol et al (2000) and Melchert (2007).

Some immediate conclusions can be drawn from the number and distribution of sites indicated by the completed database. A decline in the number of sites from the Early Bronze Age to the 2nd Millennium is particularly noticeable, while the continued decline into the Late Bronze Age and the subsequent recovery in the Iron Age are less marked, but still visible, although as noted above, the small number of specifically Late Bronze Age sites may be a result of the available dating evidence, and some of the 2nd Millennium sites may also have been occupied later than these results suggest. It is also clear from the results that the level, low-lying ground of the Konya plain and Çarşamba and Göksü valleys were broadly preferable to the rugged Taurus mountains, while there is also a marked lack of sites south of the mountains on the Mediterranean coast, or anywhere in the south-west of the study area, despite this area being comparatively rich in Classical Greco-Roman sites. Whether this is due to changes in the physical geography of the coastline as a result of increased alluvial or coastal deposition between the Bronze and Iron Ages and the Classical period, or simply due to there having been fewer archaeological surveys focussed on the Bronze Age conducted in this region, cannot yet be ascertained.

The most drastic decline in the number of settlements after the Early Bronze Age appears to be concentrated around the outer Çarşamba fan, in the heart of the Konya Plain and at the northern edge of the study area. There are close to 30 sites in this small section of the study area in the Early Bronze Age - by the 2nd Millennium most of these have been abandoned, and only one site identified as being specifically Late Bronze Age is occupied in this area. Furthermore, the area between Karadağ and modern Karaman in the south-east of the Konya plain also sees a significant decrease in settlement. However, Late Bronze Age sites appear to be most common around the edges of the plain rather than at its heart - this is particularly noticeable in the north-eastern corner of the study area near Ereğli, along the western edge of the plain and in the central area of mountainous hinterland separating the Upper Çarşamba valley from the Konya plain.

4.5 - Methods for Site Characterisation Analyses

The analyses which examine those spatial criteria, used to underpin previous hypotheses on Tarḫuntassa, which relate to the attributes of the sites themselves, as opposed to their location or proximity to natural features, have been defined as 'site characterisation analyses'. The procedures that can be used to carry out these analyses are often the most simple available within ArcGIS 10 - the attribute table for the database of sites can easily be displayed and sorted by certain attribute fields, and can be further subdivided into categories according to the values of these attribute fields using a simple data query by attribute. GIS data queries of this nature have been used to investigate questions of past use of the landscape by archaeologists since the very early days of archaeological computer science (see Müller's 1988 study of chambered cairns in the Shetlands for such an early example), and can still serve such a purpose today.

4.5.1 - Analysing site number and size across time periods

The first hypotheses to be tested are those regarding the number and size of sites over time. Singer (2006) states that, due to the lack of references to Tarḫuntassa in textual sources before its establishment by Muwatalli II, it must have been a newly constructed settlement. This means that by simply recording all of the periods of occupation of all of the sites in the database and using a simple 'Search by Attribute' function within ArcGIS 10 to categorise the sites by date, it is possible to isolate those sites which were only dated to the Late Bronze Age, or display only Early

Bronze Age and Late Bronze Age dating evidence. However, once again there should be an awareness that specifically dating sites to the Late Bronze Age is problematic, particularly in cases where there has apparently been no reason to assign the broader '2nd Millennium' designation. In some cases, it may be that other forms of material culture or archaeological features, such as masonry, metalwork or monumental architecture, have been used as the primary dating evidence, but if pottery alone has been used to make such a distinction, this could be erroneous.

Broadly speaking, it has been widely suggested by many of those who have surveyed the area, from Mellaart (1958/1964) through to the Konya Plains surveys of the University of Liverpool (Baird 2001b) as well as the survey carried out by Dinçol et al (2000) and the subsequent appraisal by Yakar et al (2001), that there are two points in time at which the number of settlements in the area, especially around the Çarsamba fan, drastically declines. The first, as noted by Mellaart (1964) is in the EBA III period (2300-2000 BC), after which many sites are suddenly abandoned, and the second is at the transition from Middle to Late Bronze Age (1600-1500 BC), noted by Yakar et al (2001). However, this is contradicted by Bahar (2001), who on collating his data from his surveys from 1994-2000, reports that across the entirety of Konya and Karaman provinces, the number of settlements actually rises throughout the Bronze Age, from 83 in the EBA, to 89 in the MBA and finally to 104 in the LBA. These results may be skewed by the fact that he was only part way through the survey at the time, and had far more sites in total for the regions to the north of Konya, largely outside the survey area for the purposes of this research, than he had for the regions to the south. Nevertheless, even in the southern region, the only one of his seven areas to reverse this trend was the eastern area around Karapınar and Ereğli, where the 8 EBA sites outnumbered the 5 MBA and 6 LBA sites (Bahar

2001). What is particularly strange is that although it is Bahar's data that comprises a significant proportion of the data, the resulting dataset does not mirror his conclusions. This either suggests that the sites he surveyed after 2000 were primarily earlier sites as he progressed further south, or that he has not given full or detailed enough descriptions of the character of the sites in his survey reports.

The corollary to this decline is that the size of the mounds increase from EBA to MBA, reflecting the change from dense clusters of small farming settlements with local trade networks to large, more spaced out but more densely populated urban centres that grew around international trade with Assyria and other far flung nations. A perfect example of one of these MBA centres is Karahöyük, south of Konya. However, whether this trend continues in the LBA, or whether sites shrink again, is less well known. Across the whole of Anatolia, Glatz (2011) suggests that sites decrease in size again, as established power bases like Karahöyük were abandoned (possibly forcibly so) in favour of new regional administrative centres used by the Hittites as a form of imperial control - these sites have a tendency to be smaller than the MBA trading centres.

In order to test the hypothesis that sites decreased in number but increased in size throughout the Bronze Age, the 'Select by Attributes' tool was used to sort the settlements into categories of increasing size, both in terms of diameter (each category increasing by 100m in diameter, east to west) and height (each category increasing by 2m in height).

4.6 - Results of Site Characterisation Analyses

4.6.1 - Number of sites across time periods

Firstly, the distribution of sites by date alone is shown in Tables 4.1 and 4.2 below, firstly by the number of settlements in total occupied in each of the four main time periods, and then by the number of settlements occupied in each specific combination of time periods, from those occupied in only a single period to those occupied throughout. Table 4.2 gives a better indication of the extent to which sites were continuously occupied, and may give some indication of how likely it is that Singer (2006) was right to argue that Tarḫuntassa was built on 'virgin ground'.

Early Bronze Age	2nd Millennium	Late Bronze Age	TOTAL
174 (84.47%)	74 (35.92%)	57 (27.67%)	206

Table 4.1. Distribution of sites in the study area by period of occupation.

Looking at the total number of sites occupied during each time period, particularly as a percentage of the total number of sites in the database, it can clearly be seen that while there is a drastic decline after the Early Bronze Age, the decline from 2nd Millennium to Late Bronze Age is far less marked than expected - and could be even less marked given the difficulties of differentiating between the ceramics of the Middle and Late Bronze Ages. However, as shown in Table 4.2 below, over half of those sites occupied in the Late Bronze Age had been continuously occupied since the Early Bronze Age, while only twelve were newly established in the Late Bronze Age, with a further nine having been abandoned after the Early Bronze Age then subsequently resettled. Again, the difficulties in firmly dating sites to the Late Bronze Age, as opposed to being part of the general ceramic tradition of the entire 2nd Millennium, may account for this shortfall in sites dating only to the Late Bronze Age.

EBA	EBA + 2nd M	EBA + LBA	2nd M	2nd M + LBA	LBA	All 3	TOTAL
113	22	7	14	6	12	32	206

Table 4.2. Number of sites in the study area occupied in specific combinations of time periods.

Evidently, this leaves a very small number of sites that could feasibly be Tarḫuntassa if Singer (2006) is correct. While these results offer no definitive proof either way of whether Singer's assertion is correct, particularly given the difficulties in assigning a specifically Late Bronze Age date to sites which have only been dated using surface pottery scatters, the lack of new sites apparently established in the Late Bronze Age does still mean that alternative hypotheses for the lack of earlier records for a city of that name should be considered. Alternative explanations include the possibility that a previous settlement had its name changed to tie in with Muwatalli's royal cult of the Storm God of Lightning, or simply that the settlement chosen to become the new capital served no administrative or religious function, and was therefore of such little importance that there was no need to mention it.

The results of this analysis should be brought back into consideration once the more complex spatial analyses have been completed, and the predictive model created - if there are sites among those identified by the model that also fulfil Singer's criteria of being newly established Late Bronze Age settlements, then they could be considered more likely to be the location of Tarhuntassa. However, this should not be considered an absolute indication, due to the inherent uncertainties of site periodisation in the surveys used to construct this database. These results should also be considered when hypothesising that any changes in settlement pattern are necessarily a result of Hittite influence - if few sites were established in the Late Bronze Age, and a great number continuously occupied throughout the Bronze Age, then to what extent will changes in settlement patterns at this time be visible, and will it be possible to assign a 'Hittite' character to those changes? There might have been an external Hittite influence regarding which sites were abandoned and which continued to exist, but is certainly not evident from this analysis alone. It will therefore almost certainly be prudent not to accept Singer's (2006) hypothesis when considering these results, and it will be just as important to consider those sites that were continuously occupied as those which were newly established.

4.6.2 - Distribution of sites by size across time periods

Table 4.3 and Figure 4.6 on the following page show the proportion of sites across the three broad time periods in bands of 100m diameter, measured from east to west using the path tool in Google Earth. A path drawn in Google Earth can be represented as a horizontal line plotted against altitude on the Y axis. As well as giving a distance for the length of the path, or any selected section of the path, it also produces statistics for steepness of slope. An east-west path was drawn which incorporated the mound and a good area either side, and the diameter of the mound was recorded as the distance between the points where the steepness of incline became less than 3% for mounds of below 10m in height, and less than 5% for mounds over 10m in height.

Mound Diameter	Early Bronze Age	2nd Millennium	Late Bronze Age	TOTAL
N/A	5	2	5	10
0-100	3 (1.77%)	2 (2.78%)	3 (5.77%)	3 (1.53%)
101-200	42 (24.85%)	12 (16.67%)	14 (26.92%)	49 (25%)
201-300	56 (33.14%)	20 (27.78%)	13 (25%)	63 (32.14%)
301-400	44 (26.04%)	21 (29.17%)	10 (19.23%)	50 (25.51%)
401-500	15 (8.88%)	10 (13.89%)	6 (11.54%)	17 (8.67%)
501-600	7 (4.14%)	2 (2.78%)	2 (3.85%)	8 (4.08%)
600+	2 (1.18%)	5 (6.94%)	4 (7.69%)	6 (3.06%)
Mean Size	283.33	324.22	299.65	291.18
TOTAL	174	74	57	206

Table 4.3. Frequency of sites in 100m classes of east-west diameter and average mound diameter across time periods.

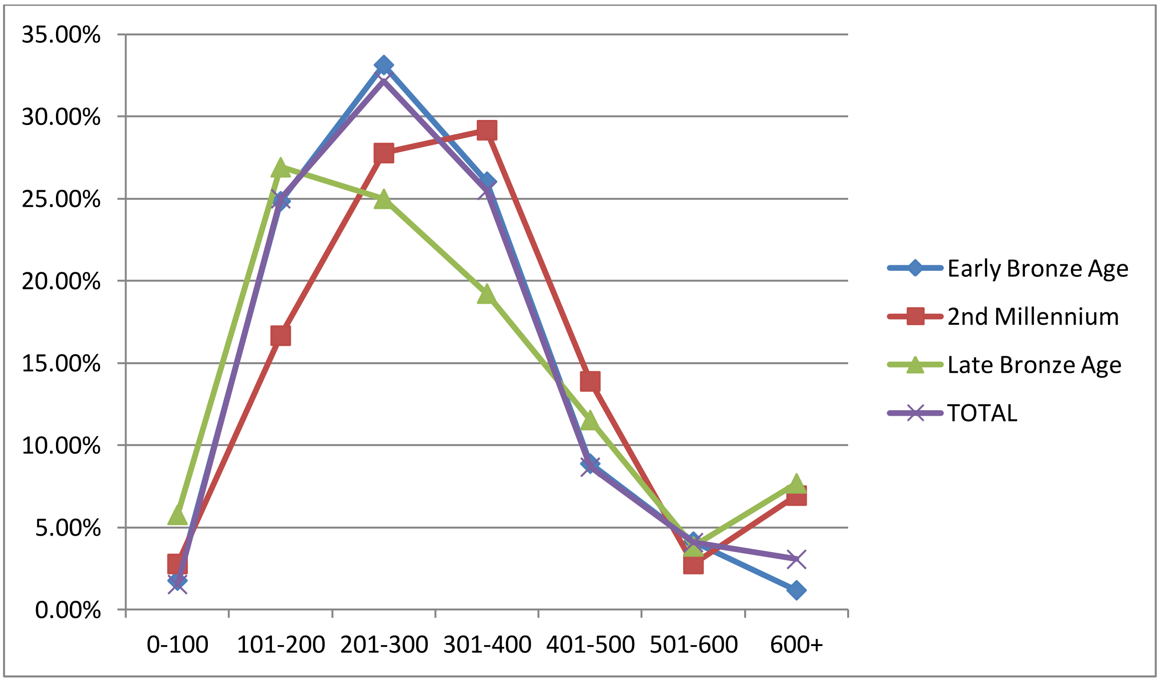

Figure 4.6. Graph representing the data shown in Table 3.

Table 4.4 shows the distribution of sites across the three time periods by their height in metres, in bands of 2m. Height was again measured using the Google Earth path tool, from the highest point of the mound to the lowest point on the east-west path at which the incline became lower than 3% for sub-10m and lower than 5% for mounds over 10m.

Mound Height	EBA	2nd M	LBA
0 (N/A)	10	4	8
1-2	29	4	2
3-4	38	8	7
5-6	22	8	2
7-8	12	5	3
9-10	19	12	6
11-12	10	8	7
13-14	6	3	2
15-16	7	6	4
17-18	2	2	1
19-20	6	3	2
21-22	4	2	2
23-24	2	2	3
25-26	2	2	2
26+	5	5	6
Mean Height	8.16	11.68	13.27
TOTAL	174	74	57

Table 4.4. Frequency of sites in 2m classes of height and average mound height across time periods.

The results of these analyses would, at least for this area of southern Anatolia, seem to follow Glatz's hypothesis - in terms of diameter, in the Early Bronze Age there is a tendency towards mounds of 201-300m in diameter, with a substantial proportion of sites in the 101-200m band. There is a steady increase in size 2nd Millennium sites, indicated partly by the decrease in percentage of 101-200m sites, the increase in percentage of 301-400m sites (which now make up the greatest proportion of total sites for the time period), the presence of five sites of 600m or more, and the increase in average mound size to well over 300m. In the Late Bronze Age, there is an increased proportion of small (101-200m) sites, but also a greater proportion of sites measuring 600m or more. The mean diameter has fallen back to just under 300m on average - still larger than the average Early Bronze Age site, but by no means as large as those of the Middle Bronze Age.

In the height data, however, this conclusion is contradicted. Over half of the Early Bronze Age sites are 6m or less (99 of 174, 56.9%). The most populous class is 3-4m. In the 2nd millennium, the most well represented class is of sites between 9 and 10m, while the proportion of very small sites, measuring 6m or less, has fallen drastically to just 24 of 74 (32.43%). In contrast, the proportion of sites between 7-16m in height is up to 45.95% (34 of 74) from 31.03% (54 of 174) in the Early Bronze Age, and the average height has increased hugely, by 3.52m. Most strikingly, unlike the results of the analysis by site diameter, this data shows a further increase in size into the Late Bronze Age. The mean height has increased again by a further 1.59m, and mounds of 20m and higher are much better represented - 13 of the 57 (22.81%) Late Bronze Age sites are over 20m in height compared to 13 from 174 (7.47%) in the Early Bronze Age and 11 of 74 (14.86%) in the 2nd millennium. However, the height data is not quite as straight-forward to interpret as the diameter data. The increased height of the Late Bronze Age sites could be interpreted as a sign of continuity of settlement, and thus an increased number of stratigraphic layers in the mounds, or as reflecting the tendency for Late Bronze Age sites to be built on natural hills, ridges and bluffs - this preference for natural high points may distort the apparent height of the archaeological mounds compared to the surrounding land.

To clarify these results, and show whether continuity of settlement does account for the number of large settlements in the Late Bronze Age, the database of sites was subdivided into groups based on all periods in which they were occupied, rather than by all sites occupied in each of the three periods. In Tables 4.5 and 4.6 below, therefore, each site is only accounted for once, whereas in Tables 4.1, 4.3 and 4.4, sites occupied in multiple periods will be present multiple times. This should reveal further patterns in fluctuations of site size over time.

Mound Diameter	EBA	EBA+2nd M	EBA+LBA	2nd M	2nd M+LBA	LBA	All 3
N/A	4	0	0	1	0	4	1
0-100	0	0	1	0	0	0	2
101-200	31	3	2	2	1	4	7
201-300	40	8	1	3	2	2	8
301-400	27	7	2	6	0	0	8
401-500	6	4	1	1	1	0	4
501-600	5	1	0	0	0	1	1
600+	0	1	0	1	2	1	1
Mean Size	271.01	327.82	254.29	331.77	411.5	288.5	291.13
TOTAL	113	22	7	14	6	12	32

Table 4.5. Distribution by diameter (metres) across time periods, subdivided by periods of occupation.

Mound Height	EBA	EBA+2nd M	EBA+LBA	2nd M	2nd M+LBA	LBA	All 3
0 (N/A)	6	0	1	1	0	4	3
1-2	25	2	1	1	0	0	1
3-4	31	2	1	1	1	1	4
5-6	17	4	0	3	0	0	2
7-8	7	2	1	1	0	0	2
9-10	10	5	0	3	0	2	4
11-12	5	1	1	2	1	1	3
13-14	3	1	0	0	0	0	2
15-16	1	4	1	0	1	1	1
17-18	0	0	0	0	0	0	1
19-20	3	1	0	0	0	0	2
21-22	2	0	0	0	0	0	2
23-24	0	0	1	0	1	0	1
25-26	0	0	0	0	0	0	2
26+	3	0	0	2	1	3	2
Mean Height	6.51	9.73	9.29	11.23	16	18	12.58
TOTAL	113	22	7	14	6	12	32

Table 4.6. Distribution of mounds by height (metres) across time periods, subdivided by periods of occupation.

The results shown in Table 4.5 are very much in keeping with the suggestions of Glatz (2011), and suggest that sites which were apparently newly established in the Late Bronze Age, and indeed those with signs of Early Bronze Age occupation but then showing subsequent evidence of Late Bronze Age habitation, are much smaller than those established in the Early Bronze Age or 2nd Millennium and occupied continuously through into the Late Bronze Age. In fact, the settlements first established in the Early Bronze Age then re-established in the Late Bronze Age are, on average, the smallest of all, while the sites newly established in the Late Bronze

Age are the third smallest. However, the very small sample size, with just 19 measurable sites (i.e. mounds, not monuments) across these two categories, may mean that this data is not comprehensive enough to be considered fully representative of a decreasing trend in site size in the Late Bronze Age. Furthermore, given that many of the 2nd Millennium sites may also date to the Late Bronze Age, any conclusion regarding site size on this basis must be considered fairly unindicative. These results also confirm that it is the 2nd Millennium sites that are the largest, whether continuously occupied or not. This may represent the increasing nucleation of settlements during this period, as the economic focus switched from small, self-sufficient farming communities to long-distance, centralised trading hubs which drew in labour and resources from the surrounding communities.

The results shown in Table 4.6, however, are very similar to those shown in Table 4.4. The percentage of sites occupied in the Early Bronze Age alone that are under 6m in height (79 of 113, 69.91%) is far higher than for those sites occupied in later periods or through multiple periods. Furthermore, rather than sites simply becoming taller if they are occupied for a greater length of time due to the accumulation of occupation layers, it appears from the mean heights that the those sites occupied in the Late Bronze Age only are the tallest. However, this is distorted by the presence of three very tall sites in a dataset of just twelve measurable sites - if these sites are removed, four others are completely flat or not measurable, and the remainder are of low to middling height. This is comparable to those sites occupied in the 2nd Millennium alone, but lower than those sites occupied in the 2nd Millennium and Late Bronze Age, and broadly similar to those site occupied across all three periods. As already mentioned, the tendency for new Late Bronze Age sites to be established on natural outcrops or slopes may distort this apparent increase in settlement size, and the comparatively large average settlement size for sites occupied in all the latter two periods, or indeed in all three, seems to confirm that there is some correlation between the height of a settlement mound and the duration of occupation. As such, in establishing the truth of Glatz's (2011) conclusions, the diameter of a mound is more reliable than its height when trying to ascertain the size of the settlement at the time it was in use, and in this regard, the results seem to agree with her hypothesis, particularly when one eliminates the element of continuous occupation increasing the size of settlement mounds. Those sites occupied in only one time period follow the suggested pattern of small agricultural settlements in the Early Bronze Age, sprawling towns supporting a trading economy in the early 2nd Millennium and small new settlements built to control strategic points in the landscape in the Late Bronze Age.

However, once again the difficulties in differentiating Late Bronze Age sites from earlier 2nd Millennium ones means that any conclusions regarding changes in settlement size throughout these periods cannot be thought of as entirely definitive. Furthermore, when interpreting the apparent decrease in settlement size between the earlier and later 2nd Millennium, one must be careful when assigning such a change to the external Imperial influence of the Hittites - there may also have been other more local factors at play, political or economic, which may become apparent with further analyses.

4.7 - From characterisation to location

The site characterisation analyses produced some important outcomes for this project - the collation of the disparate sources of archaeological data into a single dataset was in itself an unexpectedly difficult task, but has produced a valuable, if flawed, resource which will not only be important to this study but may be of additional value to future researchers in this region. However, there is undoubtedly room for a significant review of the surveys conducted so far, including a statistical analysis of the material (particularly ceramic) finds which were used to date them, in order to give future researchers a more accurate database to work with (as suggested by Schoop 2003, 2006 with regard to the Hattuša/Boğazkale assemblages).

Some of the hypotheses stated but not tested in the literature have already been tentatively confirmed through these relatively simple processes - there was indeed a significant drop in settlement at the end of the Early Bronze Age. However, the second apparent drop in the number of settlements with the onset of the Late Bronze Age, is not only less drastic than that which occurred at the end of the Early Bronze Age, but could also be explained by the difficulties in differentiating early and late 2nd Millennium sites, due to the relatively unbroken ceramic tradition. There is also a corresponding increase in mound size, from the small settlements of the Early Bronze Age to the larger towns of the 2nd Millennium, with the few new settlement sites apparently established in the Late Bronze Age again being much smaller.

However, there are few conclusions that can be drawn from these analyses alone about why these declines and apparent changes in settlement size took place, what larger patterns these changes fit into, or what factors may have motivated the choice of site for Tarḫuntassa. Other influencing factors must first be taken into account, particularly those regarding the location of the settlements in relation to the landscape and to each other.

5. Site Location Analyses

Having constructed a database, tested criteria relating to the sites themselves and drawn some conclusions directly from the empirical data, the third objective of this study involved testing those criteria which require analytical processes which were defined as 'site location analyses'. These analyses involve examining patterns of ancient settlement in relation to the landscape, certain topographical features and each other. This chapter presents the results from a range of analyses carried out in order to test a significant number of the spatial criteria used to justify previous hypotheses regarding the potential location of Tarḫuntassa, including; the distribution of sites according to both their altitude and the steepness of slopes; the proximity of sites to rivers; the density of settlement across the study area; and the proximity of sites to the edge of the Konya plain. Similar to the analyses performed in the previous chapter, many of these analyses involve a simple form of data query - however, this time the searches were not only performed by attribute, but also by location. Furthermore, these analyses also involved the creation of new raster images derived from the DEM through spatial analysis techniques, in order to represent additional data such as slope steepness and areas of dense settlement.

5.1 - Methodologies

5.1.1 - Distribution of sites by altitude and slope steepness across time periods

It has been suggested by Bahar et al (2005) that there is a tendency in the Late Bronze Age for sites to move towards "mountainous and sloping areas, for security reasons" (p2). To test this hypothesis, the digital elevation model was first divided into 13 bands, each representing 250m in altitude. A simple 'Select by Location' search was then used, with the 'Target layer (in this case, the settlements) has its centroid within Source layer (the altitude bands)' criteria, to ascertain the number of settlements in each of these bands. However, since the vast majority of the settlements are located on a relatively flat plain, a second, more detailed 'Select by Location' search was carried out, splitting the 1000-1500m bands into a further 10 bands of 50m each.

In order to assess Bahar et al's claim that Late Bronze Age sites are on steeper slopes, as well as on higher ground, a similar analysis was carried out, but this time, a slope model derived from the DEM was divided into 5 bands using the 'Slice' tool, based on natural breaks in the data. Slope models are a fairly common derivation of DEMs, and are calculated using a plane tangential to the surface of the elevation model, which can then be used to calculate the gradient (the maximum change in altitude within that plane) and the aspect (the direction in which that change occurs) of the slope (Wheatley & Gillings 2002). An example of a slope gradient raster calculated from the earlier DEM example can be seen in the diagram below (5.1).

170	148	122	128	131
144	111	115	127	149
138	107	161	173	152
118	104	155	196	184
100	122	140	159	177

75.2	76.54	37.99	52.61	39.97
74.51	70.32	70.53	76.35	67.42
81.84	59.41	90.93	88.43	83.6
67.08	82.29	91.27	73.19	48.32
63.75	82.65	85.5	82.3	47.62

Figure 5.1. An example of a slope raster (right) calculated from the DEM (left).

The 5 bands were classified as flat, flat-to-moderate, moderate, moderate-to-steep and steep, and were split using the 'natural breaks (Jenks)' data classification method. This method automatically distributes the data into the specified number of classes according to the best natural groupings of similar values, with the boundaries between classes placed where there is a relatively big difference in data values (de Smith et al 2015). A 'Select by Location' search with the 'Target layer has centroid in source layer' criteria was again used to investigate whether later settlements tended to be found on steeper ground. All data was expressed both as numbers and percentages. Images of the rasters used in these analyses, including the slope raster and the bands of both altitude and slope, can be found in Appendix B, Figures B.2 (slope raster), B.3 (altitude bands) and B.4 (slope bands).

5.1.2 - Distribution of sites by proximity to rivers

Proximity to rivers or other sources of fresh water is a common criterion for the building of settlements, both in ancient Anatolia and in most other sedentary, agricultural populations across the world. Access to water for drinking, cleaning and for use in farming was critical in deciding the locations of settlements from the very advent of urbanism. It could be assumed, therefore, that all settlements are likely to be found within fairly close proximity of rivers.

However, there are two reasons to conduct this analysis beyond confirming the obvious. In accordance with the aforementioned conclusions of Bahar (2005) regarding the movement of settlements towards the slopes at the plain edge, this may also mean a withdrawal from the Çarşamba river system that forms the centre of the flat alluvial plain. The importance of assessing the changing proximity of settlements to rivers through time is backed up by the environmental archaeology conducted thus far in the region, particularly by Boyer et al (2006). Investigating the patterns of alluvial deposition in both the central fan (around Catal Höyük and modern Cumra) and its peripheries further north, this research found that there was a major change to the flooding regime in the peripheral regions of the fan, represented by a cessation of alluvial deposition around 2400BC (EBA II-III). This corresponds with the observable decline in the number of settlements in this area in the later centuries of the Early Bronze Age. In the Central region of the fan, deposition did recommence throughout the Middle and Late Bronze Ages, but this is importantly *not* mirrored by a subsequent increase in settlements on the plain, suggesting that 'either social or political conditions did not favour resettlement, or the alluvial and climatic regime remained unfavorable' (Boyer et al 2006, p695).

The Buffer tool within ArcGIS was used to create bands of increasing distance from a series of polylines representing rivers. The 'Select by Location' tool was then used to find settlements within each of these distance bands, and the percentage of sites from each time period in each band was calculated. If the conclusions of Boyer et al (2006) are true, then we would expect to see a decrease in the percentage of sites built in close proximity to major rivers in the Middle and Late Bronze Age when compared to the Early Bronze Age. If these results do indicate such a change, then they could then contribute to the predictive model, as a newly built Late Bronze Age settlement would be less likely to be built right next to the river if this was not a prevalent factor for settlement location choice in the Late Bronze Age. The raster showing the bands of distance from rivers can be found in Appendix B, Figure B.5

5.1.3 - Settlement density

In order to assess the criteria used by Dinçol et al (2000) that Tarḫuntassa should be 'sought in a densely settled area' of 2nd Millennium sites, the 'Point Density' tool was used to highlight those parts of the study area where settlement was densest throughout the Bronze Age. This tool assigns a value to all cells in the output raster based on the number of points within the 'neighbourhood' of each point (this neighbourhood is, by default, circular, and has a radius equal to shortest of the width or height of the output extent divided by 30). This is shown in Figure 5.2 below. The results of this analysis may highlight the shifting preferences of settlement location through time, and will also show whether there is any correlation between Late Bronze Age settlement choice and the density of both contemporary and earlier sites.

Having created point density rasters using the Point Density tool, every cell with a zero value was then removed using the 'Con' function, so that only those cells with a value above zero are displayed. This allows the results to be more easily related to the underlying surface model, and therefore contextualises the results in the surrounding landscape and the extent of the study area.

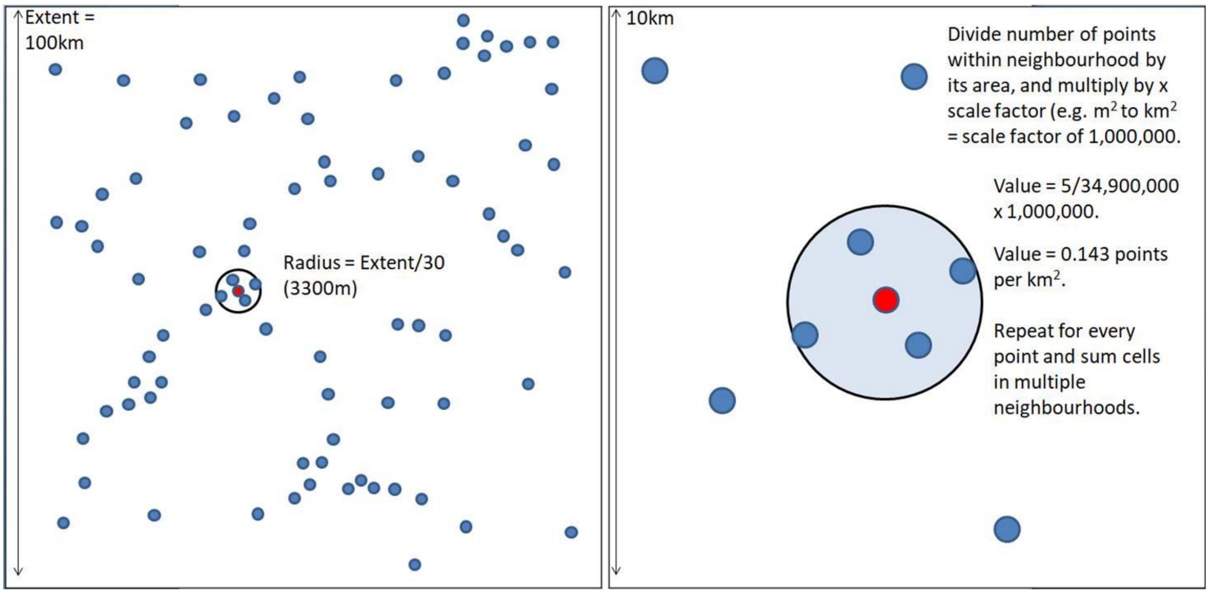

Figure 5.2. Explanation of how Point Density analysis works.

5.1.4 - Proximity of sites to the 'plain edge'

In some ways, this analysis is one of the most important in that it overlaps with several other analyses, as well as verifying an important criterion in and of itself. The suggestion of Mielke (2011a) that Hittite urban centres tend to positioned in the peripheral areas of large valleys and plains, particularly where natural routes through rough terrain emerge onto open, level ground, forms the basis for this analysis. If this is proven to be correct, then those areas within close proximity to the plain edge will score more highly in the predictive model. However, this criteria is also important in that overlaps heavily with the hypothesis of Bahar et al (2005) that Late Bronze Age sites favoured sloping, easily defended sites over the flat plain, as well as the economic and agricultural picture suggested by the Beyşehir Occupation Phase hypothesis of Eastwood et al (1998), wherein upland agriculture of vines, fruit and nuts becomes more prevalent from 1600BC onwards. Therefore, if this analysis shows that Late Bronze Age sites are, in fact, closer to the plain edge, it should also overlap with the results of the 'slope steepness' and 'proximity to rivers' analyses, and these will form important parts of the predictive model.

In order to assess *proximity* to higher altitude areas, rather than presence within them, a 'Select by Location' search was used using polygons created based on distance from areas of a certain altitude representing the 'plain edge', in this case 1050-1100m (band 2 of the second altitude analysis). For the purposes of this analysis, the sites found between 1000-1050m (band 1 of the altitude analysis) were used as a sub-dataset, as this covers the majority of sites found on the Konya Plain. The criteria 'Target layer is within distance of Source Layer' (in this case, the 1050-1100m band) was used to find out whether there was any noticeable change over time in the tendency for sites to be found closer to the edges of the plains. Distances of 10km, 7.5.km, 5km, 2.5km and 1km were used.

However, this analysis only covers a subset of the available data, and also assigns an arbitrary altitude for the 'slope edge', which in actuality varies across the study area. Therefore, a second analysis was performed using 'moderately steep' slopes as the factor for defining the edge of the plain. Again, bands defining a distance from these slopes were used to separate the sites into different categories. These bands define distances of 1km, 2.5km, 5km, 7.5km, 10km, 15km, 20km and 25km from moderately steep slopes. Furthermore, for the purposes of this analysis, all isolated slopes produced as artefacts of the computing process have been removed from the Konya plain and Lake Beyşehir/Upper Çarşamba areas, leaving totally slope-free plains where dense areas of slopes are not clearly indicating the genuinely prominent topographic features that make up the plain edge. The two rasters showing the bands of distance from the plain edge used in this analysis, as defined by both altitude and slope, can be found in Appendix B, figures B.6 (altitude) and B.7 (slope).

5.2 - Results

5.2.1 - Distribution of sites by altitude and slope steepness across time periods

The results of the initial search, using bands of 250m in altitude, are shown in Table 5.1 below. This analysis was carried out on an earlier version of the database prior to the addition of a number of new sites.

Altitude (m)	EBA	2nd Millennium	LBA	Total
0-250	2	1	5	8
251-500	0	0	0	0
501-750	0	0	0	0
751-1000	16	1	0	17
1001-1250	81	34	26	141
1251-1500	3	1	5	9
1501-1750	2	0	0	2
1751-2000	0	0	0	0
2001-2250	0	0	0	0
2251-2500	0	0	1	1
2501-2750	0	0	0	0
2751-3000	0	0	0	0
3000m +	0	0	0	0
Unclassified	3	1	0	

Table 5.1. Site distribution by altitude in 250m bands across time periods.

Clearly the 1001-1250m covers the vast majority of the Konya plain, where most of the sites are located. There are still some comments to be made here, however - the 16 EBA sites between 751-1000m, which reduces to 1 in the 2nd Millennium and 0 in the LBA, probably represents a number of sites around the Çarsamba fan and the low lying area to the east of Karadağ - it is possible that a climactic deterioration in the late 3rd/early 2nd Millennium could have led to the creation of salt-lakes and marshes in these low lying areas, rendering them less suitable for settlement. There is also a small increase in the proportion of sites in the 1251-1500m band in the Late Bronze Age. The results of the more detailed analysis between 1000-1500m can be seen in Tables 5.2 and 5.3 below, along with a graphical representation of the results shown in Table 5.2 in Figure 5.3.

Altitude	**EBA**	**2nd M**	**LBA**
Under 1000m	24 (14.04%)	3 (4.11%)	6 (10.53%)
1000-1050m	70 (40.94%)	30 (41.1%)	16 (28.07%)
1050-1100m	17 (9.94%)	9 (12.33%)	6 (10.53%)
1100-1150m	28 (16.37%)	12 (16.44%)	11 (19.3%)
1150-1200m	12 (7.02%)	7 (9.59%)	5 (8.77%)
1200-1250m	3 (1.75%)	2 (2.74%)	1 (1.75%)
1250-1300m	4 (2.34%)	1 (1.34%)	2 (3.51%)
1300-1350m	5 (2.92%)	3 (4.11%)	4 (7.02%)
1350-1400m	3 (1.75%)	3 (4.11%)	2 (3.51%)
1400-1450m	2 (1.17%)	1 (1.34%)	0
1450-1500m	1 (0.58%)	1 (1.34%)	0
Over 1500m	2 (1.17%)	1 (1.34%)	4 (7.02%)
TOTAL	171	73	57

Table 5.2. Site distribution across time periods in 50m bands between 1000-1500m.

Altitude	EBA	EBA+2nd M	EBA+LBA	2nd M	2nd M+LBA	LBA	All 3
Under 1000m	19	0	3	1	0	1	2
1000-1050m	48	12	2	5	4	2	8
1050-1100m	8	4	0	0	0	1	5
1100-1150m	20	2	0	3	1	4	6
1150-1200m	7	1	0	2	0	1	4
1200-1250m	2	0	0	1	0	0	1
1250-1300m	2	0	1	0	0	0	1
1300-1350m	1	0	1	0	0	0	3
1350-1400m	0	1	0	0	0	0	2
1400-1450m	1	1	0	0	0	0	0
1450-1500m	0	1	0	0	0	0	0
Over 1500m	2	0	0	0	1	3	0
TOTAL	110	22	7	12	6	12	32

Table 5.3. Site distribution in 50m bands between 1000-1500m altitude and below and above those altitudes, across time periods subdivided by periods of occupation.

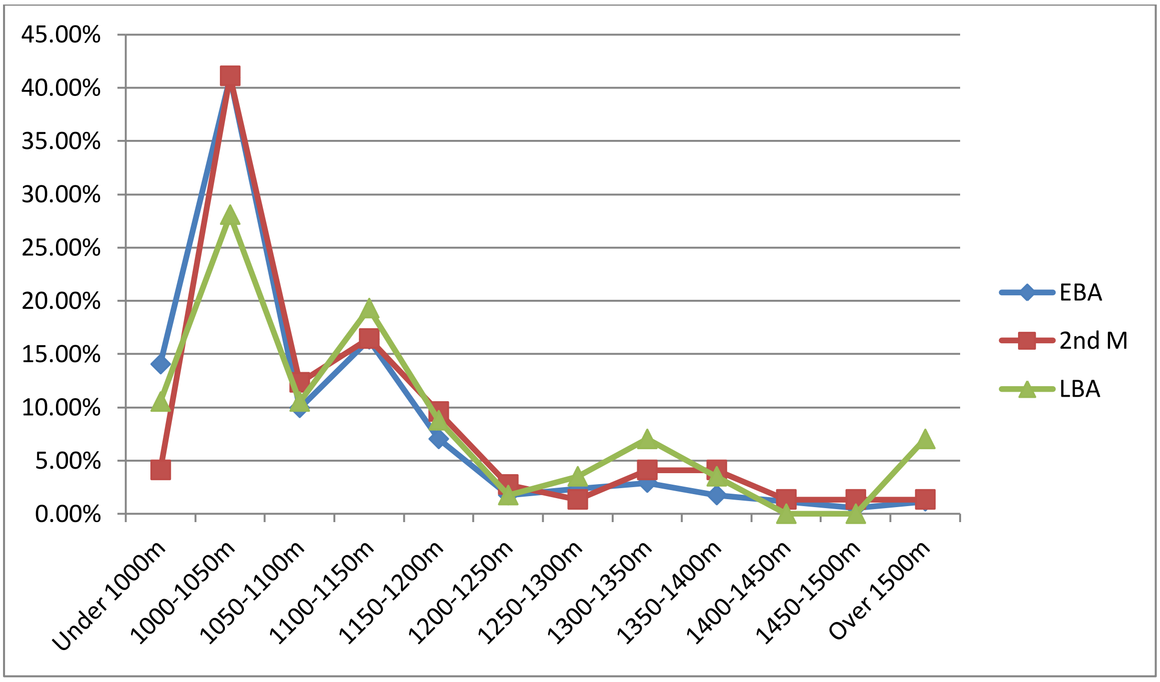

Figure 5.3. Graphical representation of the data in Table 5.2.

The data in Table 5.2 shows a marked tendency for sites to be built in the lowest band of 1000-1050m across all three time periods, representing the flat expanse of the Konya plain. Across all three periods, the second most common area is between 1101-1150m, probably representing the area around Lake Beysehir, and the foothills of the Taurus range along the edges of the Konya plain. However, there is a marked decrease in the proportion of sites in the 1000-1050m band (the Konya plain) in the Late Bronze Age, along with a slight increase in the proportion of sites between 1100-1200m, as well as over 1300m. Five of the ten LBA sites over 1300m represent sites occupied in all three periods. This is particularly visible in the graph shown in Figure 5.3. It is also worth noting the proportion of Early Bronze Age and Late Bronze Age sites below 1000m. This is probably indicative of settlements in the Göksü valley and the coast, but also, in the Early Bronze Age, of sites in the very lowest areas of the Konya plain close to the upper Çarşamba fan. The increase of sites at lower altitude in the Late Bronze Age could be argued to represent the renewed focus on communication with the coastal region via the Göksü valley, but of the five Late Bronze Age sites under 1000m, four of them had been previously occupied in the Early Bronze Age or continuously occupied throughout the Bronze Age.

Table 5.3 shows some further interesting results. When sites are split by periods of occupation, it becomes clear that the Konya plain (1000-1050m) is barely used for the establishment of new sites in the Late Bronze Age, while four of the twelve newly constructed settlements of this period are built between 1100-1150m, and three are constructed at over 1500m. There are also five sites between 1300-1400m that remain occupied throughout all three periods. It is interesting that these sites, despite being outliers in terms of the tendency towards settling the lower lying plains, remain occupied throughout the Bronze Age. The results of the analysis regarding slope steepness are shown in the table below.

Steepness	EBA (173)	2nd M (73)	LBA (56)
Flat	109 (63.01%)	45 (61.64%)	29 (51.79%)
Flat-to-Moderate	57 (32.95%)	23 (31.51%)	18 (32.14%)
Moderate	7 (4.04%)	3 (4.11%)	7 (12.5%)
Moderate-to-Steep	0	1 (1.37%)	1 (1.785%)
Steep	0	1 (1.37%)	1 (1.785%)

Table 5.4. Site distribution by steepness of location across time periods (total in each period).

Steepness	EBA (113)	EBA+2nd M (22)	EBA+LBA (7)	2nd M (14)	2nd M+LBA (6)	LBA (12)	All 3 (32)
Flat	73 (64.6%)	16 (72.7%)	3 (42.86%)	9 (64.3%)	3 (50%)	6 (50%)	17 (53.1%)
Flat-to-Moderate	37 (32.7%)	6 (27.3%)	3 (42.86%)	4 (28.6%)	2 (33.33%)	2 (16.67%)	11 (34.4%)
Moderate	3 (2.7%)	0	1 (14.29%)	0	0	3 (25%)	3 (9.4%)
Moderate-to-Steep	0	0	0	1 (7.1%)	0	1 (8.33%)	0
Steep	0	0	0	0	1 (16.67%)	0	0
Unclassified	0	0	0	0	0	0	1 (3.1%)

Table 5.5. Site distribution by slope steepness.

These results lend even further credence to Bahar et al's (2005) suggestion, with a far greater proportion of settlements which have been dated to the Late Bronze Age being established on slightly steeper ground. This is even more evident with those few sites built and occupied in the Late Bronze Age alone (as seen in Table 5.5). Only one site is on moderate to steep ground, this being Egilmez, a 2nd Millennium site classified as a 'slope settlement', not a mound. This suggests that Bahar's analysis is correct - however, as with the data relating to mound height, this could be distorted by the known Late Bronze Age site preference for natural hills and ridges, which may not necessarily be in, or near, mountainous areas, and may instead represent isolated peaks in otherwise flat areas.

5.2.2 - Site distribution by proximity to rivers

Tables 5.6 and 5.7, along with Figure 5.4, show the results of the analysis conducted to ascertain whether there is a higher chance of sites being located close to rivers. This analysis uses the shapefiles of the rivers in their modern, perennial form, as the flat nature of the study area made creating a hydrological flow model to imitate the rivers' natural courses impossible.

Dist. from River	**EBA (113)**	**EBA + 2nd M (22)**	**EBA + LBA (7)**	**2nd M (13)**	**2nd M + LBA (6)**	**LBA (12)**	**All 3 (32)**	**Total (205)**
<1km	47 (41.59%)	9 (40.9%)	3 (42.86%)	4 (30.77%)	1 (16.67%)	3 (25%)	13 (40.625%)	80 (39.02%)
1-2.5km	21 (18.58%)	2 (9.1%)	0	0	1 (16.67%)	3 (25%)	7 (21.875%)	34 (16.59%)
2.5-5km	21 (18.58%)	4 (18.18%)	1 (14.29%)	3 (23.08%)	2 (33.33%)	1 (8.33%)	5 (14.285%)	37 (18.05%)
5-7.5km	14 (12.39%)	1 (4.55%)	2 (28.57%)	0	0	0	3 (9.375%)	20 (9.76%)
7.5-10km	2 (1.77%)	1 (4.55%)	0	1 (7.69%)	0	2 (16.67%)	3 (9.375%)	9 (4.39%)
10-15km	5 (4.42%)	4 (18.18%)	0	1 (7.69%)	0	3 (25%)	1 (3.125%)	14 (6.83%)
15+ km	3 (2.65%)	1 (4.55%)	1 (14.29%)	4 (30.77%)	2 (33.33%)	0	0	11 (5.37%)

Table 5.6. Distribution of sites across time periods (subdivided by periods of occupation) by proximity (kilometres) to rivers.

Dist. from River	EBA	2nd M	LBA	Total
0-2.5km	102 (58.62%)	38 (51.35%)	31 (54.39%)	114 (55.61%)
2.5-5km	31 (17.82%)	14 (18.92%)	9 (15.79%)	37 (18.05%)
5-7.5km	20 (11.49%)	4 (5.41%)	5 (8.77%)	20 (9.76%)
7.5-10km	6 (3.45%)	5 (6.76%)	5 (8.77%)	9 (4.39%)
10-15km	10 (5.75%)	6 (8.11%)	4 (7.02%)	14 (6.83%)
15+ km	5 (2.87%)	7 (9.46%)	3 (5.26%)	11 (5.37%)
TOTAL	174	74	57	205

Table 5.7. Distribution of sites across time periods (totalled) by proximity (kilometres) to rivers.

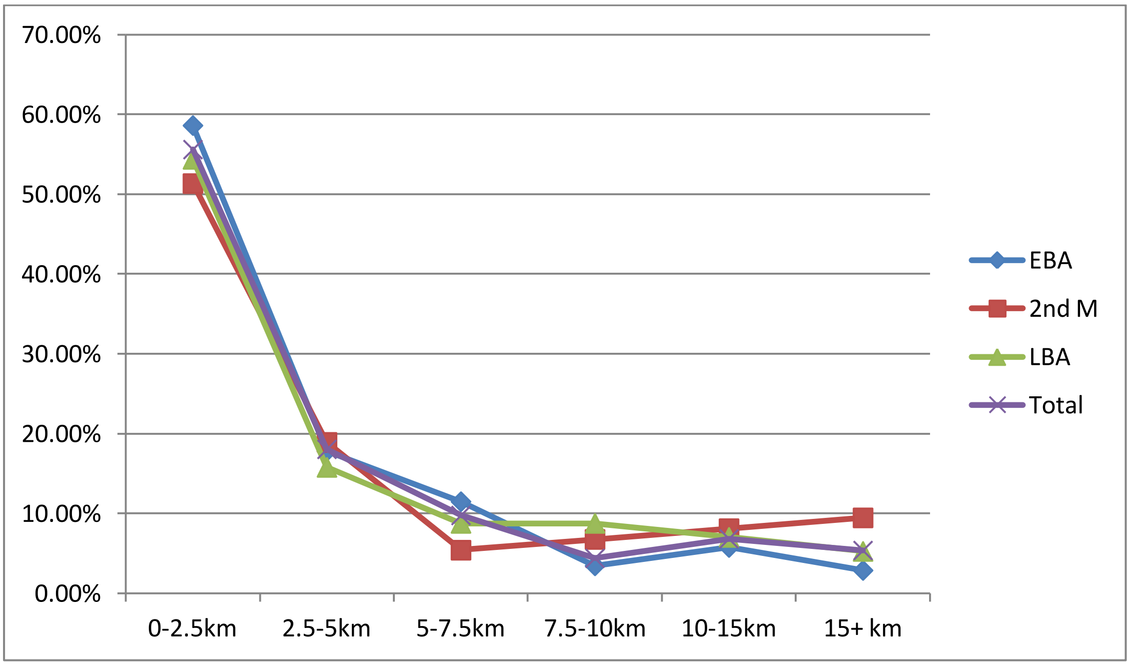

Figure 5.4. Graphical representation of data in Table 5.7.

These results clearly show that, across all time periods, there is a well over 50% chance that sites will be located within 2.5km of a waterway. In total, 114 of the 205 sites within the database (55.61%) are within 2.5km of a waterway, with this percentage rising only slightly to 58.62% (102 of 174) when considering sites occupied in the Early Bronze Age alone. In general, Early Bronze Age sites are slightly more likely to be within very close proximity to a river than those occupied in later periods - this may reflect their agricultural origins and the prioritisation of immediate access to water over access to other routes of communication or the centralisation of regional power. This is somewhat backed up by the results split by specific occupation phases - those sites only occupied in the Early Bronze Age or continuously occupied throughout the Bronze Age have over a 60% chance of being located within 2.5km of a river, while those established in the Late Bronze Age have a 41.67% chance of being located over 7.5km away. Oddly, it is in the 2nd Millennium when the highest percentage of sites are occupied at a large distance from waterways, a result visible in Figure 5.4. Overall, proximity to rivers was clearly of great importance throughout the Bronze Age. However, while there is some evidence to suggest that there is an increase in sites established further from rivers in the 2nd Millennium and Late Bronze Age compared to those of the Early Bronze Age, it is not by a large enough margin for this to be considered a key criterion for locating Tarḫuntassa. In fact, since rivers often form the natural routes through the landscape that Mielke (2011a) believes the Hittites chose to position cities in order to control, it could be that the Late Bronze Age settlements of this region, if they are representative of Hittite influence, are in fact more likely to be found near rivers than the large trading centres of the 2nd Millennium. This conclusion is supported somewhat by these results, as well as those of the analyses below regarding proximity to the edge of the plain.

5.2.3 - Site density

The following Figures (5.5, 5.6 and 5.7) show the results of the Point Density analysis for settlements of each time period, after all cells with a zero value have been removed.

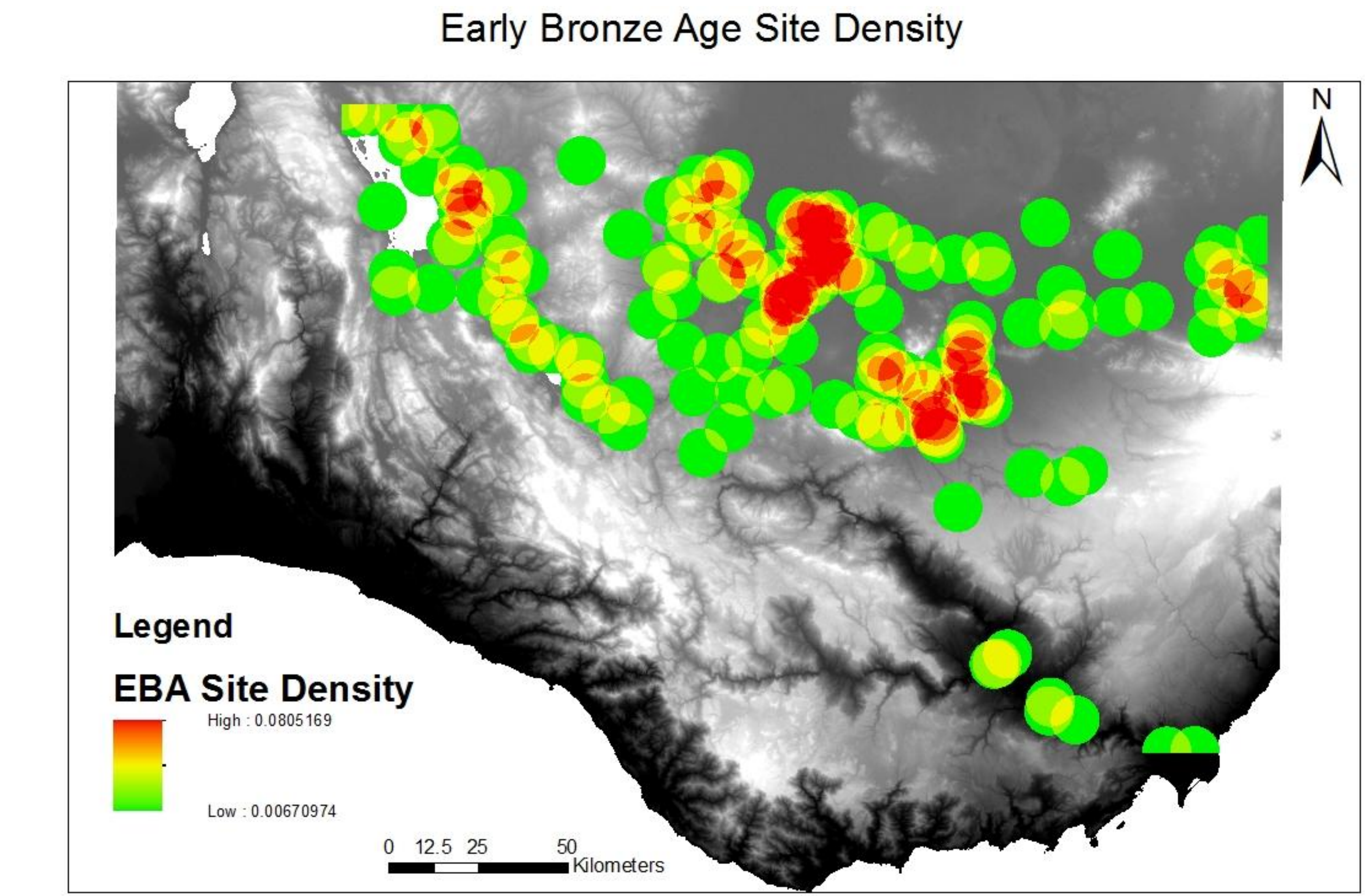

Figure 5.5. Density of Early Bronze Age sites in the study area.

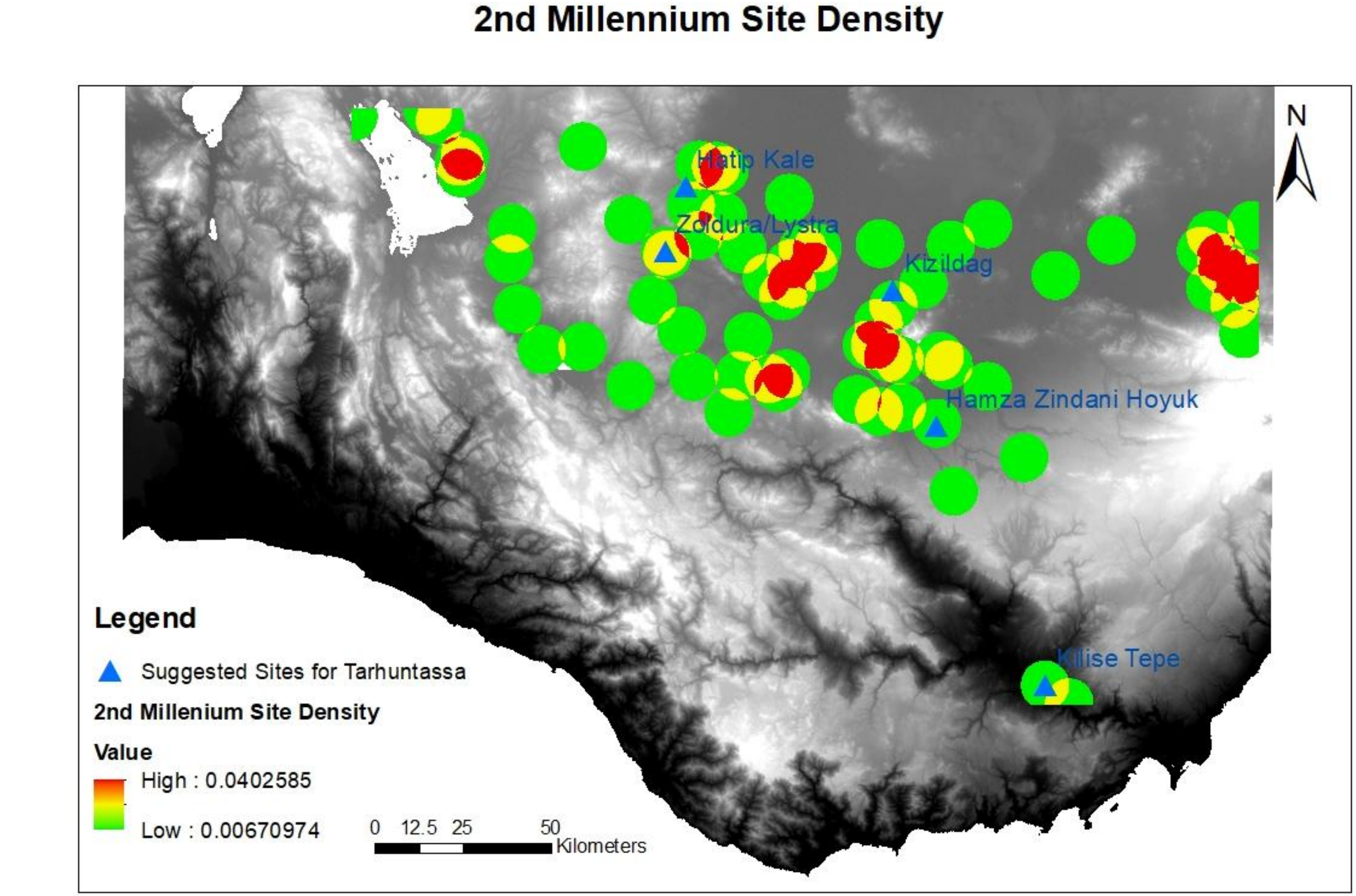

Figure 5.6. Density of 2nd Millennium sites in the study area.

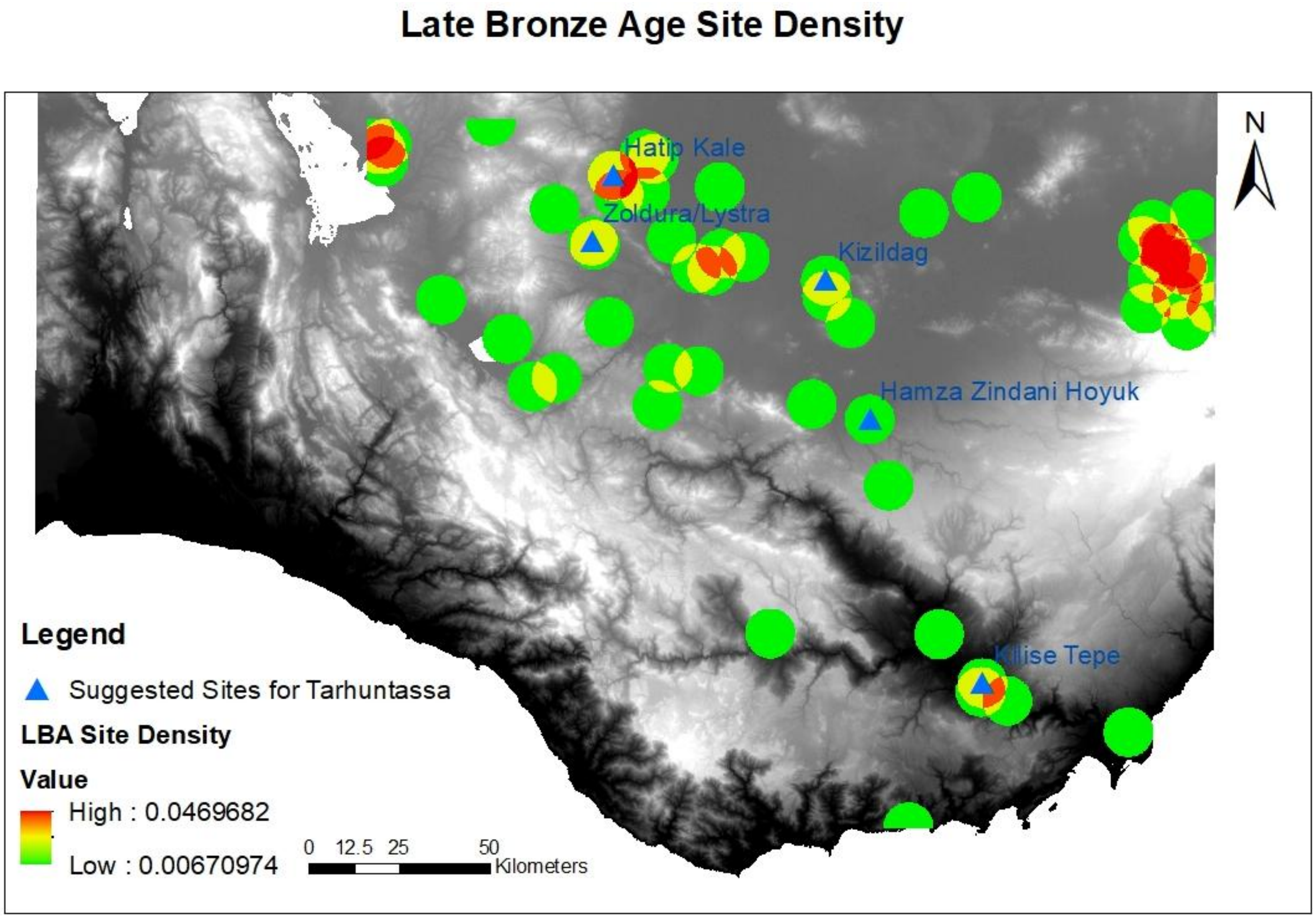

Figure 5.7. Density of Late Bronze Age sites in the study area.

The clearest result visible in Figures 5.5 through 5.7 is also one that could have been assumed from observing the raw data in the previous chapter - the maximum density value for Early Bronze Age sites is double that of the maximum value for 2nd Millennium sites, and just short of double that of Late Bronze Age sites. Not only were there vastly more separate settlements in the Early Bronze Age, but these settlements were very densely concentrated in two key areas - the Çarşamba alluvial fan and the area north of modern Karaman. Two further concentrations are found on the eastern shore of Lake Beyşehir and to the far northeast near modern Ereğli. These latter two concentrations remain fairly consistent throughout time. The Çarşamba and Karaman concentrations, however, are severely reduced in the 2nd Millennium, and almost entirely gone when only taking into account those sites specifically dated to the Late Bronze Age. Interestingly, two new concentrations of dense settlement in the 2nd Millennium, on the central-southern edge of the plain and immediately south-west of Karadağ volcano, are also not apparent in those sites assigned a Late Bronze Age date. The latest period is characterised by generally very sparse settlement density, although the Ereğli and Beyşehir concentrations remain important, and a new focus on the Göksü valley is indicated, as well as a fairly heavy concentration on the north-western edge of the Konya plain, near the modern city of Konya itself.

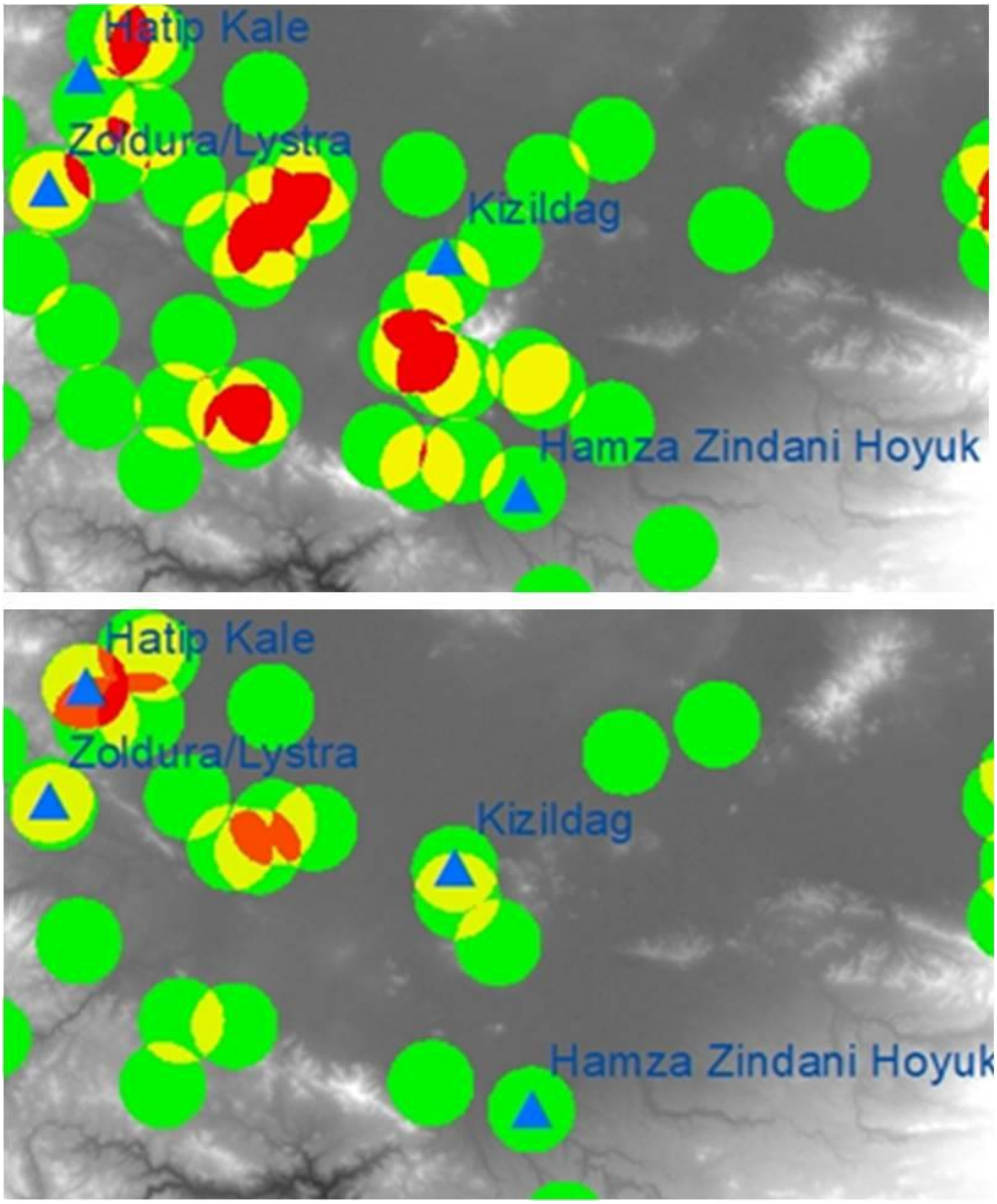

Figure 5.8. Side-by-side comparison of the settlement density in the central Konya Plain area in the 2nd Millennium and Late Bronze Age, as shown in figures 5.6 and 5.7.

However, as with some of the earlier analyses, making clear distinctions between the density of settlement in the 2nd Millennium and the Late Bronze Age is not necessarily feasible, with some of those sites labelled only as '2nd Millennium' perhaps also dating to the Late Bronze Age. It is for this reason that this analysis uses the density data of both 2nd Millennium and Late Bronze Age sites in drawing any conclusions about apparent Late Bronze Age site location.

It should also be noted that Dinçol et al (2000) used the criteria of Tarḫuntassa being in a densely settled area to justify their hypothesis of Kızıldağ as the most likely location for the capital. However, while it is true that there is a dense concentration of 2nd Millennium sites immediately west and south-west of the Karadağ massif (and it is presumably this concentration to which Dinçol et al were referring), this concentration seems to be of less importance when considering the sites identified as Late Bronze Age. Indeed, the site of Kızıldağ, to the north of Karadağ, appears incredibly isolated, even by apparent Late Bronze Age standards. If Kızıldağ had been chosen as the site of a new capital in order to control an existing population, then it would have been a poor choice, as this population may well have been dwindling by the time of Tarḫuntassa's construction. Thus Dinçol et al (2000) may not be justified in using the criterion of settlement density to justify the choice of Kızıldağ as the likely site of Muwatalli II's capital. This observation was tested in ArcGIS by the carrying out of a further density analysis including both 2nd Millennium and Late Bronze Age sites, and the results reclassified into four bands designated Isolated, Low Density, Medium Density and High Density. A 'Search by Location' was then carried out on sites dated specifically ot the Late Bronze Age to see if there was a correlation between dense areas of combined 2nd Millennium and Late Bronze Age occupation and the location of Late Bronze Age sites. The results are shown in Table 5.8 below.

Density of 2ndM/LBA Sites	LBA Sites
Isolated	24
Low Density	12
Medium Density	11
High Density	10
TOTAL	57

Table 5.8. Correlation between Late Bronze Age site location and areas of dense 2nd Millennium and Late Bronze Age sites.

These results clearly prove the observation made earlier, in that nearly half (42.11%) of all Late Bronze Age dated sites are found in comparative isolation from areas of dense settlement in the 2nd Millennium . This conclusion, in combination with the apparent decline in dense concentrations of population observed in the Late Bronze Age site data, suggests that building new settlements in already densely populated areas was not a significant concern to the local Late Bronze Age population, and that if settlement density is to be included in the predictive model for locating Tarḫuntassa, it should perhaps be weighted to be of lesser importance. However, whether this change is due to the external influence of the Hittites, or a local change in settlement strategy, cannot be said for certain. Since the results of this analysis appear to have cast doubt over the use of this criterion to justify the conclusions of Dinçol et al (2000), it may be better not to include density as a criterion for the predictive model at all. To say that there is a 42% chance of Late Bronze Age settlements being found outside areas of dense settlement would be actively counterproductive to locating Tarḫuntassa, since the location of known settlements is the basis on which the predictive model is being calculated. Furthermore, given that what has been shown is a *lack* of correlation, applying these results to the predictive model would mean allocating a meaningless value of 42% to the vast majority of the study area.

5.2.4 - Proximity of sites on plain to plain edge across time periods

Tables 5.9 and 5.10 below show the proximity of the sites located between 1000-1050m in altitude (Band 1 of Tables 5.1 and 5.2) to areas with an altitude of 1050-1100m (Band 2 of Tables 5.1 and 5.2). This method accounts only for those sites in the main Konya plain, around the Çarşamba fan, and therefore is a smaller subset of the total dataset. It also arbitrarily assigns the 1050m mark as the point at which the 'plain edge' starts. In these two tables, the number of sites represented in each proximity band is cumulative, rather than separate as in other tables . This was due to this analysis being carried out earlier, before it was decided that the sites results would be separated out into the number of sites per band so that they could be easily converted into the percentages that would be used to construct the predictive model. Tables 5.11 and 5.12 (and the graphical representation of Table 5.11 in Figure 5.9) on the other hand, show the results of the analysis using 'moderately steep' slopes to define the plain edge.

Proximity to Band 2 (km)	EBA (of total 66)	2nd Millennium (of total 26)	LBA (of total 10)
10km	61 (92.42%)	25 (96.15%)	9 (90%)
7.5km	56 (84.85%)	23 (88.46%)	8 (80%)
5km	45 (68.18%)	20 (76.92%)	6 (60%)
2.5km	24 (36.36%)	14 (53.85%)	4 (40%)
1km	8 (12.12%)	3 (11.54%)	1 (10%)

Table 5.9. Proximity of sites within band 1 of Table 7 (1000-1050m) to band 2 (1051-1100m) across time periods.

Proximity to Band 2	EBA (of 48)	EBA+2nd M (of 12)	EBA+LBA (of 2)	2nd M (of 7)	2nd M+LBA (of 3)	LBA (of 1)	All 3 (of 4)
10km	44	12	2	7	3	1	3
7.5km	39	12	2	6	2	1	3
5km	29	12	2	5	1	1	2
2.5km	14	8	1	4	1	1	1
1km	7	1	0	1	1	0	0

Table 5.10. Proximity of sites within band 1 of Table 7 (1000-1050m) to band 2 (1051-1100m) across time periods subdivided by periods of occupation.

Proximity to Mod Slopes	EBA	2nd M	LBA
<1k	58 (33.33%)	29 (39.19%)	32 (56.14%)
1-2.5k	35 (20.11%)	16 (21.62%)	5 (8.77%)
2.5-5k	29 (16.67%)	14 (18.92%)	10 (17.54%)
5-7.5k	16 (9.2%)	6 (8.11%)	5 (8.77%)
7.5-10k	12 (6.9%)	3 (4.05%)	2 (3.51%)
10-15k	11 (6.32%)	2 (2.7%)	1 (1.75%)
15-20k	10 (5.75)	3 (4.05%)	2 (3.51%)
20-25k	3 (1.72%)	1 (1.35%)	0 (0%)
TOTAL	174	74	57

Table 5.11. Proximity of sites to Plain Edge (defined by moderately steep slopes) across time periods (total sites in each period).

Proximity to Mod Slopes	EBA	EBA+2nd M	EBA + LBA	2nd M	2nd M +LBA	LBA	All 3	TOTAL
<1k	33 (29.2%)	5 (22.73%)	5 (71.4%)	7 (50%)	2 (33.33%)	10 (83.33%)	15 (46.875%)	77 (37.38%)
1-2.5k	23 (20.35%)	7 (31.82%)	1 (14.3%)	5 (35.71%)	0	0	4 (12.5%)	40 (19.42%)
2.5-5k	18 (15.93%)	6 (27.27%)	0	0	3 (50%)	2 (16.67%)	5 (15.625%)	34 (16.5%)
5-7.5k	10 (8.85%)	1 (4.545%)	0	0	0	0	5 (15.625%)	16 (7.77%)
7.5-10k	9 (7.96%)	1 (4.545%)	1 (14.3%)	1 (7.14%)	0	0	1 (3.125%)	13 (6.31%)
10-15k	10 (8.85%)	1 (4.545%)	0	0	1 (16.67%)	0	0	12 (5.83%)
15-20k	8 (7.08%)	0	0	1 (7.14%)	0	0	2 (6.25%)	11 (5.34%)
20-25k	2 (1.77%)	1 (4.545%)	0	0	0	0	0	3 (1.46%)
TOTAL	113	22	7	14	6	12	32	206

Table 5.12. Proximity of sites to Plain Edge (defined by moderately steep slopes) across time periods (subdivided by specific occupation phases).

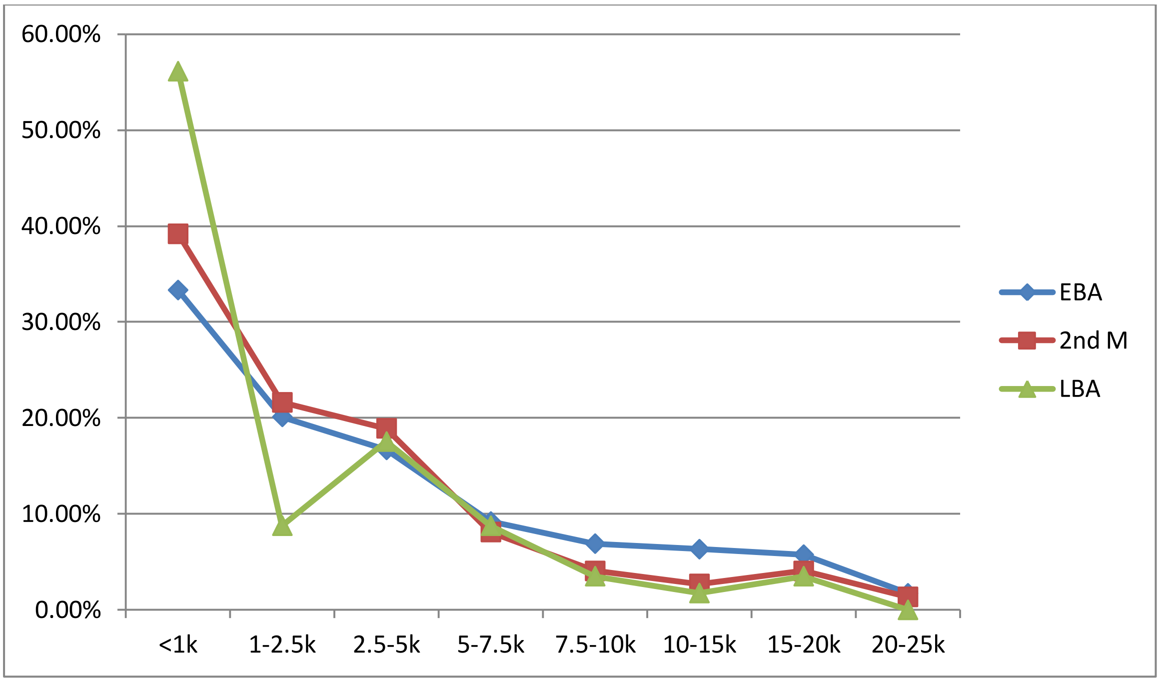

Figure 5.9. A graphical representation of Table 5.11.

The results shown in Tables 5.9 and 5.10 are very interesting, as they seem to disprove Bahar et al (2005) and Mielke's (2011a) hypotheses entirely. Indeed, it is the 2nd Millennium sites that seem to be situated closest to higher altitudes, with over 50% of sites from this period within 2.5km of the 1051-1100m band, compared to just 20% of those dated to the Late Bronze Age and 26.5% in the Early Bronze Age. In fact, even though there are far more Early Bronze Age sites than Late Bronze Age sites in band 1, the percentages of sites close to band 2 in these two periods are remarkably similar.

However, the results shown in Tables 5.11 and 5.12 tell a very different story. If the 'plain edge' is defined by steeper slopes surrounding the flat plain, then the results shown here are a lot closer to the conclusions of Mielke (2011a) and Bahar et al (2005). Over half of sites dated to the Late Bronze Age are situated within 1km of moderately steep slopes (56.14%), and 47 of the 57 Late Bronze Age sites are within 5km of these slopes. It is also worth noting that there is a general trend towards sites being closer to the plain edge across all time periods by this definition, but that this is apparently more defined in the Late Bronze Age. In those sites occupied in the Early Bronze Age, more sites are 5k or further from the plain edge than in any other period, or on average. When the results are subdivided by specific phases of occupation (as seen in Table 5.12), the difference between the Late Bronze Age sites and those established earlier is even more stark. 10 of the 12 sites newly established in the Late Bronze Age (83.33%) and 5 of the 7 sites initially settled in the Early Bronze Age then re-occupied in the Late Bronze Age (71.4%) are within 1km of moderately steep slopes - the highest percentages of any of the occupation phases by over 20%. Furthermore 20 of the 113 sites abandoned after the Early Bronze Age (18.02%) are found more than 10km from moderate slopes, again considerably higher than any other occupation phase, with the exception of the sites occupied in the 2nd Millennium and Late Bronze Age (of which there is a sample size of only six, not enough to produce any statistically meaningful data).

This methodology should be considered more reliable in defining the 'plain edge', as slope steepness values remain constant and directly comparable across the entire study area, while altitudes are not, since the plains of the upper Çarşamba valley around Beysehir and Seydisehir are at a higher altitude than the Konya plain. As such, the hypothesis of Mielke (2011a), that Late Bronze Age sites are to be found at the periphery of wide valleys such as the upper Çarşamba and open plains such as the Konya Plain, appears to be borne out by the results of this analysis, and will form a key part of the predictive model and the search for Tarḫuntassa.

5.3 - Modelling the past landscape

The results obtained in this chapter have gone a long way towards further developing a broad picture of Late Bronze Age settlement patterns, how these patterns apply to this region, and what this might mean for the location of Tarḫuntassa. It can be suggested with a reasonable level of confidence that, in the Late Bronze Age, settlement sites were more likely to be established (or continue to be settled) at the edges of the plain, in close proximity to rivers, and were somewhat more likely to occupy sloping ground, rather than occupying the entirely level central plain as earlier Bronze Age settlements had done. Furthermore, it has been shown that density of either contemporary or prior settlement was not an important concern in the Late Bronze Age, with new settlements frequently being established in relative isolation from previous centres of population.

However, once again such conclusions can only be drawn with the caveat that distinguishing between 2nd Millennium and specifically Late Bronze Age settlement patterns, on the assumption that none of the sites designated as '2nd Millennium' were occupied at all in the Late Bronze Age, is dangerous, and while the aforementioned trends are certainly identifiable from these results, they may not be as clear cut as they first appear.

Furthermore, there are still more criteria that cannot be tested without first carrying out much more complex processes. These are the 'landscape modelling' criteria, which will involve the utilisation of datasets which are highly abstracted from the source data, and will be addressed in the next chapter.

6. Landscape Modelling

The previous two chapters have presented the results of the analyses which can be performed by first observing the empirical data directly, and secondly by analysing the data in relation to the surrounding landscape and topography, as well as to other settlements. However, the important criteria that Tarḫuntassa should be located within close proximity to roads (Dinçol et al 2000) cannot be tested without first entering into a process of further abstraction from the raw data. Rather than directly examining the database as with the site characterisation analyses, or analysing the connection between the sites and the landscape using a digital elevation model, testing this criteria requires the construction of a hypothetical network of ancient roads, *created from* both of these available datasets but without being *directly drawn from* either. For this reason, this chapter refers to this process as 'landscape modelling', the creation of new datasets from the available data, which are then in turn used to perform further analyses. As a result of being more abstract, this is not only the most difficult and complex analysis of any performed for this project, but also the most open to critique - it is hoped that some of these flaws will be examined as the analysis is carried out, in an ongoing process of reflective self-criticism and, in the next chapter, comparison with other studies where such data has been available without having to create such abstract datasets.

6.1 - Methodologies

6.1.1 - Least Cost Path Analysis

Least Cost Path analysis is an analytical tool available within most, if not all, commercially available GIS Software. It is a method of modelling theoretical routes of communication and travel through a landscape, and in essence answers the simple question of 'what is the easiest way to move from point A to point B?' The ease of movement through each raster cell is represented through a 'cost' value, and the least-cost path is the line which accumulates the lowest cost value between A and B, or 'source' and 'destination' as they are referred to in ArcGIS. The minimum requirements for performing least cost path analysis are the source and destination for the path, usually (but not always) vector shape files, and a raster file from which the tool can derive both 'cost' and 'backlink' rasters. The input raster file which represents the 'cost' values is usually a derivation of the Digital Elevation Model (DEM), and among the most commonly used of these is slope steepness. Avoiding the extra work involved in traversing steep slopes is usually one of the key factors in the creation and positioning of routeways, making this the most obvious criteria from which to generate a cost value. The tool first calculates the accumulated cost of travelling to any other cell within the raster model (the 'cost' raster). Starting from the source, which has a cost of zero, the input value (for example, slope gradient) of each cell is added to the input value of its neighbour and divided by two. Diagonally neighbouring cells are added, divided by two and multiplied by 1.414214 (the square root of 2). Whichever calculated cell with uncalculated neighbouring cells which has the lowest cost is then used to calculate the calculate the cost value of *its* neighbours, and so on. These costs are then accumulated (i.e. each newly calculated cost value is added to the cumulative costs of each neighbouring cell which offers the lowest cost route back to the source), until each cell represents the lowest possible accumulative cost of travelling from that cell back to the source. The tool subsequently generates a value between 1 and 8 for each cell equating to the direction of travel (1 for East, continuing clockwise through to 8 for North-east) to whichever neighbouring cell is on the path of lowest accumulated cost back to the source (the 'backlink' raster). Using these two rasters and the destination as inputs, the cost path can then be produced. Theoretical examples of a cost surface, backlink raster and cost path are shown below in diagrams 6.1, 6.2 and 6.3. For a more in-depth explanation of the archaeological potential and uses of least-cost path analysis, including case-studies, see White & Surface-Evans (2012).

75.2	76.54	37.99	52.61	39.97
74.51	70.32	70.53	76.35	67.42
81.84	59.41	90.93	88.43	83.6
67.08	82.29	91.27	73.19	48.32
63.75	82.65	85.5	82.3	47.62

75.2 224.73	76.54 148.86	37.99 91.59	52.61 46.29	39.97 0
74.51 255.67	70.32 168.18	70.53 133.36	76.35 82.25	67.42 53.7
81.84 275.77	59.41 225.24	90.93 200.53	88.43 163.92	83.6 150
67.08 314.68	82.29 323.01	91.27 290.99	73.19 260.87	48.32 215.96
63.75 380.1	82.65 413.97	85.5 373.08	82.3 308.32	47.62 263.93

Fig 6.1 - Example of a Cost Surface raster (right) calculated using the earlier slope gradient example (left). The cell in the top right is the source.

75.2 224.73	76.54 148.86	37.99 91.59	52.61 46.29	39.97 0
74.51 255.67	70.32 168.18	70.53 133.36	76.35 82.25	67.42 53.7
81.84 275.77	59.41 225.24	90.93 200.53	88.43 163.92	83.6 150
67.08 314.68	82.29 323.01	91.27 290.99	73.19 260.87	48.32 215.96
63.75 380.1	82.65 413.97	85.5 373.08	82.3 308.32	47.62 263.93

224.73 1	148.86 1	91.59 1	46.29 1	0
255.67 8	168.18 8	133.36 8	82.25 8	53.7 7
275.77 8	225.24 8	200.53 8	163.92 8	150 7
314.68 8	323.01 8	290.99 8	260.87 8	215.96 7
380.1 7	413.97 8	373.08 8	308.32 8	263.93 7

Fig 6.2 - Cost Backlink (right) calculated from the Cost Surface (top left), with the top right cell as the source. Each cell's value represents the direction of travel to its lowest-cost neighbouring cell.

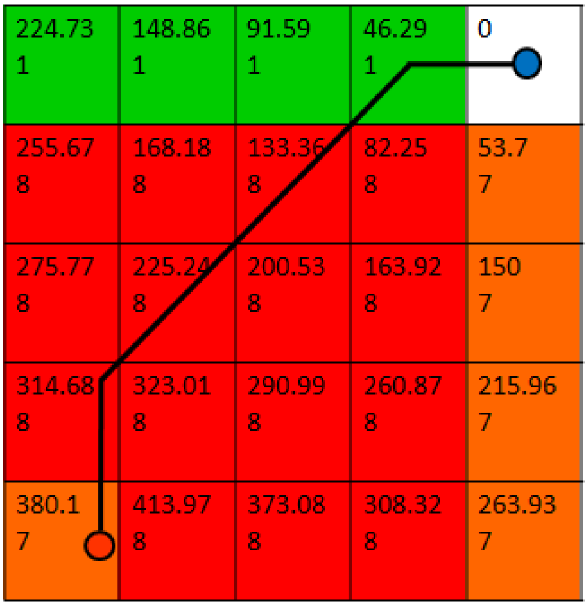

Fig 6.3 - A least-cost path from the source (top right) to a destination in the bottom left cell. Note how the least cost path does not go straight through the centre, due to the higher cost of travelling through these cells.

6.1.2 - Previous attempts to map historical trade routes in the study area and beyond

Bajramovic (2011) attempted to map out the historical geography of Anatolia in the Old Assyrian period, including locating cities named in itineraries and connecting them together with the presumed location of trade roads - however, his was a highly text-based methodology, with his conclusions based almost entirely on the identification of cities through toponyms, and his observations from travelling in the region. In fact, in her review of Bajramovic's study, Radner (2012) points out the dire lack of computational archaeology in his study, saying that 'given his key objective of linking up the necessities of trade with geography, a cost surface model would have provided a valuable research tool' (p2).

Dercksen (1996), in his study of the Old Assyrian copper trade does not cover an area any further south than Konya-Karahöyük, despite the clear evidence from the settlement data collated here for further heavy 2nd Millennium settlement to the southeast around Karadağ and the modern city of Karaman. Furthermore, Michel's (2001) map of Old Assyrian trade roads, used by Bajramovic (2008) as a base for his model of zones of interaction, has a road running roughly east-west past Konya-Karahöyük, crossing the mountains, turning sharply south down the Çarsamba valley to Lake Suğla, before following the Çarsamba up to the point to where it turns back towards the plain near Bozkir. From here, Michel's road departs from the Çarsamba, instead climbing to the headwaters of the Göksu and following this river all the way to the coast near modern Silifke.

During the Hittite Empire period, the focus of trade changed from the interior of Anatolia and the obsidian, silver and wool trades that had fuelled the growth of Karahöyük and the other Old Assyrian trading colonies, to the coast and international trade with Cyprus, Egypt and the Levant. Newhard et al (2008) carried out a least-cost path analysis within the Goksü valley region to ascertain whether the Sertavul pass, the route the modern highway takes, was used as a primary means of connecting the Konya plain to the Goksü valley and therefore the coast in the Late Bronze Age. Their results showed that while the Sertavul pass and the Göksü valley could not be considered a routeway of primary importance in the Late Bronze Age, it may have provided a local alternative to the more widely used Cilician Gates for those settlements located in the western Konya plain. They also note the increased cultural connection between Central Anatolia and the Göksü valley in particular, in the form of Central Anatolian ceramics (notably red lustrous ware) present at sites like Kilise Tepe and Terkirköy. It has been noted by Jasink and Bombardieri (2013) that this is a connection which gets less prominent further east into the Cilician plain, and that the Göksü valley and coastal area around modern Silifke must have served a particular purpose with regard to trade, both between various regions of Anatolia and with cultures overseas such as Cyprus.

Bikoulis (2012) attempted a least cost path based analysis of Early Bronze Age sites within a similar study area to this project (although expanding slightly further to the east), generating least cost paths between every site in the study area before using network analysis to show which 'nodes', i.e. settlements, were of greater importance in the hierarchy of Early Bronze Age communications networks. This involved abstracting the actual map of least cost paths into a series of straight lines ('vertices'), representing the number of interconnecting routes between each settlement and making it easier to analyse the routes as a conceptual network, rather than a physical map. While there is some value in this method, showing individual sites which may have carried greater importance, simply knowing the number of routes connecting each site does not allow us to ascertain the possible locations of the roads themselves, nor does it effectively create a hierarchy of routes, revealing which were major trading roads and which minor byways.

Beyond the study area, a key comparison for this project can be found in the detailed study of the potential Hittite road network carried out by Karl Ströbel (2008), as part of his Tavium International Research Project. This project focusses on the area surrounding the modern village of Büyüknefes, the site of the ancient Galatian city of Tavium (known to the Hittites as Tawiniya). Ströbel attempts to map out the road system connecting Tawiniya, Hattuša and other major Hittite settlements in the area (including Zippalanda/Kusakli Höyük and Yassihoyuk) through references to Hittite religious festival itineraries (namely the AN.TAR.ŠUM^{SAR} festival, the Purullija New Year festival and Nuntarrijašha festival), preserved Roman roads which may follow earlier Hittite routes, and the use of Google Earth, satellite photography and 1:25,000 scale maps. Further comparison between this study and that of Ströbel will be carried out in Chapter 7 of this thesis.

6.2 - 'Total' Least Cost Path Analysis

There are some issues with the routes produced by Least Cost Path analysis, which are outlined by Conolly & Lake (2006) and are of relevance here. Firstly, the fact that the backlink raster only produces eight directional values means that paths often have a slight zig-zagging appearance, even on flat landscapes - however, this can be mitigated by having the algorithm search for raster cells further away than a radius of just one cell when producing the cost and backlink rasters, and is of less concern in larger study areas such as the one involved in this study, where the number and size of the cells within the context of the total size of the raster means that this effect is less obvious when considering the bigger picture. The second relevant issue mentioned by Conolly & Lake (2006) is that of multiple destinations, and it is this issue that the 'Total Least Cost Path' analysis modelled here seeks to eliminate.

Conolly & Lake raise the issue that the available GIS algorithms (when their work was published in 2006) only traced paths between two locations at a time. Certainly, within ArcGIS, this is still the case with the basic Least Cost Path functionality provided. The solutions they suggest are to either trace least cost paths from a single source to multiple destinations individually, if the source in question is a trading centre, or to treat each site as source and destination in turn, if they are part of a single trade road such as a caravan route. This second option is more applicable to the current study, as no site is being given priority over any other and the exercise here is simply to try and model the most likely routes of communication throughout the entire landscape. However, Conolly & Lake believe that for this to work, one must first already know the order in which these sites were visited. In contrast, the process by which Total Least Cost Path analysis is achieved has to be entirely without precedence given to any one site over another.

The aim of Total Least Cost Path Analysis is to generate cost paths between every site within the database of 2nd Millennium date or later (a total of 76 sites) - this corresponds with the general shift in settlement pattern observed at the end of the Early Bronze Age and the apparent decline in the rural population of the Çarşamba fan, resulting in a much lower number of settlement sites in the 2nd Millennium and Late Bronze Ages, a situation which did not alter until the Iron Age (Baird 2001b, Yakar et al 2001, Mellaart 1963). Knowing that very few new settlements were established in the Late Bronze Age, with the possible exception of the new capital of

Tarḫuntassa, it is likely that the trading routes established earlier in the 2nd Millennium, which included key *karum* settlements such as Konya Karahoyuk, may still have provided the backbone for the routes used in the Late Bronze Age - by the local population, by the Hittite Empire and by the vassal kingdom of Tarḫuntassa. If a new city was established by Muwatalli II to be the Hittite capital, it surely must have been within close proximity to an existing major route of communication, a criteria also applied by Dinçol et al (2000) in their assessment of the archaeological landscape. Using 2nd Millennium as well as Late Bronze Age sites to generate the Total Least Cost Path model also accounts for the fluidity of the dating evidence in these two periods.

However, simply generating paths between every site in the database will not be enough - as noted in the critique of Bikoulis (2012), it will be more important to ascertain which of these routes were the most important, or most frequently used.

In order to ascertain this, an effective Total Least Cost Path analysis has to show not only which settlements are connected by routes, but also how frequently these same routes are used between multiple settlements. It stands to reason that, if a road is created to link key settlements within an area, or if settlements are deliberately established within close proximity to a pre-existing route, then multiple least-cost paths between these sites will not only fairly accurately approximate the location of this route, but also superimpose on each other with a greater regularity if this route is more frequently used to travel between a greater number of settlements.

In order to achieve this, ArcGIS's Model Builder was used to create two programs - one to automatically generate least cost paths from one source site within the database to every destination to which a path had not already been generated, and a second to turn these paths into rasters which could be added together to form a single composite model of all the generated paths superimposed on top of each other. When ArcGIS produces a least-cost path, the output is a raster file, with the cell representing the location of the source itself having a value of 1, and the cells representing the least-cost path all having a value of 3. Every other cell within the extent of the original cost raster which is not on the least-cost path is assigned a value of Null, essentially removing them entirely from the raster and rendering them unusable for any subsequent analysis. As such, Null cells cannot be added together using the Raster Calculator tool. Therefore, the second tool created in Model Builder isolates the cells with Null values, giving them a value of 1 and all other cells (the least cost path and source) a value of 0. This is then reversed using a Conditional map algebra query - all cells with values of 1 are given values of 0, and all cells with values of 0 are given their original output value of 3. This means that those cells which were originally Null now have values of 0 and can be added together in the Raster Calculator. Furthermore, by giving all path cells a value of 3, the value of cells with greater numbers of superimposed paths will increase exponentially quicker than if they had values of 1, and subsequently the more important routes will be more readily identifiable.

The resulting paths are added together in Raster Calculator, firstly into sets by source site (the number of paths in each of these sets decreases by one each time, by virtue of one more site having already been used as a source each time, and therefore not having to be reused as a destination). Then, these sets are added together to create the total composite. Finally, this raster composite is converted into a series of vector polylines and colour coded to correspond with increasing number of superimposed routes. All cells with values of 0 are therefore not represented, the polylines become more easily searched and routes with high values are more easily identifiable. The resulting raster of the total least cost path analysis, before its conversion into polylines, can be found in Appendix 2.

The resulting database of polylines were separated into six categories of increasing value and assigned colours from the same scheme as that used by UK road atlases. Minor local trackways and lanes (those paths with the lowest values) were white. Paths in the second and third categories were designated as equivalent to UK B roads, coloured yellow and orange, respectively. Categories four and five were coloured red and green, the colours of UK A roads. Finally, the sixth and highest value category of roads was blue, as with UK motorways. The higher valued categories also had a greater size of polyline, to exaggerate the paths with greater values.

<u>6.2.1 - Distribution of sites by proximity to roads</u>

Once a network of hypothetical trade routes used throughout the 2nd Millennium had been developed using Total Least Cost Path analysis, the paths with the highest values, i.e. those made up of the most least cost paths between sites superimposed on each other, were used to calculate nine shapefile bands of increasing distance from those key trade routes using the Buffer tool. The 'Select by Location' tool could be used to find sites in each of the bands. This was done to assess Dincol et al's (2000) assertion that a prospective Late Bronze Age Hittite capital would have to be close to important communication networks. This is a key element of the predictive model, but also one of the hardest to assess the veracity of, due to the lack of physical evidence for these ancient trade routes. However, the paths generated through least cost path analysis are a good 'most-likely' scenario to use in testing this criteria, as they use a combination of the existing settlement evidence and the natural routes through the landscape to calculate where the most effective ways to travel between settlements may have been, in the absence of other cultural or political mitigating factors.

6.3 - Specific Routes of Interest

6.3.1 - Old Assyrian Trade Roads

In order to assess the validity of Michel's map (2001), the conclusions of Dercksen (1996) and to improve on the methodology of Bajramovic (2008), the results of the total least cost path analysis, which includes 2nd Millennium sites, were used firstly to identify potential routes across the mountains from the Konya plain to the Beysehir- Suğla area, and the extent of the road network in the area south of Konya-Karahöyük. Michel's map hypothesises a route directly from the Çarşamba valley into the Göksü via the area around Bozkir, rather than through the Konya plain south of Karahöyük. The Konya plain itself, south of Karahöyük, seems to have been paid precious little attention by scholars of the *kharum* colony period, and the results of the analysis may reveal alternative proposals for the trading network in this area.

6.3.2 - Late Bronze Age routes between coast and plain under the Hittite Empire

Newhard et al (2008) used the results of their least-cost path analysis conducted around the Late Bronze Age settlements of the Goksü valley region to argue that the Sertavul Pass was not the primary route used to connect the Konya Plain to the Mediterranean coast, and would instead have played a very much secondary role to the more widely used Cilician Gates. However, this would seem contrary to the extensive Late Bronze Age archaeological site excavated at Kilise Tepe and the further sites elsewhere along the Göksü valley, including the site of Tekirköy near the river's mouth, and the possible location of the port city of Ura around modern Silifke, according to Lemaire (1993) and Melchert (2007). Furthermore, Jasink & Bombardieri's (2013) conclusions suggest that the Göksü valley region was more closely connected to the Hittite heartland than the region beyond the Cilician Gates further east, which would have been associated with the territory known to the Hittites as Kizzuwatna. These suggest a more prominent role for a trade route linking the Konya Plain to the Göksü valley - and it is possible that control over this route would have been a key motivating factor in the location of Tarḫuntassa.

There was a particular focus, therefore, on the results of the Least Cost Path analysis in the region of the upper Goksü valley and southern Konya plain, and the mountainous area separating the two. The high density of 2nd Millennium or later settlements in this area, and particularly the string of settlements heading east-west across the southern Konya plain, suggest that there may have been a potentially important crossroads in this region. Bahar (2007) identified the site of Çiçek Höyük and the area surrounding it as a possible location for this crossroads, and particular attention was paid to the results of the Total Least Cost Path analysis around the site to see if it did indeed act as major junction of potential Hittite trade routes.

6.4 Results

6.4.1 - Results of the Total Least Cost Path Analysis

The initial results of the Total Least Cost Path analysis can be seen in Figures 6.1 and 6.2 below. What is very clear from the results is that there is one route across this part of the Konya plain, from the concentration of settlements near Eflatunpinar on the eastern shores of Lake Beysehir in the northwest of the study area, through the hills and mountains separating this basin from that of the Konya plain, emerging by the monumental inscription at Hatip, before forming an arc along the eastern edge of the Çarşamba alluvial plain, passing major Late Bronze Age settlements at Comakli Höyük and Sircali Höyük, as well as the concentration of settlements dated to the 2nd millennium around the western slopes of Karadağ near modern Islihisar. The route reaches modern Karaman and the Late Bronze Age site at Hamza Zindani Höyük, before continuing south through the Taurus foothills, passing by another Late Bronze Age settlement at Kozlubucak, and nearly following the route of the modern road from Karaman to Mut through the Sertavul Pass. After descending into the Göksü Valley, this route continues via a Late Bronze Age settlement at Orentepe, near Mut, before reaching the well excavated site at Kilise Tepe.

Total Least Cost Path Results

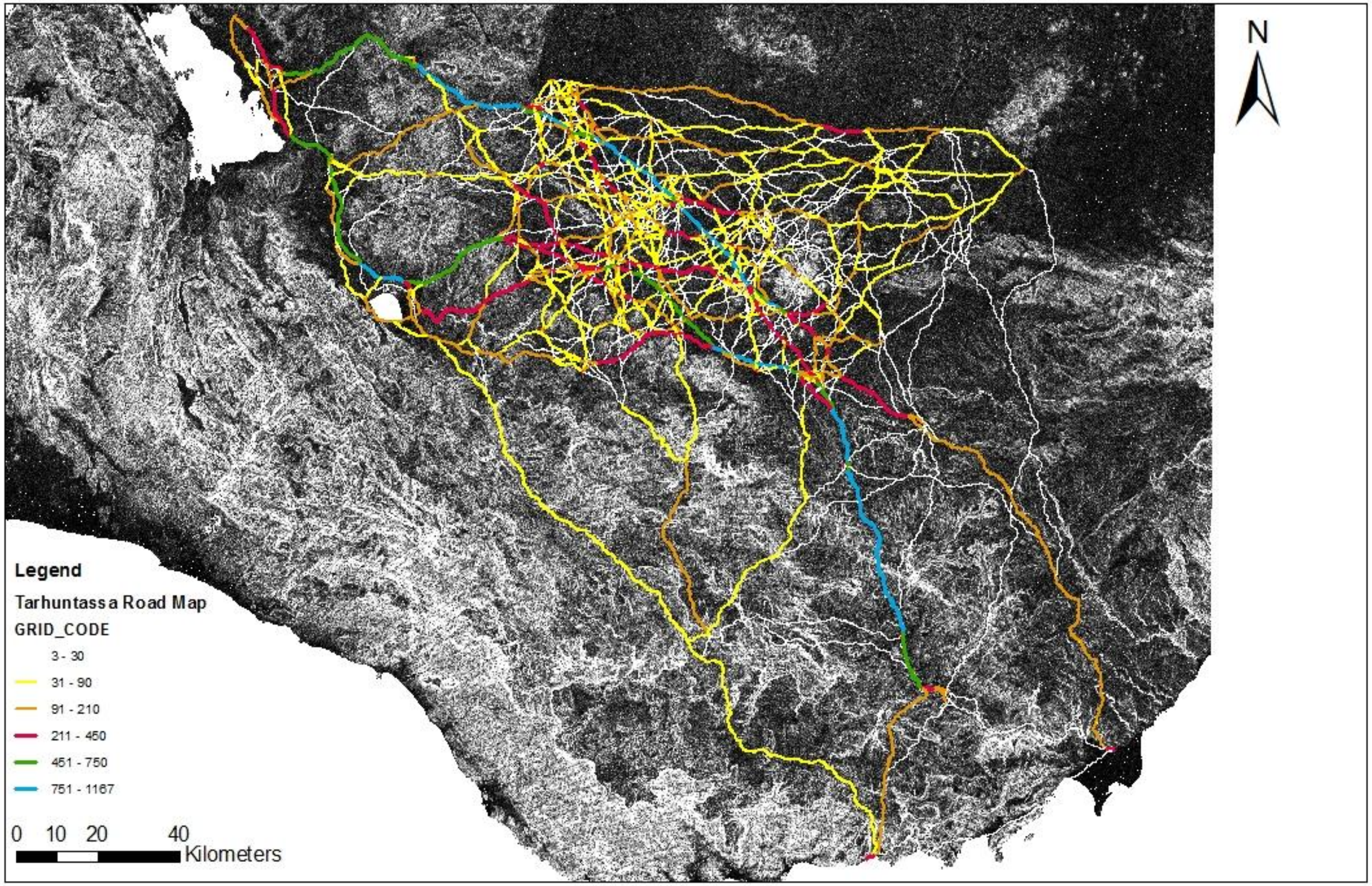

Figure 6.4. Results of the Total Least Cost Path Analysis.

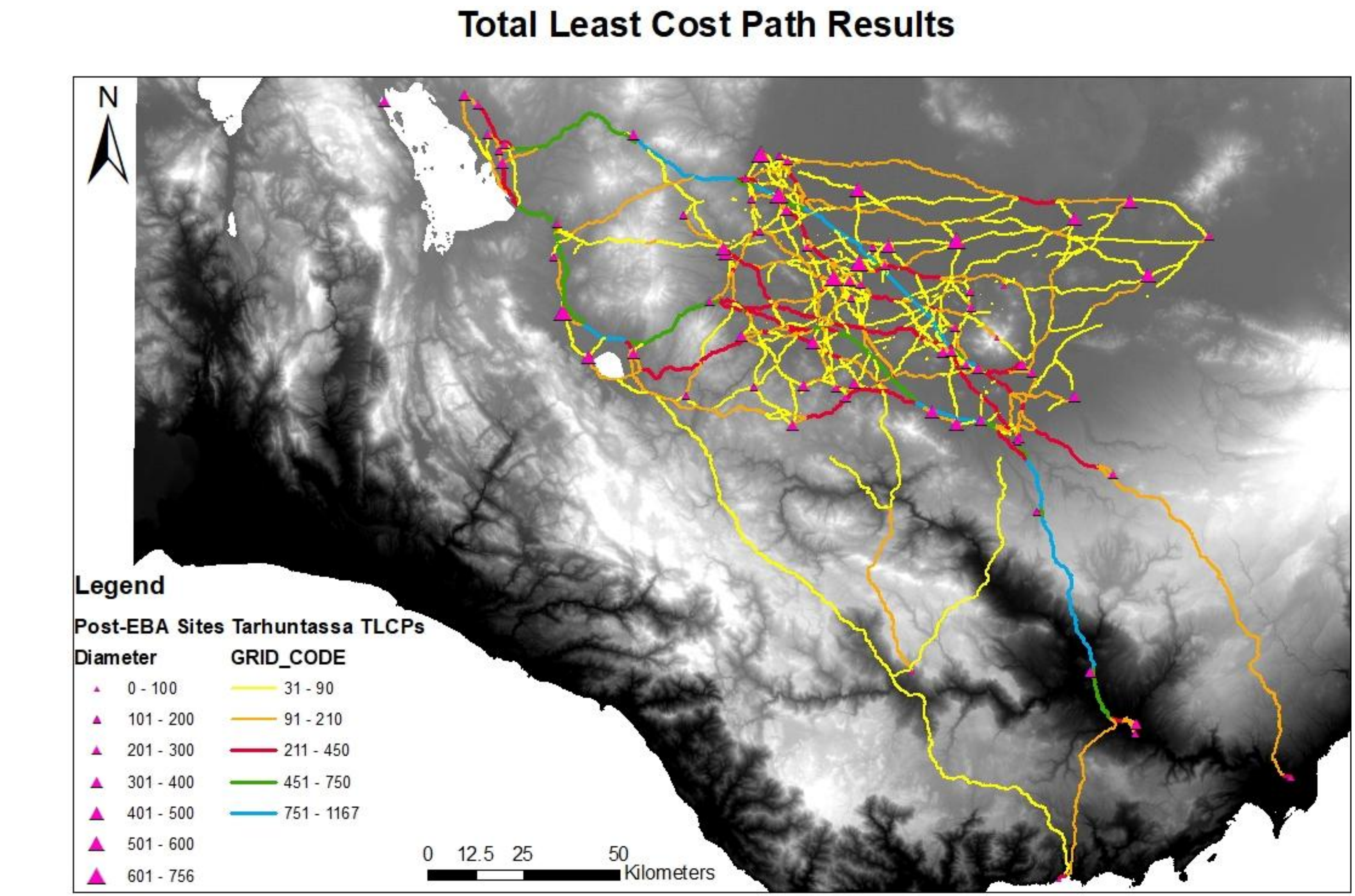

Figure 6.5. Total Least Cost Paths with Category One routes removed and 2nd Millennium/LBA sites superimposed.

There are several reasons to believe that this could have been a major routeway through the Konya plain in the Late Bronze Age, particularly at its northern and southern ends. The royal monuments at Eflatunpinar and Hatip were almost certainly placed deliberately on the borders between Hatti and Tarḫuntassa at a time of political uncertainty. The monument and ritual pool at Eflatunpinar are dated to the reign of Tudhaliya IV, cousin of Kurunta of Tarḫuntassa. The monument at Hatip, however, is one of Kurunta himself. Glatz & Plourde (2011), in their broader study of the purpose of Hittite monuments, use 'costly signalling theory' to hypothesise that monuments were used as 'signals of political competitive ability' (p58). These monuments would not necessarily be present near large population centres or even used simply to express imperial power, but were instead placed in areas far away from major political centres, closer to the populations and political entities to whom the messages were directed, and proving that the monument had been erected at great expense both in terms of travel and expertise in order to reach their intended target. Furthermore, these monuments would have been more common in areas 'where political conflict is most intense or precarious', for example in border zones, and where 'traffic between polities occurs most frequently' (p58). With this in mind, it seems very likely that these monuments were deliberately constructed on the route revealed by the Total Least Cost Path results, to convey to travellers that they were leaving one political territory and entering another, at a time when these borders would have been highly contested. The site of Comakli Höyük, which sits almost directly on this route, is also of particular interest. The majority of the archaeology at Comakli is of a later, Iron Age date, but it was almost certainly established in the Late Bronze Age. However, there is no apparent evidence for earlier occupation in the Early or Middle Bronze Age. Therefore, the settlement may well have been established as a further expression of political control over this pre-existing route. The settlements of the Hittites and their contemporaries were often established in positions of control over roads or important natural features in traversing the landscape, such as rivers and mountain passes. Examples of this can be found in the landscapes surrounding Hattuša and Tavium (Ströbel 2008).

At the southern end of the route, the likelihood of the Total Least Cost Path being accurate is further increased by the presence of settlements being used to control the route. One of these is located on the remote promontory of Kozlubucak, overlooking the Deliçay River which flows northwards towards the plain, emerging from the Taurus foothills just west of Karaman. The position of Kozlubucak in relation to this river and to the Least Cost Path is crucial. Much like the settlement at Evci-Yilanlitepe, south-east of Hattuša, this settlement controls not only a routeway but also a number of natural features which define the landscape and the ability to traverse it - firstly, the settlement is located near the sources of the two rivers which emerge near Karaman - the Deliçay to the west, and a minor tributary of the Kocadere to the east. To the south is a narrow mountain ridge which forms the watershed separating the waters flowing north into the Konya basin from those flowing south into the Göksü valley. Even today, this natural boundary is the location of the border between the Karaman and Mersin provinces. Finally, just 10km to the south of Kozlubucak is the entrance to the Sertavul Pass, a valley which provides a natural descent from the mountains into the Göksü valley. The main road from Karaman to Mut still passes through it, although its importance in ancient times, particularly the Early Bronze Age, has been questioned (Newhard et al 2008, Bikoulis 2012).

Further to the south, the route passes another settlement dated to the Late Bronze Age at Orentepe, near modern Mut. This site lies on the gently sloping eastern side of the Göksu valley. The least cost path has, at this stage, descended from the Sertavul Pass, past the early Christian monastery at Alahan, and run parallel to the Göksü, steadily descending the valley along the steep slopes of its eastern edge. However, these slopes begin to level out and become less treacherous in the vicinity of Mut, where a number of small tributaries flow down into the Göksü to the west. Orentepe is found on the south-western edge of the modern town, in a suburban district known today as Deveci. It occupies a slightly protruding outcrop at an altitude of roughly 245m above sea level, with steeper slopes on its southern and western sides. This gives it a commanding view of the Göksü river at the point where the road from the mountains enters into what is, at this point on the river's course, a wide and fertile flood plain with evidence for settlement since at least the Early Bronze Age. This same strategic point in the landscape would continue to be of importance well into the Middle Ages, with the Ottoman Castle at Mut being built 2.5km to the north-east also offering commanding views to the south and south-west. Just south-west of this site is the point where the two branches of the Göksü meet, one from the north and the other from the west. This western branch may have been another route of communication, connecting the lower Göksü valley to the western coastal region of Rough Cilica, around modern Alanya. The presence of a Hittite royal inscription monument near the modern town of Ermenek would seem to confirm this, if we accept Glatz & Pourde's hypothesis (2011) and assume that monuments were placed in areas of heavy traffic between contested political areas. However, the Total Least Cost Path does not account for this possible route, due to the lack of settlements dating to any part of the 2nd Millennium discovered in the western coastal region, with the exception of Parha, the Hittite name for the classical settlement of Perge, much further to the west near Antalya. Certainly there is room for further survey work to be done in this western coastal region, and excavations at Antiocha ad Cragum and Selinus, while primarily investigating Classical remains, have uncovered Late Bronze Age pottery.

At the southern end of this most intensively used section of the Total Least Cost Path is the site of Kilise Tepe, excavated by Cambridge University under Nicholas Postgate. This site has been interpreted as being 'situated to oversee the last descent to the coast' (Gates 2011) along the Göksü valley. Symington (2001) asserts that the Göksü valley would have been a key conduit for transporting trade products from the Mediterranean into Central Anatolia. However, the Total Least Cost Path does not favour the river valley as the simplest route to get from the Konya plains to Tekirkoy, the known Hittite settlement at the estuary of the Göksü (situated at modern Atayurt, east of Silifke). This may be because, beyond Kilise Tepe, the character of the valley changes drastically, from a broad-based, fertile valley floor to a steep sided canyon running through semi-arid terrain populated by hardy shrubs, and sparsely populated throughout the Bronze Age. Kilise Tepe is situated on the east bank of the Göksü, very close to the modern road from Karaman to Mersin. It is possible that the ancient road would have ascended to the cliffs above the river, in the same manner as the modern road. However, such a route would have been arduous. There is very limited scope for a route to have existed along the river bank itself, as the canyon becomes so narrow at points as to make this nigh impossible. Furthermore, while the river is navigable for much of its course from the estuary up to Kilise Tepe, sections of it are strewn with large boulders, and the waters can be very fast flowing through the narrow canyons, making it more suitable for white-water rafting than as a steady and reliable waterway for trading vessels. There are further indications that this route may have been used by the Hittites. A rock-cut monument at Keben, almost precisely half way between Kilise Tepe and the coast, suggests that traffic through the valley would have been heavy enough for this to be considered a good location for a monument. However, the lack of inscription and some stylistic features have led some to suggest that the monument is of Early Iron Age date (Ehringhaus 1995).

The Total Least Cost Path traverses the Konya plain through the Çarşamba alluvial fan for most of its central portion, and does so in a steady arcing line from north-west to south-east. In doing so, it passes through the heart of the much earlier population centre near modern Cumra. There are a number of 2nd Millennium settlements within 5-10km of the Total Least Cost Path as it passes through this area, including Sircali, Saksak, Seydihan and Okcu Höyüks, as well as Alibeyhoyuk 11km to the south-east. However, it does not follow the clear linear alignment of 2nd Millennium and later settlements observed running south-south-east along the western edge of the plateau, from Konya Karahoyuk to Gokhoyuk. Furthermore, it is also very distant from the later settlements on the far western edge of the plateau near the foothills, such as Zoldura, Mula Höyük, May Höyük and Karahoyuk 2. These are the settlements, among other examples, that led Baird (2001) to hypothesise that settlement had shifted away from the Çarşamba fan and towards the hills region to the west in the 2nd millennium BC, a shift in settlement pattern also suggested by the environmental evidence and the Beyşehir Occupation phase hypothesis of Boyer et al (2006)

The Least Cost Path, however, does not tally with this apparent shift in settlement. This is perhaps due to a large number of overlapping cost paths from the settlements on the shores of Lake Beysehir to those near Karaman and further south towards the coast. These long distance routes will all have taken the most direct route across the plain regardless of the settlement patterns on the plain that lies between these extremities. This may have had the effect of masking more localised patterns of communication within the Konya basin.

A second route with a high number of overlapping cost paths also begins on the shores of Lake Beysehir, splitting from the route towards Hatip near the monument at Eflatunpinar, and continuing south along the shores of the lake towards the modern city of Beysehir. From here, the road follows the broad and fertile valley of the river Çarşamba as it proceeds from Lake Beysehir to near Lake Sugla, passing major 2nd millennium settlements at Karahisar, Evregi and Seydisehir II. The path leaves the Çarşamba on the northern edge of the plains surrounding Lake Sugla, near modern Ortakaraoren and the 2nd millennium settlement at Ortakaraoren Buyuk, and heads north-east up a ridge into the hills separating this area from the Konya plain. This ridge ascends 300m in altitude over a distance of just under 6km, before levelling out. The route then follows the modern road between Akkise and Akoren, passing several small freshwater lakes before steadily descending into the valley of the river May, and reaching the 2nd millennium settlement of May Höyük. From here, it follows a roughly easterly course, reaching the Çarşamba river near modern Doganli, 4.5km north-east of the 2nd millennium settlement at Dineksaray. Continuing eastwards for a short distance, it then turns south-east, almost following the route of the modern Konya-Karaman road from near modern Avdul to a short distance west of the 2nd millennium settlement of Gaferiyat on the southern edge of the plain. Finally, the route skirts the southern edge of the plain, bypassing settlements at Ilisira and Miledana Höyük, before joining the primary route in or near modern Karaman. An alternative route, not as frequently used as the route just described but still primarily composed of category four and above paths, heads more directly south-east from May Höyük, passing through the settlement at Dineksaray and arriving at the southern edge of the plateau slightly further west, about 8.5km east of the 2nd millennium settlement at Gavur Höyük.

6.4.2 - Results of the Analysis by Proximity to Roads

Table 6.1 shows the results of the 'Search by Location' analysis determining whether there is a strong tendency for Late Bronze Age sites to be situated in close proximity to the trade networks modelled in the Total Least Cost Path analysis. While it could be argued that this methodology is circular, as the roads were modelled on the sites themselves, there are three factors which reduce this circularity. Firstly, the model is derived from those sites which were dated to both the broader 2nd Millennium as well as specifically to the Late Bronze Age, while the results of the analysis display each of these discrete categories separately (however, as with other analyses, the flaws in the dating evidence must be borne in mind). Secondly, only the highest-scoring paths were used to calculate these results. Therefore these results reflect the sites which act as key 'nodes' in the communication network, and the time in which they were playing a role within the network. Thirdly, and most importantly, there are two datasets which were used to calculate the Least Cost Paths - the sites and the slope severity/cost distance. Therefore there is an additional factor, besides the position of the sites, which has decided the locations of the routes, and it is therefore entirely appropriate to consider whether sites are positioned close to these routes, as they are also a reflection of the natural ease-of-travel through the landscape. As with the Total Least Cost Paths themselves, the sites which were added to the database later, specifically those from the KEYAR survey of Maner et al

(2014-16) are not included in this analysis, hence the lower totals of sites than in previous analyses.

Within (x)km of Roads	**2nd M**	**LBA**	**Total**
0-2.5km	18 (29.51%)	10 (27.03%)	24 (32%)
2.5-5km	12 (19.67%)	8 (21.62%)	13 (17.33%)
5-7.5km	7 (11.47%)	2 (5.405%)	7 (9.33%)
7.5-10km	8 (13.11%)	6 (16.22%)	10 (13.33%)
10-15km	5 (8.2%)	4 (10.81%)	6 (8%)
15-20 km	6 (9.84%)	2 (5.405%)	6 (8%)
20-25km	1 (1.64%)	0	1 (1.33%)
25-50km	3 (4.92%)	4 (10.81%)	6 (8%)
Over 50km	1 (1.64%)	1 (2.7%)	2 (2.67%)
TOTAL	61	37	75

Table 6.1. Proximity of 2nd Millennium and Late Bronze Age sites to Total Least Cost Paths.

These results show that there is a very strong correlation between sites identified as 2nd Millennium and/or Late Bronze Age and the most frequently used routes of trade and communication through the region. Nearly half of all these sites are found within 5km of these key trade routes - 49.18% in the 2nd Millennium, 48.65% in those dated to the Late Bronze Age and 49.33% in total. There is also a small but significant proportion of sites between 7.5-10km from key routes. 73.76% of 2nd Millennium sites, 70.275% of Late Bronze Age sites and 71.99% of sites in total can be found within 10km of key routes. This is a highly significant proportion of sites throughout the 2nd Millennium (slightly more in those identified only as 2nd Millennium and not as Late Bronze Age, but not significantly so), and it should be supposed that proximity to these routes was a key motivating factor in the location of settlements throughout the 2nd Millennium.

6.5 - Interpretation of the Results

It is clear that the route passing through the upper Çarsamba valley from the region of Lake Beyşehir, past Lake Şuğla, into the Konya plain in the vicinity of either May Höyük or Akören Karahöyük and across the southern edge of the plain to Karaman (henceforth known as the 'southern route'), and the aforementioned primary or 'northern' route through the Çarsamba fan and skirting the western slopes of Karadağ, form an elongated oval loop, starting near Eflatunpinar and ending at Karaman. Between them, these two routes form the backbone of the hypothetical 2nd millennium road network. However, this system immediately casts doubt on Bahar's identification of Çiçek Höyük as the location of a potentially important 'crossroads' (Bahar 2007). According to the results of this Total Least Cost Path analysis, there is no 'crossroads' at this location, with the primary road heading south towards the coast located much further east near Karaman, and the east-west road along the southern edge of the plain diverting much further north towards Dineksaray and May Höyük. There is some suggestion in the results of a possible route through this area, connecting Karaman and the Late Bronze Age settlement at Sazli Höyük, via Gavur Höyük, Gurağaç Höyük and Sarioglan/Beloren, but this route is certainly less frequently used than the previously described 'southern route', and Çiçek Höyük is not a part of this route either, sitting between the two in a very isolated and poorly connected position.

Further doubt is also cast on the most frequently suggested potential location for Tarḫuntassa's capital, Kızıldağ (Alp 1995, Dinçol et al 2000, Melchert 2007). The volcanic hill on which the site is built occupies a promontory that would have been surrounded on three sides by the salt marshes or shallow lakes of Lake Hotamış, which may have proved a natural barrier in the Late Bronze Age. Evidence of a resumption of frequent flooding in the heart of the Çarşamba fan from 2800BC onwards suggests a wetter, more mild and humid climate had resumed after the drought which had caused the massive reduction in settlement numbers in the latter stages of the Early Bronze Age (Boyer et al 2006). That this area was once again suitable for occupation from the Middle Bronze Age onwards is borne out by the presence of two 2nd Millennium settlements within 5km of the western shores of Hotamış, at Uçhüyük and Türkmenkarahüyük. However, it should be taken into account that Hotamış has not been a lake in the proper sense of the word since about 2700BC, and after this point would only ever have been an extensive marsh, as it was until very recently. The extent of this marsh was not linked to climate, but was more likely anthropogenic in nature, being controlled by the expansion and collapse of irrigation systems on the nearby plains (Fontugne et al 1999). Therefore, the presence of a salt marsh at Hotamış would have been a consequence, not a causative effect, of the level of settlement intensity in the area. To the south-east of Kızıldağ is a second lake, Suleymanhaci, and beyond that, the slopes of Karadağ. A Late Bronze Age settlement can be found in the modern village of Suleymanhaci, on the lake's south-western shores, 4km south of Kızıldağ.

It is hard to argue against there being an important Late Bronze Age presence at Kızıldağ - however, as a result of its isolated location, it is only easily accessible from the east and south-west, and is therefore not easily reached from the common routes across the plain identified by the Total Least Cost Path. The routes of the Total Least Cost Path that connect Kızıldağ to the main trade route across the Konya plain are all of category three or lower, with the most likely and direct route travelling south, past Suleymanhaci Höyük, then south-west past Karren Höyük, joining the main trade route near Islihisar. It is possible, therefore, that Kızıldağ, rather than being a location of a capital city, was part of a wider ceremonial landscape with Karadağ, where inscriptions of Hartapu are also found.

Two further settlements have been proposed as likely capital sites by Bahar et al (2005 and 2007) - Zoldura Höyük (2005) and Hatip (2007). The first site suggested by Bahar et al (2005), Zoldura Höyük, is large, has produced plenty of Late Bronze Age dating evidence and is well situated on the point of convergence of a number of streams which feed into the May River alluvial system on the western edge of the Konya plain. However, once again this site does not feature strongly in the Total Least Cost Path results. There is some suggestion of a route heading down stream to the south-east, and then heading directly east across the Çarşamba to the settlements on the western slopes of Karadağ. This route is made up almost entirely of roads of category four or higher. It is also relatively well connected to the 'southern' route from May Höyük. However, its connections to the west and north are quite poor, and it is quite distant from the main 'northern' route. As such, Bahar's suggestion of a major crossroads at this location (2005 et al) seems unlikely. Furthermore, of the settlements on the western edge of the Konya plain, Zoldura is among the least likely to have served as a point from which a major road would have crossed the hills to the west into the upper Çarşamba valley and the area around Lakes Beysehir and Sugla. The routes from Hatip in the north, May Höyük in the south and Akören Karahöyük in the far south-western corner of the plain appear, from the results, more likely to have been heavily used. Therefore, while this site cannot be entirely disregarded as a candidate for the location of Tarḫuntassa, the results of the Total Least Cost Path do not suggest that it was at the heart of the regional trade and communication network, as Bahar et al (2005) hypothesise.

While the second of Bahar et al's suggestions, Hatip (2007) is certainly on a main route as identified by the Total Least Cost Path, the fortress on the cliff top near the monument is of a much later, Iron Age date, while the Early Bronze Age and Iron Age mound is too small and of the wrong date to be considered a location for the capital city. Furthermore, as discussed in Chapter 2, if the presence of a monument of Tudhaliya IV at Eflatunpinar and of Kurunta at Hatip suggests that the space between these two locations constitutes the border between the Hittite Empire and the vassal kingdom of Tarḫuntassa, Hatip Höyük is more likely to constitute a border post, and is in an area of great uncertainty, politically speaking. Therefore, it can almost certainly be discounted as a likely capital location.

Of the sites previously suggested as potential capitals of Tarḫuntassa, the results of the Total Least Cost Path analysis point strongly towards the area around modern Karaman as the most likely, and specifically the site at Hamza Zindani Höyük. Late Bronze Age pottery was found here by French (1965), who mentioned the site to Hawkins (1995), who dismissed it as a possible location of Tarthuntassa's capital on the grounds that he believed it to be too close to the country's borders. However, Hawkins also believed the borders of Tarḫuntassa to lie much further south, and its heartland to be in the Taurus mountains and the Göksü valley. Analysis of the Tarḫuntassa border treaties, CTH 106 and the Bronze Tablet, has shown that the 'Hulaya River Land' which formed the border was a part of Tarḫuntassa, and not outside of it (Gurney 1993). With the 'Hulaya River' very likely to be the Çarşamba, Karaman is very much located well within the borders. Gordon (1967) also considered Karaman to be a likely location for Tarḫuntassa's capital, although did not mention a specific site.

The results of this analysis bring Hamza Zindani Höyük firmly back into contention. It is at this point that the two main routes, the 'northern' route coming past Karadağ and the 'southern' route coming in from the west along the southern edge of the plain, converge. The northern route passes directly through it to reach the point of convergence, while the southern route heads south and passes the site roughly 2.5km to the west, with the two routes converging 5.5km to the south-south-east.

In terms of the route connecting the plain to the coast, while the most common route is that from Karaman to Kilise Tepe via Kozlubucak, the Sertavul Pass and Orentepe, there is a second possible route further to the east, which unlike the aforementioned route, continues all the way to the coast at Terkirkoy, just east of the Göksü estuary. While this may not have as many superimposed routes as the Karaman-Kilise Tepe route, what is noteworthy is that, with Tekirkoy being the only site in this part of the study area which was incorporated into the Total Least Cost Path analysis, and with only one 2nd Millennium site on this route outside of the plains at Godet Yolu Höyük, it can be assumed that if one divides the value of the route coming out of Tekirkoy (i.e. the number of superimposed routes) by 3 (the value assigned to each route), this will tell us the number of sites for which this route is the preferred route to the Göksü estuary. The value of this route is 204, which means that for 68 of the 76 2nd Millennium sites in the database, it is apparently easier to get to the Göksü estuary by this route, over apparently featureless mountains and through no obvious passes or river valleys, than it is through the Sertavul pass and Göksü valleys. It is this disparity between the ease of reaching Kilise Tepe compared to the coast itself that was probably identified by Newhard et al (2012), and caused them to reject the Sertavul pass as an important route in the Bronze Age. This result does raise further questions about the navigability of the lower reaches of the Göksü in antiquity, because it is clear that there is some cost impediment which makes the stretch from Kilise Tepe to the coast far from easy. Certainly the valley itself is, at points along this section of the river, a steep sided gorge, and the road would have had to climb in order to run along the cliff tops. However, the Least Cost Path analysis assumes that the speed of travel through the valley and over the mountains to the east would have been the same, without accounting for the fact that it may have been possible to navigate the Göksü by boat, making this route much faster. While the river is, in the present day, very fast flowing and rocky in some areas of the valley and is only barely navigable, water levels may have been different in the Bronze Age thanks to a milder climate and the fact that the waterways of modern Turkey have been vastly changed due to the construction of hydroelectric dams, canals and irrigation tunnels. Therefore it is worth investigating the environmental record in the lower Göksü valley, to see if the river would have been any more suitable in the Late Bronze Age for the transport of goods by boat from the coast to the 'inland port' at Kilise Tepe, as well as vice versa. In the later Hittite Empire particularly, the reliance on imported grain from the Levant and Egypt, as well as bronze from Cyprus, made bringing goods in from the coast far more important.

The results also reveal areas through which these routes pass in which no settlements of 2nd millennium date have been discovered. The stretches of the Konya plain between Comakli and Sircali Höyüks, and between Sircali and Okcu and Islihisar, have been intensively surveyed in the last 50 or so years, and the likelihood of new sites being discovered here is quite low, although not impossible. However, it would be of great archaeological value to conduct a detailed survey in the mountainous region through which the road to Kilise Tepe passes, between Karaman and Mut. Archaeological sites are not as easy to spot in this landscape as they are on the flat plains, with earlier höyük-type sites less likely to form and Late Bronze Age sites more likely to occupy natural outcrops of high ground, a tradition which would continue into the Iron Age with the creation of the walled 'hilltop forts'. A survey of this area, then, would have to consist of an intensive survey on the ground (using similar techniques to Baird's survey of the Konya Plain, including field walking, canal/stream walking and local knowledge), supplemented with the use of remote sensing techniques and multispectral imaging, as employed in the Khabur basin of Syria, Iraq and south-eastern Turkey by Menze et al (2006).

While there are no major routes passing through the area, it may also be worth extending this survey further west, into the area surrounding Ermenek. If Glatze and Pourde (2011) are correct, then the presence of the monument at Ermenek suggests that this branch of the upper Göksü valley may have been a well travelled route in the Late Bronze Age. However, since the least cost path analysis is reliant on previously discovered sites to act as sources and destinations, and there are none in the vicinity of Ermenek, then this area does not become part of the total least cost path network.

6.5.1 - Old Assyrian Trade Roads

There is little reason to suggest that a route ran directly from the Çarsamba Valley to that of the Göksu, over some fairly steep and mountainous terrain - there are no 2nd Millennium sites in this area between rivers except for the isolated Tahtali Höyük, which lies very close to the Çarsamba gorge running through the mountains. There are a number of Late Bronze Age sites in the Upper Goksü valley, however, along with an east-westerly string of 2nd Millennium (and Late Bronze Age) sites on the northern side of the mountains, leading from where the Çarsamba emerges across to Karaman.

There are three possible east-west routes between known 2nd Millennium sites which traverse the mountains from the Konya Plain to the Beyšehir-Suğla area. The furthest north follows the route of the modern Konya-Seydişehir highway. From Karahöyük itself, this route heads south-west past the modern towns of Erenkaya, Inlice and Karacaören before emerging on the other side of the mountains close to the 2nd Millennium sites of Karahisar and Evreği. The second route heads due west from the twin sites of Zoldura Höyük and Hatunsaray (both of which were also occupied in the Late Bronze Age), following the river May into the mountains, passing Gavur Lake and descending before emerging near Evreği, via the Early Bronze Age site of Üyük, near Tol. The third route, which is also the shortest, starts at May Höyüğü, in the south-western corner of the plain, and traverses a short, low-lying pass in a south-westerly direction before emerging next to Lake Suğla and the 2nd Millennium site of Ortakaraören Büyük.

From the analyses carried out using least cost path analysis between 2nd Millennium sites around the Konya plain, it seems impossible to ignore the aforementioned string of sites along the southern edge of the plain, heading towards Karaman. Furthermore, heading south-east from Karahöyük is another string of four sizeable 2nd Millennium sites and two Late Bronze Sites (both also occupied in earlier periods), ending at either Batum Höyük or Gökhüyük/Tımras. There is then a large area with no settlement at all, before there is another cluster of sites to the west and south of Karadağ. If we are to assume that these two groups of sites may have been linked, along with the curving line of Early Bronze Age sites leading from near Karadağ to Karaman itself, then we can propose a system of roads creating a loop, connecting Karahöyük to Karaman via both the settlements of the Konya plain and the Beyšehir-Suğla area.

6.5.2 - Late Bronze Age routes between coast and plain

The results of these analyses show that the primary route connecting the plain to the coast, as has already been discussed, was that heading south from Karaman, through the Sertavul Pass and on to Kilise Tepe. The suggestion of Bahar (2005) that Çiçek Höyük was the location of an important crossroads and a portal that linked the plain to the Goksü valley, on the other hand, appears to be very flawed. Instead, the Total Least Cost Path results seem to suggest that Çiçek Höyük is something of a dead-end. Even the Late Bronze Age settlement at Sarioglan/Belören further south, which lies on a modern road into the upper Goksü valley via Yeniköy and might reasonably be expected to be approached from the north via Çiçek Höyük, is most frequently accessed from the north-west, via Gurağaç Höyük.

Sarioglan/Belören therefore sits not on a north-south road into the Göksü valley, but towards the western end of a potential road that extends from Hamza Zındanı Höyük, near Karaman into the upper Çarsamba valley around Lake Suğla via the site of Sazli Höyük. Çiçek Höyük is also poorly connected to the nearby sites of Akören Karahöyük and May Höyük in both east-west and north-south directions. These sites are instead connected to the main route across the plain, and to the aforementioned road to Karaman along the southern edge of the plain, either via Dineksaray or through a route heading almost due east from May Höyük and reaching the north-south road around the cluster of settlements sites west of Karadağ. This suggests that while there was an increased desire in the Hittite Empire period to construct networks of trade and communication between the Goksü valley, the plains near Karaman and the Beysehir-Suğla area, there was no major crossroads of routes into the valley via Çiçek Höyük, and instead the upper Çarsamba was connected to the Konya plain primarily via the site at May Höyük, and onwards to the Göksü valley through the main route heading south from Karaman. Alternative routes into the Göksü besides this one appear infrequently used and far less direct.

6.5.3 - Proximity of sites to key roads

It can be argued that, due to the fact that the sites themselves were used to generate the least-cost paths in the first place, that it would be obvious that the majority of sites would be in close proximity to them, and that this methodology is somewhat circular. However, due to the total least-cost path method used, and the fact that only the key routes, i.e. those where the most least-cost paths were superimposed on one another, were used for this proximity analysis, this argument does not necessarily hold true. These key routes take up a very small proportion of the area covered by the complete road network modelled by the total least-cost path analysis, and many sites will not have produced routes which factored into the creation of these key paths at all. Therefore, it could not be guaranteed that such a high percentage of sites would be within this close a proximity to those routes, and this result, can be seen as significant. As such, this analysis confirms Dinçol et al's (2000) hypothesis that it is more likely that an important Late Bronze Age city should be located within close proximity to important trade networks and routes of communication.

6.6 - Critique and comparison

The analyses based on the modelling of Bronze Age routes of trade and communication have been very successful. The total least cost path analysis proved to be a very useful method in helping to create a hypothetical model of 2nd millennium BC trade routes. This is not only significant with regards to this particular case study, and as a constituent part of the methodology being created, but also provides a useful methodology in and of itself for exploring movement, trade and communications in other ancient societies. These results have also shown that there is a significant correlation between the locations of these trade routes and settlement sites throughout the 2nd millennium BC. With this analysis having been completed, it would now be possible to proceed to the creation of a model which combines all of the analyses performed thus far, in order to attempt to locate likely sites for the city of Tarḫuntassa.

However, it would be unwise to move straight into this phase of the study without first reflecting on the techniques used thus far, and whether the results obtained in these analyses can be deemed accurate or comparable to what is currently known of Late Bronze Age settlement patterns from work carried out in more intensely studied parts of Hittite territory. There can be no better area for such a comparison than the area surrounding the main Hittite capital at Hattuša, where a number of surveys and projects have given us a much greater understanding of the Hittites' use of the landscape than is the case in the Tarḫuntassa region. A comparison of the results of this study thus far with what is known of the region surrounding Hattuša should give some indication as to whether a predictive model based on the outcomes of this study would provide an accurate reflection of the motivating factors in Hittite settlement location. Furthermore, depending on the level to which the patterns identified in this case study match with those of the Hittite heartland, it will be possible to ascertain to what extent the Late Bronze Age settlement patterns in the Tarḫuntassa region can truly be considered 'Hittite', or whether more localised influences may have existed.

7. Comparative Analysis

At this stage, the preceding chapters have presented the results of a series of spatial analyses, from the results of which it is possible to construct a predictive model for locating Tarḫuntassa and other important Late Bronze Age cities. However, before this can be carried out, it is important to critically assess whether the conclusions reached by the analyses in the study area for this project match those that are known from a more intensively studied part of Hittite Anatolia, namely the region surrounding the capital, Hattuša.

By comparing the results of some select analyses, where possible, primarily those that have required further modelling and abstraction from the raw datasets such as the least-cost path analysis, with the more well known archaeological landscape of Hattuša, it should be possible to assess whether the results obtained so far accurately reflect Hittite settlement patterns and trading networks known to us in the Hattuša region through textual sources and extensive archaeological study, and therefore whether the settlement patterns identified in this study can be identified as 'Hittite' or whether unique local influences must be considered.

7.1 - Comparing Datasets and Some Statistical Observations

For the purposes of this comparison study, a database of Bronze Age sites within 60km of Hattuša was constructed, covering an area smaller than the main study area, so as not to essentially double the quantity of data and analysis, but large enough that observations regarding patterns within the data and results of analyses can be meaningfully compared with those of the core study.

Again, the database was constructed from a large and diverse range of studies, including regional surveys and investigations into the hinterlands of particular key sites. Like the sources used for the construction of the main database, the level of detail with regards to location, dating and dimensions varied wildly, and was often fairly poor, leading to approximated locations and dimensions either not included or recorded in Google Earth. This comparison study area is spread primarily over two modern Turkish provinces, Çorum and Yozgat, with the most recent surveys of the former carried out on a fairly consistent yearly basis by Tunç Sipahi and Tayfun Yıldırım (1998-2010), while the latter has been sporadically surveyed by the provincial department of culture and tourism, as well as by Gerber (2008) as part of Karl Ströbel's Tavium project and the excavation projects at Kuşakli Höyük (Mazzoni & Pecchioli Daddi 2015), Çadır Höyük (Gorny 2006a), Kerkenes Dağ and others.

In some ways, these two datasets cannot be directly compared at all - the topography of the region around Hattuša, with its undulating plateaus interspersed with small streams and valleys, covers a wider range of altitudes than the Tarḫuntassa region, and has no large flat expanses like the Konya Plain. Conclusions cannot be directly compared to the Konya region on the basis of settlement patterns with regard to topography, as the altitudes and slope statistics are too different and the methods used to define 'plain edge' in the Tarḫuntassa region will be less effective here.

However, some basic observations about the spread of settlement through time and the preferences for settlement location can be made, as seen in Table 7.1.

EBA	2nd M	LBA	TOTAL
83	48	43	119

Table 7.1. Total number of sites occupied in each period in the Hattuša region comparison database.

The data above shows a similar trend to that of the current project - a drastic decline in the number of settlements from the Early Bronze Age into the 2nd Millennium, and a second, much smaller decline into the Late Bronze Age. Taken at face value, the fact that there is still a decline in settlement numbers in the Late Bronze Age, even in the heartland of the Hittite Empire, may suggest that this continued decline is not a phenomenon peculiar to the outlying parts of Hittite territory, but that the Hittite economic regime led directly to this continued decline in the number of settlement sites. This could be due to the centralisation of population in large cities, or the preference for more ephemeral 'slope settlements', which are much harder to detect in surveys, rather than the continued formation of the more visible 'höyük'-type settlements in river valleys.

However, it would be hasty to draw any such conclusions, given the aforementioned difficulties in specifically dating sites to the Late Bronze Age, even in the vicinity of Hattuša. If a significant number of sites designated only as 2nd Millennium were in fact continuously occupied in the Late Bronze Age as well, then there may in fact be no decrease, or even an increase, in settlement in the area in the Late Bronze Age.

This dataset has been visualised in a similar way to that of the main dataset in Figures 7.1, 7.2 and 7.3 below. However, settlement size has not been visualised, as the lack of consistency in providing accurate site locations and measurements, and the excessive time it would take in providing these measurements using Google

Earth, meant that this was not feasible. Hattuša itself as at the exact centre of all three images.

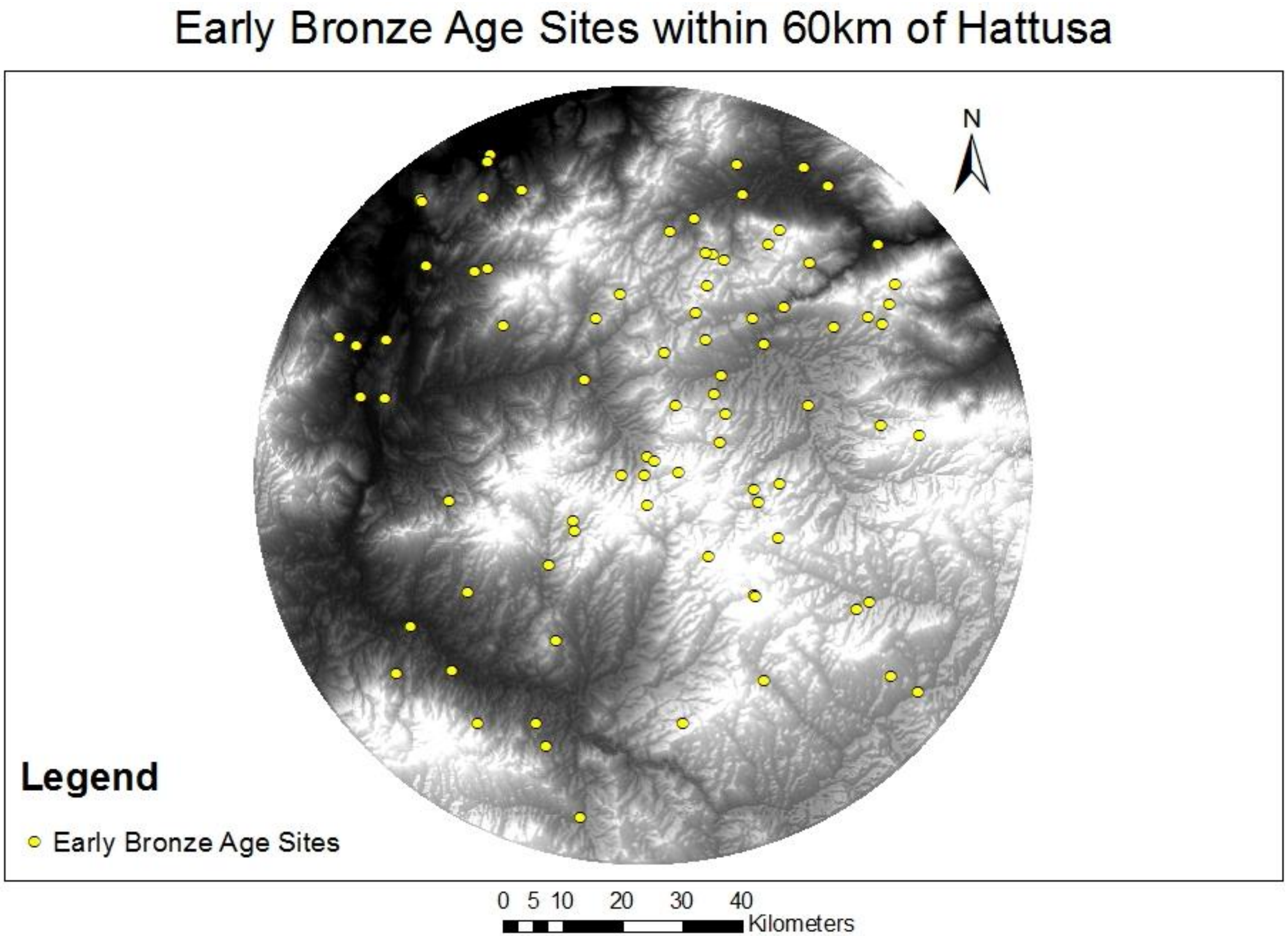

Figure 7.1. Early Bronze Age Sites within 60km of Hattuša

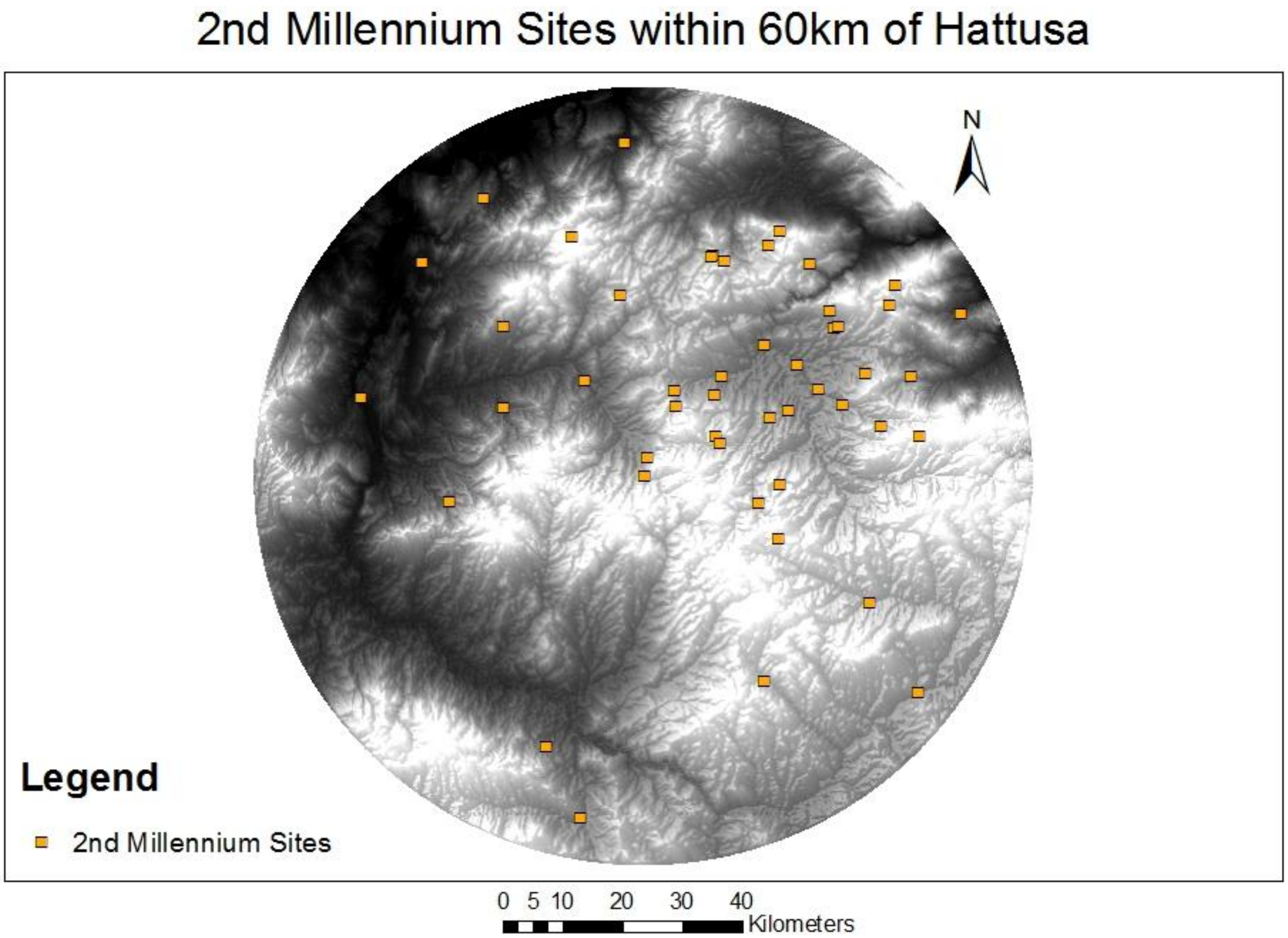

Figure 7.2. 2nd Millennium Settlements within 60km of Hattuša.

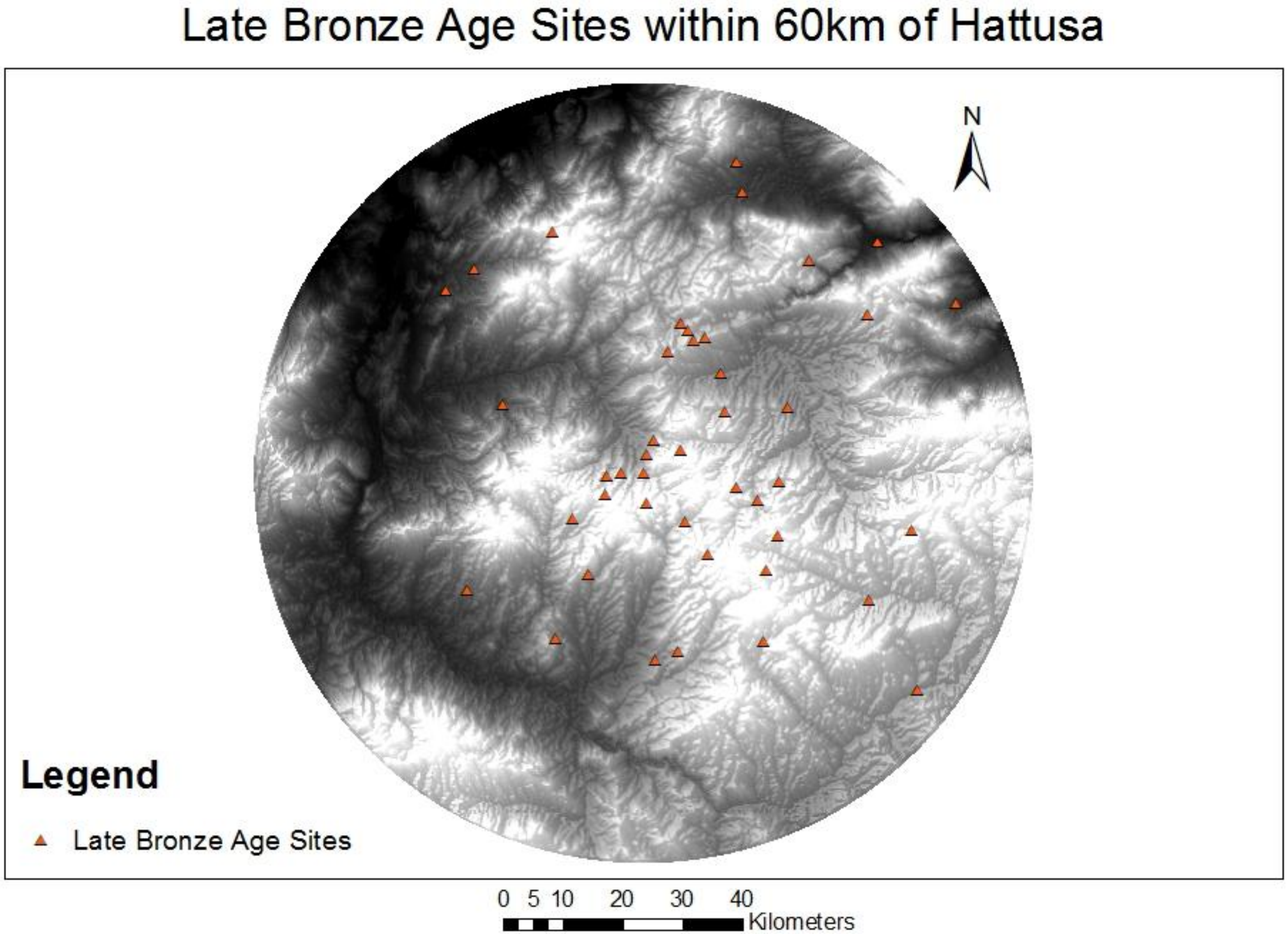

Figure 7.3. Late Bronze Age sites within 60km of Hattuša.

There are some interesting observations that can be made about the settlement patterns in the above images. There are some clear preferences for settlement location across the three time periods - in the Early Bronze Age, settlement seems to occur over a widespread area, but with particular attention paid to river systems, both the smaller streams of the upland areas and the broad valley of the Delice Irmak and the Kızılirmak (visible as the large low-lying depression in the north of the study area). There does not appear to be any preference with regard to higher or lower lying areas.

In the 2nd Millennium, however, there is a clear concentration of settlement in the area to the north-east of Hattuša, in the complex system of streams and rivers which converge around modern Alaca, and following the courses of these rivers upstream towards the surrounding highlands. While still maintaining the characteristic undulations of the Anatolian landscape, this area is more plain-like and less dramatic than the highlands and deep valleys to the south and west. As well as focussing on this area in particular, the 2nd Millennium also sees a distinct shift away from the highlands, particular in the centre of the study area around Hattuša itself, as well as a fall in settlement in the Delice and Kızılirmak valleys.

Finally, the Late Bronze Age settlement distribution sees another dramatic shift in focus, this time towards the central highlands around Hattuša itself (perhaps unsurprisingly), and particularly towards the heads of valleys, where the first tributaries of the larger river systems descend from the mountains. Even taking into account the difficulties of dating 2nd Millennium sites, the apparent change in the pattern of settlement location between those sites only designated as 2nd Millennium and those specifically dated to the Late Bronze Age is stark. This concentration on peripheral positions within larger valleys fits with the conclusions not only of this project, but also of Mielke (2011a). Furthermore, it suggests some element of desire to control passage between these water systems, crossing the high-altitude watersheds in the highlands that today form the border between modern Çorum and Yozgat provinces. This is a theme that we will see developed considerably later in this chapter when considering Hittite routeways.

7.2 - Reconstructing Hittite Roads - Methodology

The primary aim of this project is to ascertain whether GIS-based analyses can complement the work of traditional textual historical scholarship in the field of Hittite geography, or provide an alternative methodological approach altogether. However, in the study area for this project, comprising the Konya and Beysehir plains, a stretch of the Taurus mountains and classical Rough Cilicia, there have been no attempts to reconstruct the road network of this period from contemporary historical sources. Speculation over the routes of potential roads has been limited to working back from classical sources such as Xenophon, who considered the Cilician Gates, further east than our study area, to be the main route through the Taurus range. The Göksu valley has also been considered a potential route from plain to coast, mostly as a result of the surveys undertaken in the area by Mellaart and French, as well as the extensive excavations at Kilise Tepe suggesting the existence of a significant administrative centre. Beyond this, however, no attempt has been made to study or map out trade routes between the major Hittite settlements in the area.

The least-cost path analyses conducted in the previous chapter showed that there is a distinct possibility that not only did the 2nd millennium trade network extend further south than Konya-Karahoyuk, but that major routes may have existed heading across the southern edge of the plateau and through the foothills of the Taurus mountains from the 2nd millennium onwards, suggesting an increased emphasis on traversing this more mountainous region in order to head south towards the Göksu valley and, ultimately, the Mediterranean coast. These conclusions cannot be directly proven, as there are no Hittite sources describing the routes through this region. However, the method used can be tested by comparison to existing Hittite sources in other parts of Turkey. As such, a similar set of least-cost path analyses were conducted between major sites within a 50km vicinity of the Hittite capital, Hattuša, a region in which royal travel itineraries for religious festivals, as well as a well preserved Roman road network which may have succeeded the earlier Hittite royal roads, provide a perfect case study to test whether least-cost paths are an effective method for predicting the routes taken by Hittite roads.

In further contrast to the study area for this project, a detailed study of the potential Hittite road network has been carried out by Karl Ströbel (2008), as part of his Tavium International Research Project. This project focusses on the area surrounding the modern village of Büyüknefes, the site of the ancient Galatian city of Tavium (known to the Hittites as Tawiniya). Ströbel attempts to map out the road system connecting Tawiniya, Hattuša and other major Hittite settlements in the area (including Zippalanda/Kusakli Höyük and Yassihoyuk) through references to Hittite religious festival itineraries (namely the AN.TAR.ŠUM^{SAR} festival, the Purullija New Year festival and Nuntarrijašha festival), preserved Roman roads which may follow earlier Hittite routes, and the use of Google Earth, satellite photography and 1:25,000 scale maps. By comparing Ströbel's network to the results of least-cost path analyses between these same settlements, we can begin to get some idea of whether least-cost path analysis is an effective predictor of the routes taken by Hittite roads.

However, that is not to say there are not serious flaws with Ströbel's methods for mapping out Hittite roads, and his reporting of his findings. These flaws, and their repercussions for this comparison study, need to be taken into account. Firstly, his insistence that 'the prehistoric road from Tavium/Tawinija to the north must have followed in its first part the same route as the Roman *Nordstraße*' (p284) is based on little more than wishful thinking - he goes on to make the same direct comparison between the Roman *Tavium-Oststraße* and the Hittite road from Tawiniya to Zippalanda. While it would make a certain amount of sense for the Roman routes to follow pre-existing Hittite roads, there would have been a gap of over a millennia between the collapse of Hittite infrastructure and the construction of these routes. To assume a 'persistence of pathways' in spite of the collapse of the imperial networks and the resultant collapse into the regional kingdoms of the Iron Age could be seen as an impressive leap of logic. Furthermore, Ströbel rather infuriatingly refuses to publish a detailed map of his theoretical roads, meaning that for the purposes of this comparison, his routes have been reconstructed in Google Earth from the names and descriptions of the geographical locations through and near to which they pass. Therefore, there may be some discrepancy between his routes and this study's interpretation of them, due to the difficulty of finding the highly detailed and specific locations he gives, such as hills and streams, which are not named on larger scale, freely available maps.

7.3 - Reconstructing Hittite Roads - Results

7.3.1 - Road 1 - Tawiniya to Hattuša

As mentioned above, Ströbel suggests that, for the majority of its course, the Hittite road would have followed the same route as the Roman Road leading north from

Tavium to Amaseia (modern Amasya). This route leaves the höyük of the 'Upper City' of Tavium via the spring of a stream called the Kaleözü, where the north-west gate of the Late Roman city would eventually be built. This road then runs roughly north-north-east, a course still taken by the modern road to Dambasan, until it reaches the former site of the abandoned village of Eski-Dambasan. Here, the road turns northwest and reaches the Karlıözü valley near the modern village of Haydarbeyli, before turning north-east and following this stream towards Delihasanli. A settlement with pottery tentatively identified as 'Hittite' (although it is unclear whether this is referring to the Old Hittite Kingdom or the Empire Period) by Gerber (2008), and occupied continuously since the Chalcolithic period, can be found just north of Haydarbeyli in the valley of another stream, approximately 1.8km north of the point where the road turns north-east. This settlement does not have a direct view of the road junction and therefore cannot be said to hold a position of strategic importance in that sense, but is directly connected to the road network by the stream, which converges with the Karlıözü 770m to the south-west of the road.

Having followed the Karlıözü north-east for approximately 4.5km, the Roman road crosses the modern road and leaves the valley around 900m south of Delihasanli, following a curving path across a smaller stream before heading east near the modern village and ascending a ridge towards an important mountain pass known as the Çamlıbel Defile. This is one of the most important natural routes leading through this mountain range, and was still in use as the main road to Boğazkale from the south as recently as the 1940s. A heiroglyphic stele of Tudhaliya IV was discovered in the village of Delishasanli in 1995, having been reused in a modern courtyard wall (Seeher 1996). It's original location is unknown, but Ströbel (2008) remarks that that local information suggests that the stele was found in the immediate area, perhaps near the Çamlıbel Defile. Hawkins' (1996) reconstruction of the text suggests that the stele was a dedication to a temple which had been built on a mountain - the Çeç Tepe, a long ridge overlooking the road and the Çamlıbel Defile, would seem a likely location, especially given the presence of a Hittite settlement on its north-east slopes. Furthermore, Ströbel records the discovery of 'the stone fundaments of a larger rectangular building' on the Çeç Tepe in 2007, although no datable material was recovered. Certainly, if both a Hittite temple and settlement were present on this mountain, it would raise the likelihood of Ströbel's theory that the Roman road followed the course of an earlier Hittite one being correct.

After passing through the Çamlıbel Defile, two potential routes are identified by Ströbel. The first has the road following the Roman route for longer, running along a ridge on the east flank of the Çamlıbel Tepe itself, slowly descending along two more hills in a roughly north-north-easterly direction, before heading north-east towards the Sarıtepe. Before reaching this large hill, the more ancient track diverges from the Roman road, which continues heading due north past the Sarıtepe's west flank, avoiding Hattuša entirely. Instead, the older track descends even further down the hillside to the east, turns south at the foot of the slope to cross the Ören Deresi, then heads south-east to join the modern road to the village of Yazır. The second potential route descends into the valley of the Ören Deresi immediately after passing through the Çamlıbel Defile, and follows this stream to the north-north-east, before emerging onto the plains west of Yazır, turning eastwards and joining the modern road at the same point as the first route. In his surveys of the Boğazkale area, Czichon (1998 and 1999) found archaeological sites on both of these routes - however, given the propensity of many of Ströbel's routes towards sticking to river valleys (as shall be seen in descriptions of other roads), the latter route would seem not only more likely on this basis, but is also a more direct route to Hattuša with a less drastic change an altitude.

From Yazır, the route continues to the north-north-east along the Yazır Deresi, before starting to ascend the eastern flank of this valley when it reaches a narrow gorge. The road proceeds to the north-east, past a Bronze Age settlement on the rocky plateau of the Korumkaya and a Hittite garrison at the Karakaya, to reach the Lion Gate of Hattuša, which is highly probably the gate known to the Hittites as the Tawiniya Gate.

Unfortunately, the results of the least-cost path analysis from Tawiniya to Hattuša produced a route far removed from that suggested by Ströbel. Instead, the least cost path follows roughly the same route north out of Tawiniya, before heading north-east, rather than north-west, at the former site of Eski-Dambasan, avoiding the Karlıözü stream network entirely. Steadily ascending onto a barren plateau, it crosses the mountain ridge south-east of the Çamlıbel Defile, near the villageof Sarıçiçek. From here, the least-cost path descends into a valley of a large stream which joins the Yazır Deresi, and Ströbel's road, east of the village of Yazır, and proceeds to Hattuša along the same course. The two routes are compared in Figure 7.4.

Figure 7.4. Ströbel's (2008) roads from Tawiniya to Hattuša (black) compared to least-cost path (red).

If Ströbel is right in his restoration of the Hittite road, then why would they take an ostensibly more difficult route? Using Google Earth to examine the terrain profile of these two routes may reveal some details that go some way to explaining this discrepancy (Figures 7.5 and 7.6).

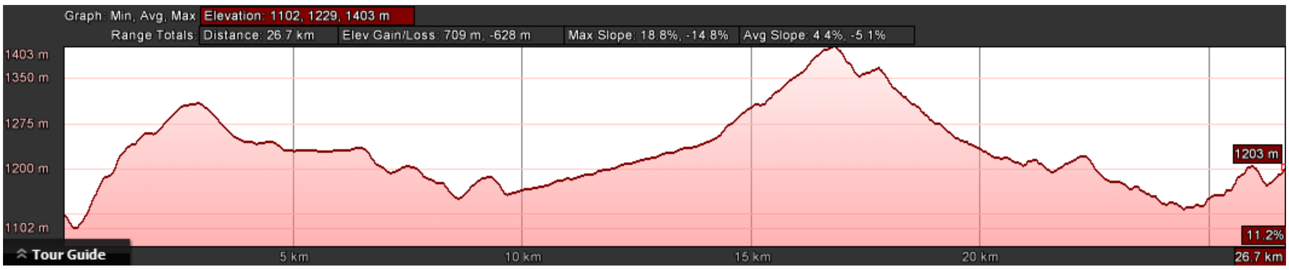

Figure 7.5. Terrain profile of Ströbel's second route, via the Ören Deresi.

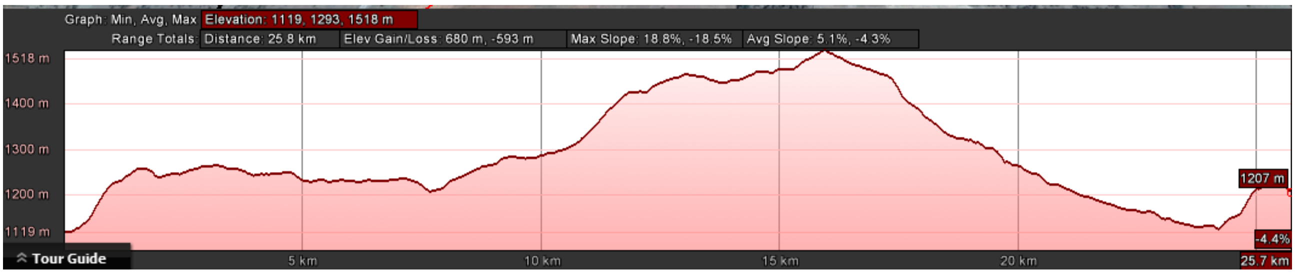

Figure 7.6. Terrain profile of the least-cost path.

The terrain profiles reveal three interesting facts about these routes. Firstly, although the least-cost path appears to be taking a much more direct route and should therefore be much shorter, it is only a shorter path by 0.9km. Secondly, the least-cost path actually crosses much higher altitude terrain for much of its route, reaching a maximum altitude of 1518m, 115m higher than the highest point of Ströbel's route at the Çamlıbel Defile (1403m), and an average altitude 64m higher. Thirdly, if one examines the steepness of the two routes, not only is the average ascending slope steepness of the least-cost path actually 0.7% higher than that of Ströbel's route, but the least-cost path also involves more difficult climbs in order to cross the mountain ridge than Ströbel's route, despite the deceptively sharp appearance of the terrain profile at the point where Ströbel's route crosses the Çamlıbel Defile. This sharpness is representative of a short but steep climb, with a maximum grade of 10.3%, with an average slope of 6.3%, over a distance of 2.3km. The least-cost path, on the other hand, rapidly ascends the mountainside over a distance of just 1.1km, with a steepest slope 12.6%, and averaging 9.9%. After this rapid ascent, the least-cost path traverses rocky, undulating terrain for 4.07km, ascending a further 92m at an average slope of 4.1%, but containing climbs of up to 9.6%, as well as some short descents. Over the peak of the mountain, the path then makes a relatively precipitous drop into the river valley below, dropping 186m in just 2.58km at an average slope of -7.1%, including a steep plunge of -18.5%. Ströbel's path makes a similar descent of 150m over 2.61km after the defile, with an average slope -7.4%, but only -13.8% at its steepest point.

On both the ascent and descent, Ströbel's route traverses a shorter vertical distance over a greater horizontal one, with a much smoother slope, as opposed to the occasionally treacherous ascents and descents taken over higher by the least-cost path. What this shows is that the Hittites were willing to take a 1km detour to take an apparently smoother route via river valleys and the lowest point at which the mountain ridge could be crossed. While the accumulated 'cost' calculated by the least-cost path algorithm may be lower, this would not have been immediately obvious to an ancient observer, who would simply have seen a steep mountainside at the point where the least-cost path makes the ascent, whereas Ströbel's route offers obvious natural features, in the rivers and the Çamlıbel Defile, that stand out as routes through the mountainous terrain. Therefore, it would be interesting to explore the possibility of creating a deliberate bias within the least-cost path algorithm to favour such 'natural' routes, and decreasing the likelihood of it producing 'unnatural' ones like this example.

7.3.2 - Road 2 - Hattuša to Yassihoyuk

Yassihoyuk, also known as Kulpese, lies 22km east of Hattuša on a high plateau overlooking the Kirimozu Deresi, a river which acts as a crucial route of communication, joining the Alaca plain to the north with the road network between Tawiniya and Zippalanda to the south. Therefore, it would have certainly been connected directly to Hattuša, to allow easy access to this crucial artery in the communications network of the Hittite heartland. In contrast to the route between Tawiniya and Hattuša, Ströbel's description of the route and the least-cost path are remarkably similar for the majority of its course, although with some noticeable deviations. The two routes are compared in Figure 7.7.

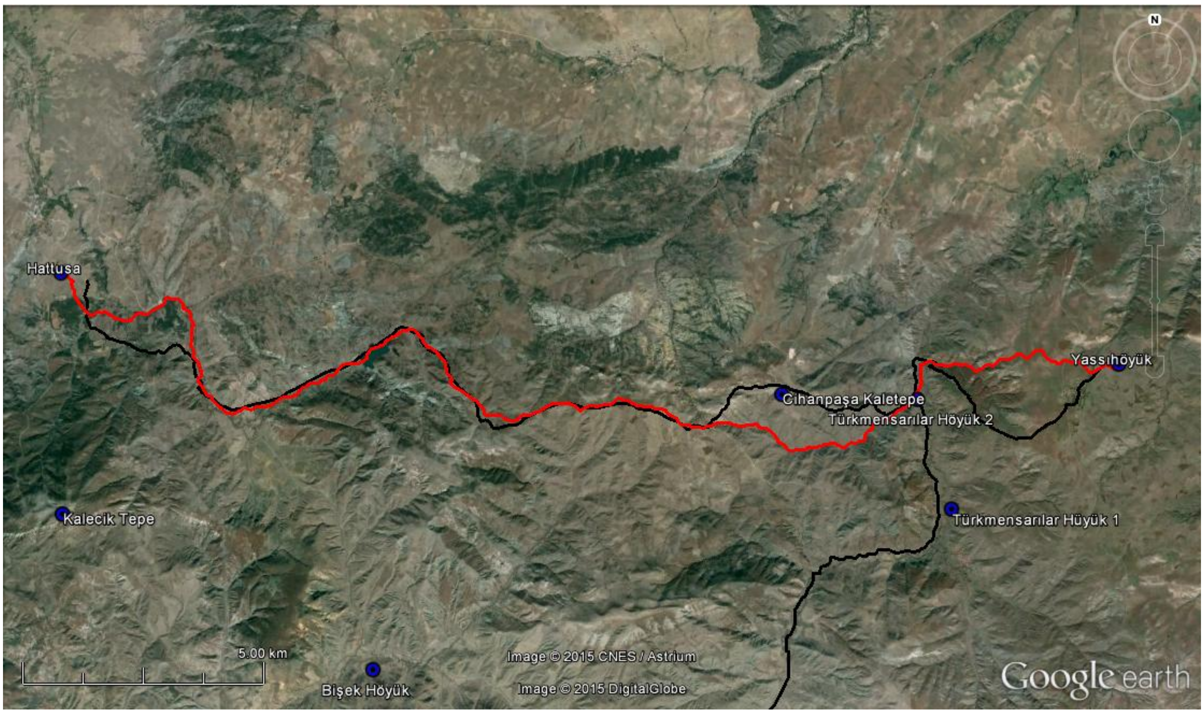

Figure 7.7. Ströbel's road (black) and least-cost path (red) from Hattuša to Yassihoyuk. The black route heading south from Turkmensarilar Höyük 2 leads to Evci-Yilanlitepe and the Tawiniya-Zippalanda road.

A notable difference between the two routes comes after the modern village of Cihanpasa. Ströbel's route, which can be clearly seen on Google Earth and is doubtless of great antiquity, heads north-east, along the southern slopes of the Aktas Tepe and Ortlek Tepe, before heading east and passing the Hittite fortress of Kaletepe and making a steady descent along a ridge, then into the valley of the Döne Deresi, a stream which joins the Kirimözü at the Early Bronze Age/Iron Age settlement of Turkmensarilar Höyük 2. The least-cost path, however, heads east from Cihanpasa, following the entire course of the Döne Deresi stream from its spring at the southern end of the village to Türkmensarilar Höyük 2. In this case, the disparity between the two paths is almost entirely down to the presence of the Kaletepe - in fact, a second path can be seen leaving Ströbel's main road, reaching the Kaletepe at its western end, presumably the entrance to the Hittite fortress.

Unlike the previous example, in the road from Tawiniya to Hattuša, the Hittite road opts not to follow a river valley, preferring instead to pass a naturally fortified position of strategic value, and descend into the river valley by a different route. The presence of fortifiable positions and/or settlements must also be taken into account when considering the likely routes of Hittite roads, and the effectiveness of least-cost paths when predicting these roads.

Another diversion is in the route taken to Yassihöyük from the Kirimözü. Again, Ströbel's route can be seen in Google Earth - initially heading up the same tributary stream as the least-cost path, heading east from the Kirimözü slightly north of Turkmensarilar Höyük 2. However, Ströbel's route almost immediately climbs the eastern flank of the Erikli Sirti ridge, instead of following the river valley. This long climb, with steep sections, curves round to the south-east, around the headspring of the stream, and reaches the plateau south-west of the modern village of Yassihöyuk. From here, the road heads north-east, through the modern village and on to the höyük. In contrast, the least-cost path takes a route as close to due east as possible, following first the major tributary, and then a smaller stream, onto the plateau. The problem with this route is with the narrow, gorge like character of these stream valleys. Ströbel mentions a similar gorge, the Kale Deresi, to the north of the höyük, and describes it as being so narrow that 'there could not be even a small path' (p293). This problem will be exacerbated by the low resolution of the DEM used to execute least-cost paths, which will 'smooth out' these rocky gorges - while the DEM will recognise these valleys as having a slightly lower altitude, the resolution will not pick up the narrowness and steepness of their edges.

Another smaller difference between the routes is at the beginning immediately after leaving Hattuša - while the least-cost path follows the Soğutluk Deresi to the

Derbent, the Hittite road, heads slightly further south before heading east, crossing the mountainous ridge overlooking the river through a saddle, meeting the Soğutluk Deresi closer to Derbent, and cutting off a significant corner, at the cost of a slightly more difficult 100m climb. Another path heads south from this road before the saddle, near a modern chrome-mining facility, eventually reaching the commanding site of Kalecik Tepe, which overlooks the southern reaches of the Soğutluk Deresi.

7.3.3 - Road 3 - Tawiniya to Zippalanda

The Hittite city of Zippalanda, a cultic centre of great importance during the Hittite Old and Middle Kingdoms (1600-1430BC) in particular, has been identified with two sites. Ströbel (2008) follows Gurney (1995) in identifying it with the site of Kuşakli Höyük, 47km east of Tawiniya and therefore identifies the two holy mountains of Hittite religious texts, Mt Daha and Mt Piškurunuwa, as the Kerkenes Dağ and the Çeška Kale (north of Yozgat) respectively. The excavators of Çadır Höyük (Gorny 2006b) have claimed that their site is Zippalanda based on its substantial Hittite casemate walls and religious artefacts. The distinctly unimpressive nearby peak of the Çaltepe is therefore interpreted as Mt Daha. Ströbel dismisses this identification on the grounds that both the site and its mountain are too small.

Assuming Ströbel is correct, two Hittite routes must, again, have followed the same routes as the later Roman routes, the *Tavium Oststraße* and *Nordoststraße*. The two routes diverge between the modern villages of Dereboymul and Musabeyli. The *Nordoststraße* heads north-east over volcanic mountain ridges, and reaches Zippalanda via the important 'junction' with the road to Hattuša at Evci-Yilanlitepe and the valleys of the Ağirek Deresi, Aroz Deresi and Eğriözü river. The *Oststraße* goes east, reaching the plateau west of modern Yozgat via one of several valleys, crosses the Yozgat Çayı near Kuyumcu, and heads to Zippalanda via the Kötü Deresi and the sites of Divanli Höyük and Taşlik Höyük. A side by side comparison of these routes, compared with least-cost paths, can be seen in Figure 7.8 below. The least-cost path which closely follow the *Oststraße* was calculated from Tawiniya directly to Zippalanda. The least-cost path following the *Nordoststraße* was calculated in two sections, from Tawiniya to Evci-Yilanlitepe and then from Evci-Yilanlitepe to Zippalanda.

Figure 7.8. Least-cost paths (red) compared to Ströbel's routes (black) from Tawiniya to Zippalanda - the *Nordoststraße* goes via Evci-Yilanlitepe, while the *Oststraße* goes via Divanli.

These least-cost paths fall somewhere between those of the mostly unsuccessful Tawiniya-Hattuša road and the fairly accurate Hattuša-Yassihöyük road. In both cases (*Nordoststraße* and *Oststraße*), the least-cost path is substantially different to the route described by Ströbel in its first stage, climbing the ridge of mountains east of the Bişek Deresi, but follows it much more closely once it has reached the second stage of the route, i.e. following river systems to Zippalanda. The *Oststraße* in particular is very different to the least-cost path in this first stage. This may be a result of the two routes starting off as one, and only diverging at a point much further north than where the least-cost path would prefer to go. It should be mentioned that in this instance, Ströbel's descriptions were particularly difficult to match with the small scale and not particularly detailed map included in his article. There are many instances where the road as he has drawn it in his map seems to disappear from Google Earth and continue in a straight line, irrespective of hills and valleys encountered along the way. This is particularly obvious in the section across the plateau, from the headspring of the Mahmatli Deresi to the crossing of the Yozgat Çayı at Kuyumcu.

However, there are certainly some positive outcomes of this comparison, particularly as this is by far the longest route to be tested, at 47km as the crow flies. Given this huge distance, for large portions of the least-cost path to be almost perfectly accurate is remarkable. The *Nordoststraße*, in particular, follows the least-cost path very closely from just after the 'junction' at Evci-Yilanlitepe onwards, and many of the discrepancies in the earlier section of the route can be accounted for by the use of Tawiniya and Yilanlitepe themselves as the start and end point. If the route were to be calculated again, using the point at which the *Oststraße* departs from the *Südstraße* at Bahçecik (south of Tawiniya) as the start point, and the 'junction' north of Yilanlitepe rather than the site itself as the end point, this may produce a very different and more closely matching route. However, this could be considered deliberately biasing the cost-path to match Ströbel's route more closely. Certainly, though, there may be a better way to test the least-cost path of the *Nordoststraße* than using Evci-Yilanlitepe itself, as this also biases the least-cost path to include this settlement as part of its route, rather than naturally proving that the route goes near it. Furthermore, Evci itself sits in a river valley, roughly 120-140m below the ridge along which Ströbel's route runs. This forces the least-cost path to leave the ridge sooner than it might otherwise. Also positive is the fact that the least-cost path that matches the *Oststraße* did not have to be artificially sent via Divanli Höyük - the path naturally incorporated both this site and the site of Taşlik Höyük, nearer Zippalanda. This shows that, much like in the study area around Tarḫuntassa, Hittite settlements are often found on, or close to, existing routes.

<u>7.3.4 - Road 4 - Hattuša to Zippalanda</u>

According to Ströbel, there are two routes from Hattuša to Zippalanda - or rather, two routes from the capital to the 'junction' near Evci-Yilanlitepe, where the two routes join the Tavium *Nordoststraße*. The first of these routes is an extension of the road to Yassihöyük, heading south on Kırımözü Deresi and passing a Hittite settlement at Türkmensarilar Höyük 1, before turning west into the valley of the Kırım Deresi. This river then bends south again, at which point it is overlooked by the commanding Büyükkale at the village of Kırım. The river reaches its spring at the Yilanlitepe junction.

The second route is more direct, heading south-east from the plain west of Derbent, following the Derbent Deresi to the mountain saddle of Kamışcık Gedik, then following a small valley until it joins the Bişek Deresi near Bişek Höyük. From here, the road follows the Bişek Deresi until it climbs a ridge to meet the Tawiniya-Ziappalanda road. These two routes are shown in Figure 7.9 below, along with the least-cost path from Hattuša to Yilanlitepe, rather than to Zippalanda.

Figure 7.9. Ströbel's roads (black) compared with the least-cost paths (red) from Hattuša and Yassihöyük to Evci-Yilanlitepe. These routes link into the Tawiniya-Zippalanda road at this point.

The correlation between the least-cost path road and Ströbel's direct road from Hattuša to Yilanlitepe is striking, even going past the settlement of Bişek Höyük as predicted, proving that the location of settlements is invariably linked to the presence of these road networks. The route from Yassihöyük to Yilanlitepe is also very nearly identical - the only notable difference comes after departing Yassihöyük to the south-west. Rather than following the ridge back down to Türkmensarilar Höyük 2, the path continues heading south-west, following two stream beds, emerging on the Kırımözü Deresi near Türkmensarilar Höyük 1. From here on, the road reaches the junction north-east of Yilanlitepe exactly as Ströbel suggests.

As can be seen above in Figure 7.9, in this area east and south of Hattuša, the least-cost path analysis has been incredibly accurate, predicting all three of the routes making up this network with remarkable similarity to Ströbel's descriptions.

7.4 - Summary of comparisons

There have been three key findings to emerge from this comparison study on the Bronze Age settlement distribution and routes of communication in the Hattuša region. Firstly, even in the heartland of the Hittite Empire, the decline in settlement numbers from the Early Bronze Age into the Middle Bronze Age is very marked, lending further credence to the idea that this is part of a much wider process of nucleation of settlements from small villages into large towns, and a change in economic regime from subsistence agriculture to a more trade-focussed economy.

The second apparent decline, from the sites only designated as 2nd Millennium to those specifically dated to the Late Bronze Age, was less marked in this region than it was in the region of Tarḫuntassa, and there may even have been increase in settlement if dating difficulties are taken into consideration. This is perhaps indicative of this being the most important and most populous part of the Hittite Empire.

Secondly, the spatial distribution patterns of settlements across all three periods of the Bronze Age bear some remarkable similarities to those of the Tarḫuntassa region, though this should be further confirmed by further analyses which are beyond the scope of this project. From observation alone, it does appear that the general trends identified in the Tarḫuntassa study area are also true in the Hattuša region. In the Early Bronze Age, settlements are clustered around major river valleys, irrespective of altitude. Given the lack of large level plains like the Konya plain in this region, it is difficult to ascertain whether there is any preference shown for level ground as is the case with the Tarḫuntassa region, but the higher volume of small sites around rivers suggests a similar agricultural focus. By the 2nd Millennium, there does appear to be a greater preference shown to low-lying areas, with very few settlements in the highlands or steeper valleys, and a greater concentration around the complex alluvial network of the Alaca region.

However, the greatest similarity between the Hattuša and Tarḫuntassa regions is in the settlement distribution of those sites specifically designated as Late Bronze Age, where this comparison study has shown a preference for the heads and intersections of valley systems, which would have acted as natural routes of communication through this difficult landscape. Again, much greater attention is paid to areas where these routes of communication transition from easily navigable valleys into the more difficult terrain of the highlands, and there is an especially large concentration of settlements at watersheds, where multiple valley systems meet and highlands are easily crossed, controlling movement between distinct geographical regions. This desire to control natural routes of communication and points of transition between lowland and highland landscapes has already been noted in the Tarḫuntassa study area, and it is remarkable that the same pattern is also visible in this region, despite the very different topographies. This suggests that despite the Lower Lands perhaps being less culturaly influenced by the Hittites, as a result of its distance from the heartland and its local Luwian character, there was a broadly similar approach to settlement in this period in both the Lower Lands and the Hittite hearlands. This may have been a result of the influence of the Hittite Imperial Administration or shared economic or strategic goals, or external factors that influenced both areas equally, such as climate. The possibility that these changes were a result of similar reactions to external influences, rather than direct Imperial control, must be borne in mind when interpreting the results of this case study.

Finally, the methodology of least-cost path analysis, compared with the combined methods of remote surveying and assumption of a continuation of usage into the Roman period used by Strobel (2008) produced some remarkably similar results, as well as some wildly differing ones. Much of this may be down to the difficulties of reproducing the routes described by Strobel in Google Earth, while in other instances it may be a result of the lower resolution imagery used in the DEM, which would make some narrow valleys and dramatic topographies appear more readily passable than they are in reality. However, Strobel's own methodology is not without flaws, as it cannot be assumed that the Roman approach to movement through the landscape was based on the same motivations as the Hittites, with cultural elements having no influence on either. Broadly speaking, however, Strobel's routes do tend to stick more to natural features which allow easier passage through the landscape, such as river valleys and mountain saddles, even if this meant ignoring a technically faster route. This has been shown in some of the above instances, where the least-cost paths and Strobel's routes have differed drastically. A least-cost path which ascended and descended unremarkable mountain slopes but went from A to B in a largely straight line would in all likelihood be less preferable than a route which stuck to river valleys, saddles and watersheds - even if this latter route proved more circuitous. This is very much worth bearing mind when applying the results of the Total Least Cost-Path analysis to the predictive modelling exercise which will be undertaken in the next chapter, and indeed the implications of this analysis for the potential location of the city of Tarḫuntassa.

8. Predictive Modelling

Many of the analyses presented in the previous four chapters, particularly those relating to the context of Bronze Age sites within the wider landscape, have produced results showing the frequency with which those sites occur within certain areas of the landscape. These areas have been defined either by intrinsic values such as altitude or slope steepness, or by their distance from particular features of the landscape, such as rivers or the 'plain edge'. In the cases of settlement density and proximity to trade routes, the areas have been classified on the basis of distance from, or density of, archaeological features either real or, in the case of the trade routes, hypothetical.

In all of the above cases, the resulting data is not only a means by which the original hypotheses proposed in the literature, and the spatial criteria upon which they were founded, can be assessed, but will also form a part of a predictive model which will offer an alternative approach to the question of where Tarḫuntassa may be found. Importantly, this answer will be based not on new archaeological evidence or new criteria for locating the city, but on taking the existing hypotheses at face value, quantifying and visualising those spatial critera which are reflected in the available archaeological data, and examining the results in light of both the original hypotheses and further cultural criteria which could not be spatially analysed. In this way, it will be possible to simultaneously propose a new hypothesis for the location of Tarḫuntassa, and assess the conclusions of previous attempts to locate the city.

8.1 - Methodology

8.1.1 - What is Predictive Modelling?

Predictive modelling is, in short, the process of bringing together the contributing environmental factors influencing site location in a given landscape, identifying the statistical relationships between these factors, weighting those factors to account for stronger causal relationships, and then combining these factors into a model which represents the overall statistical chance of there being an archaeological site within that landscape or other local landscapes.

Predictive modelling has become a key part of archaeological landscape study over the last two decades, and has arguably been the application that has brought GIS into the archaeological mainstream (Balla et al 2014). This is because it allows archaeologists to extrapolate causal relationships between the landscape and the archaeological record, and then apply those relationships to a statistical model to assist in identifying areas of high archaeological 'value' in landscapes that have yet to be thoroughly surveyed (Balla et al 2014). While this is a valuable tool for giving an insight into past land use, there is a danger in trying to use predictive modelling as a heritage management tool as a cheaper alternative to full-scale archaeological survey - Wheatley (2004) criticises the use of predictive models in archaeological environment management, since frequently the models are not tested after their production in an effort to see if their results were accurate. Furthermore, he also points out that using known sites as a basis for creating a model for locating unknown sites is a form of circular logic, and will only produce self-fulfilling results, where in reality an archaeological landscape might contain much greater levels of complexity within smaller areas than can realistically be modelled. Kamermans

(2010) also points out that there is a need to incorporate social and cultural factors into predictive modelling in order to avoid environmental determinism, but this is a difficult and complex process.

In the context of this study, predictive modelling is not being used in a context of heritage management - the main aim of this study is *not* to locate undiscovered archaeology in a hitherto un-surveyed area. On the contrary, this landscape is one that has been surveyed numerous times over the last 60 or so years, and for which the archaeological record is rich, if poorly recorded. Instead, the purpose of this project, and indeed the model, is to suggest locations for one specific site within this archaeological landscape, and to show that the criteria being used to justify archaeological and historical conclusions within this landscape do not, statistically speaking, do so at all. Any suggestion of 'archaeological valuable' areas within the survey area which might be prioritised for future investigation will be a purely additional outcome, and not one that is likely to be followed up on. It could be argued that therefore the criticism of predictive modelling being a form of archaeological 'self-fulfilling prophecy' is even more applicable to this project since the statistics borne from the archaeological record in this landscape will be applied back to that same landscape. However, since the aim of this project is, essentially, the assessment and prioritisation of known sites, rather than the prediction of unknown ones, that argument cannot be applied here.

Furthermore, cultural factors will be considered as part of this study, but will be applied to the results of the statistical predictive model retrospectively, rather than attempting to devise a way of incorporating them into the model. In the case of this project, those factors will relate to Muwatalli II's religious cult of the 'Storm God of Lightning' and how this religious expression was performed in relation to the landscape, and the purpose and location of monuments in relation to settlement and important cities.

8.1.2 - Producing the Model

As outlined in Balla et al (2014), the main procedures of producing a predictive model are; to select archaeological data; to select a series of spatial criteria brought together by a cohesive theoretical approach, and to perform analyses based on those criteria; to quantify the results of those analyses using a common scale so that they can be properly aggregated; to weight the results on the basis of their importance or statistical significance; and finally to sum all of the results.

The first two points of this process have, essentially, been covered in the preceding chapters of this thesis. The spatial criteria that will make up this predictive model are the relationship between settlements and altitude, slope steepness, proximity to rivers, proximity to plain edge and proximity to key road networks. These five criteria are the ones which can successfully be modelled and quantified in a way in which they can be included in the predictive model. Site characterisation criteria, such as periods of occupation and size, as well as cultural criteria such as the presence and meaning of monuments, can only be considered retrospectively.

As mentioned, in order for the predictive model to work, the inputs need to be quantified using a common scale. The most straightforward way to achieve this is to express the results of the analyses as a percentage of the total number of Late Bronze Age sites found within that part of the study area. With the results of all five analyses expressed as percentages, it should then be simple to sum the five rasters using the Raster Calculator function within ArcGIS and divide the total by five (the number of inputs) to produce an aggregated percentage for each cell, expressing the overall likelihood of that cell containing an important Late Bronze Age city.

The results of the initial analyses were expressed both as a raw number and a percentage of sites found in each corresponding part of the study area (for example, the number and percentage of sites found within a certain distance of rivers, in bands of 2.5km up to 10k, and then 5k bands from 10k upwards). The most appropriate way to express these results spatially would be to reclassify the original raster used to carry out the analysis, e.g. the raster expressing Euclidean distance from rivers split into the 2.5k and 5k bands, and then to reclassify the values of the cells in each band to represent the percentage of Late Bronze Age sites found in that band. Unfortunately, the Reclassify tool within ArcGIS 10 can only output a raster with integer (whole number) cell values, and not floating point (decimal) values. This means that a slightly more laborious method had to be used. The rasters used in the original analyses were instead reclassified using the number, rather than the percentage, of Late Bronze Age sites in each band. The resulting raster was then turned into a floating point raster using the Float tool, and then multiplied by 0.57 (57 being the total number of Late Bronze Age sites) in Raster Calculator in order to express the results as a percentage of the total. With all five rasters reclassified to express the results of the analyses as percentage values in each cell, they could then be summed together in Raster Calculator and divided by five to produce the final 'predictive' percentage value for each cell.

One of the steps in producing a predictive model, according to Balla et al (2014), is the weighting of the inputs on the basis of the 'importance' of the criteria, or their statistical significance. For the purposes of this project, the predictive model was not weighted, i.e. every input will be given equal weighting. This is for three reasons - firstly, since the model is being applied back onto the same landscape from which the data was derived, to weight the model in favour of certain inputs would not be representative of the relationship between the sites and the landscape, whereas for a truly 'predictive' model being used on an unsurveyed landscape it makes sense to prioritise statistically significant results. Secondly, while it would be possible to weight the model in favour of those inputs where the results of the analyses proved the original hypotheses from the literature correct, this would bias the model towards a certain understanding of the archaeological landscape, and away from the actual relationship between the sites and their environment. For example, the analysis regarding rivers showed that, rather than getting further away from rivers in the Late Bronze Age, settlements remained close to watercourses, and in fact were closer than they had been in the 2nd Millennium. However, this does not mean that this criteria should be given less priority in the predictive model, as this statistical relationship is still both significant and reveals important information about Late Bronze Age settlement location. Thirdly, many of the analyses have provided results for which it is difficult to assess the statistical significance, and therefore weighting cannot be applied on that basis

8.2 - Results

Of the five criteria, the first four (Figures 8.1 to 8.4) were produced by simply producing rasters expressing the percentage values in the tables of results produced in the corresponding analyses, which can be found in previous chapters. The fifth criteria, regarding road networks (Figure 8.5), required some extra analysis. After the hypothetical road network had been modelled and classified into six categories based on the number of overlapping routes, each road was then assigned a value between one and six based on its category. Those roads with a value of five or higher were then separated out into a subset of 'key routes', and a Euclidean Distance analysis was carried out. Like the river and plain edge distance analyses, the resulting raster was then reclassified into bands of 2.5km from the key routes up to a 10km distance, bands of 5km from 10km to 25km, a single band between 25km and 50km, and a final band for all sites over 50km from the key routes. These bands were then turned into polygons, and a 'Search by Location' analysis was carried out on the Late Bronze Age sites to produce the necessary percentage values for creating the raster which would contribute to the predictive model. These results are shown in Table 8.1 below.

Within (x)km of Roads	2nd M	LBA	Total
0-2.5km	18 (29.51%)	10 (27.03%)	24 (32%)
2.5-5km	12 (19.67%)	8 (21.62%)	13 (17.33%)
5-7.5km	7 (11.47%)	2 (5.405%)	7 (9.33%)
7.5-10km	8 (13.11%)	6 (16.22%)	10 (13.33%)
10-15km	5 (8.2%)	4 (10.81%)	6 (8%)
15-20 km	6 (9.84%)	2 (5.405%)	6 (8%)
20-25km	1 (1.64%)	0	1 (1.33%)
25-50km	3 (4.92%)	4 (10.81%)	6 (8%)
Over 50km	1 (1.64%)	1 (2.7%)	2 (2.67%)
TOTAL	61	37	75

Table 8.1. Results of analysis to identify distance between 2nd Millennium and Late Bronze Age sites and 'key routes'.

The first five figures below show each of the input criteria used to make up the predictive model, comprising altitude (Figure 8.1), slope steepness (Figure 8.2), distance from rivers (Figure 8.3), distance from the plain edge (Figure 8.4) and distance from high-use roads (Figure 8.5). The sixth figure presents the final predictive model (Figure 8.6) resulting from the summing of these inputs.

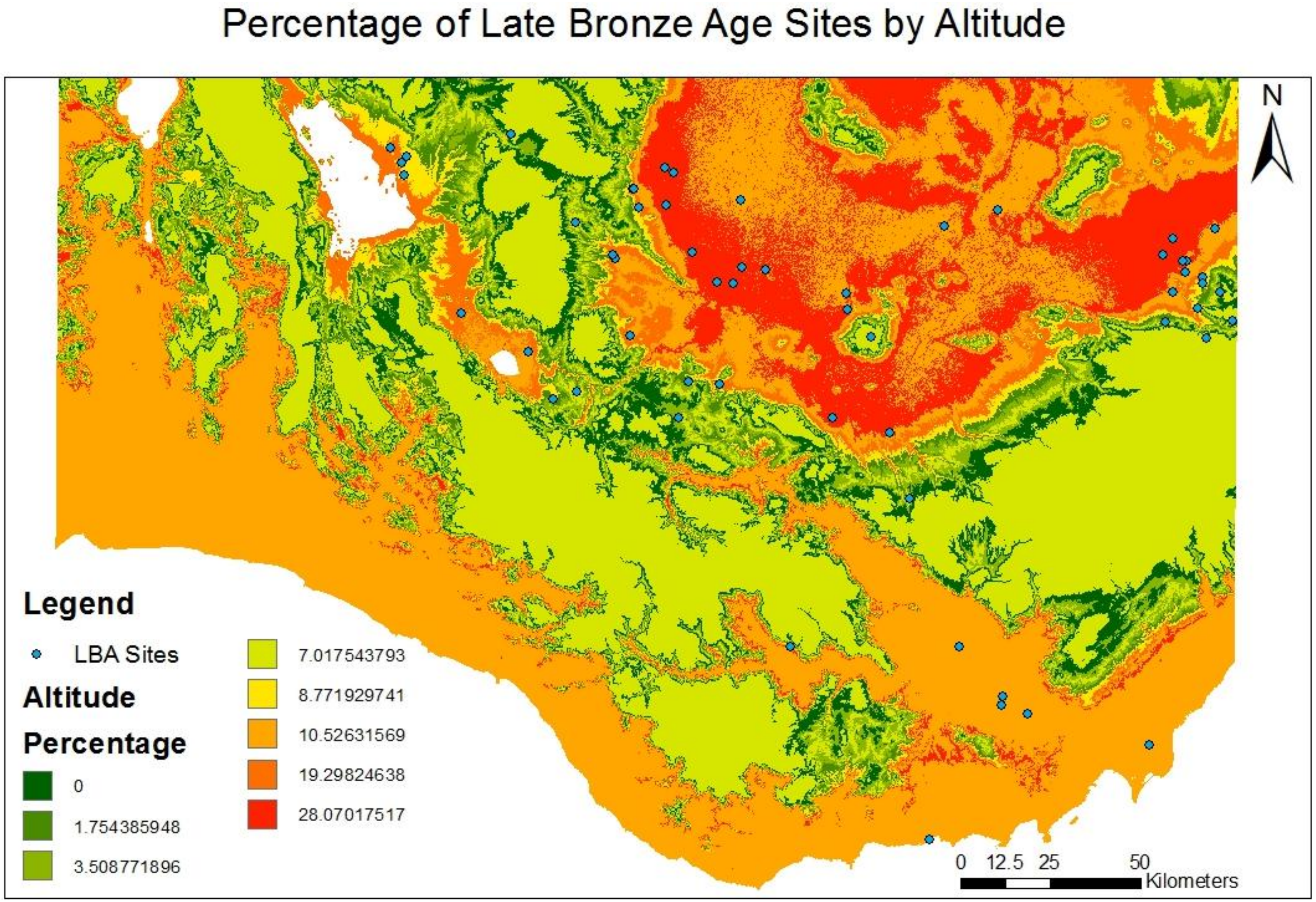

Figure 8.1. Percentage of Late Bronze Age sites distributed by altitude, in bands of 50m between 1000m-1500m, below 1000m and above 1500m.

Percentage of Late Bronze Age Sites by Slope Steepness

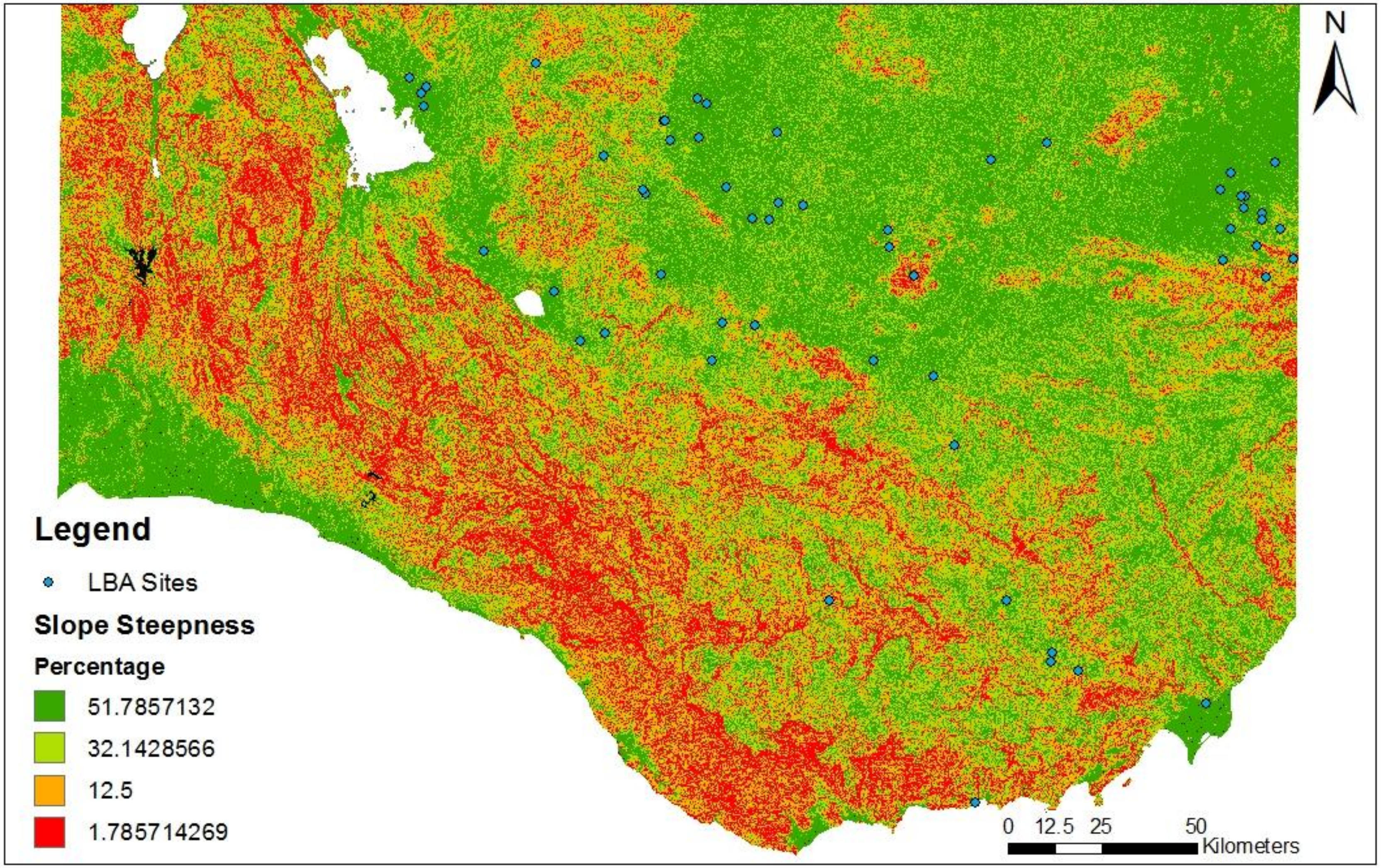

Figure 8.2. Percentage of Late Bronze Age Sites distributed by Slope Steepness in five bands.

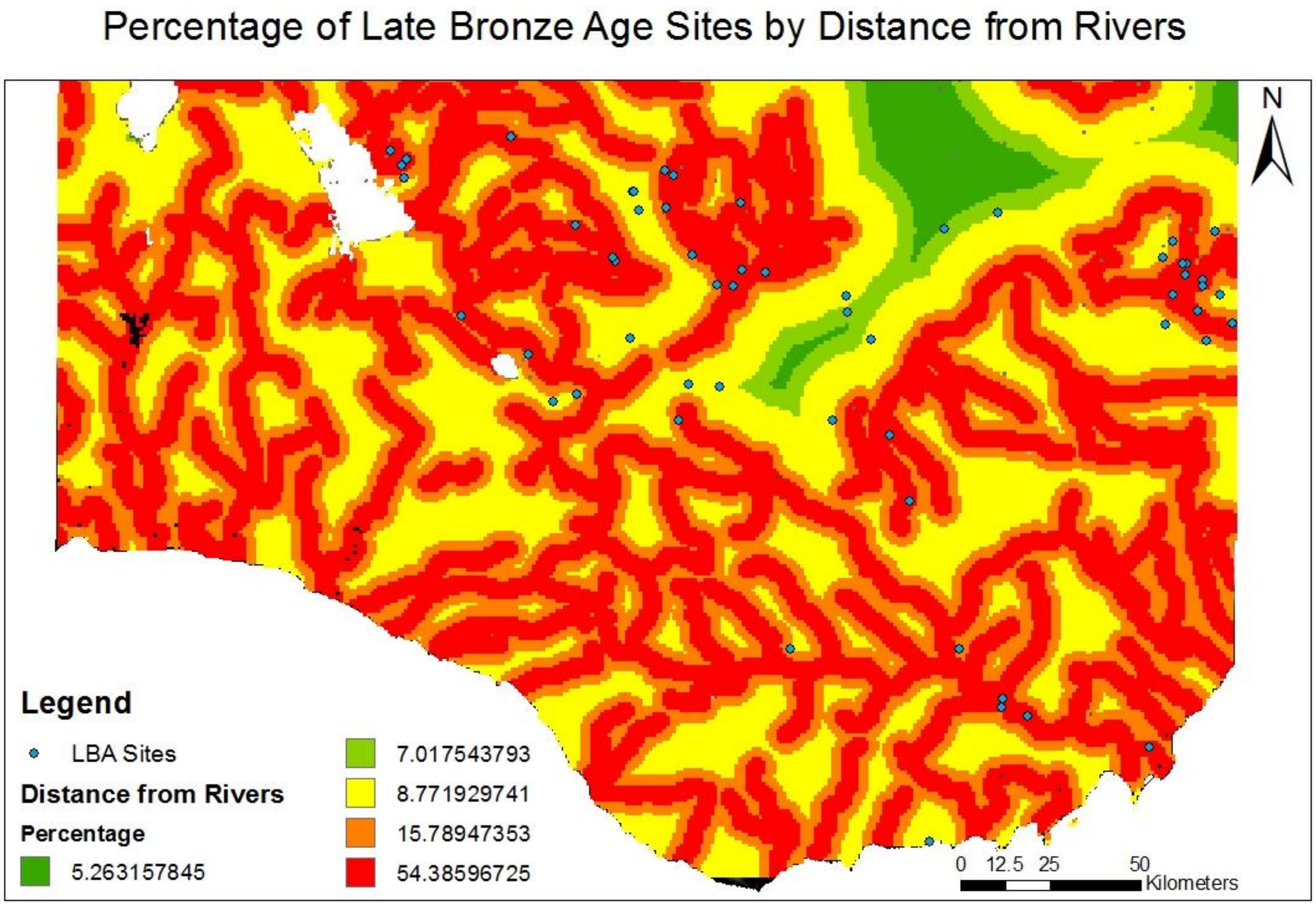

Figure 8.3. Percentage of Late Bronze Age Sites distributed by distance from rivers, in bands of 2.5km up to 10k, and 5km over 10km.

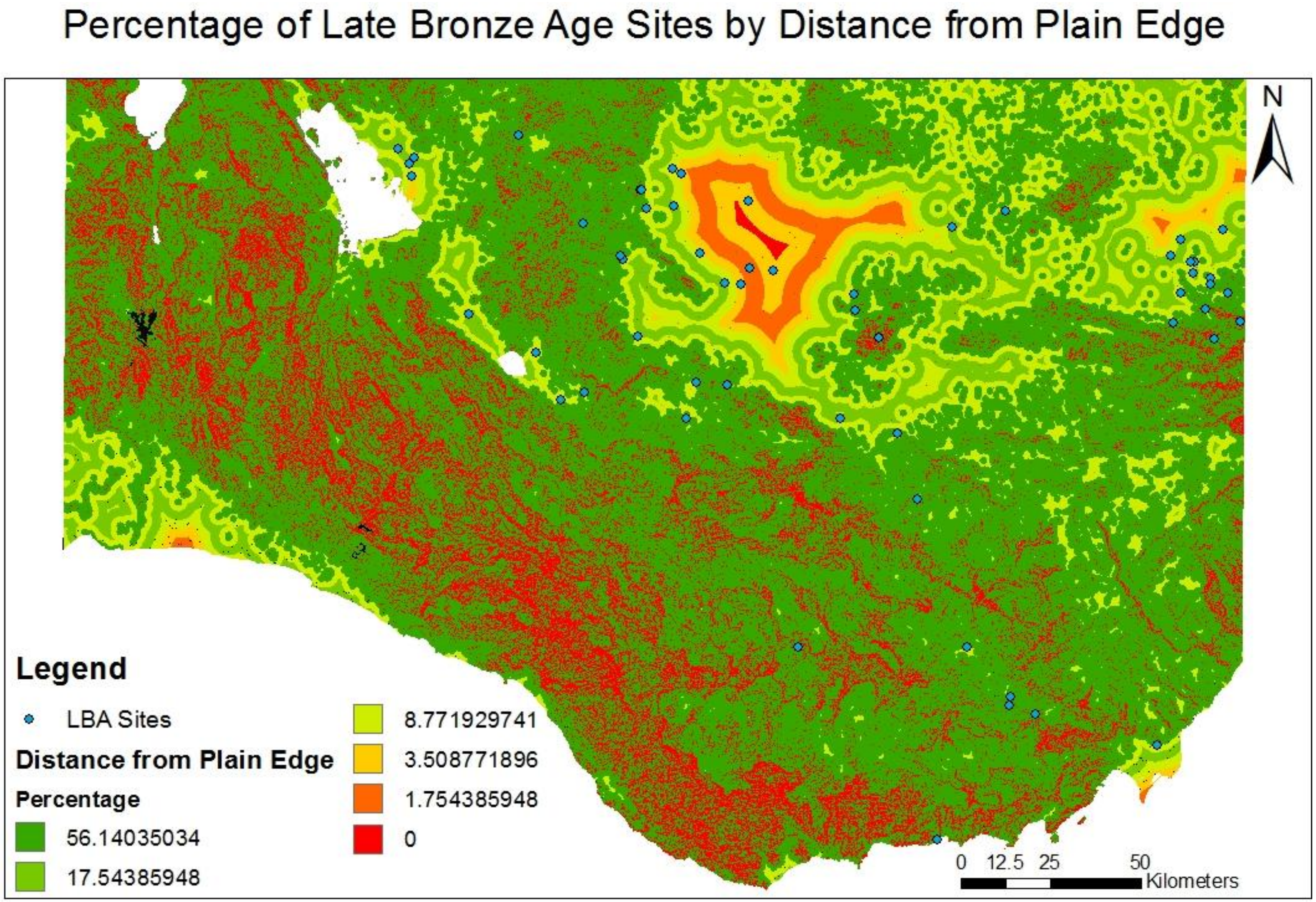

Figure 8.4. Percentage of Late Bronze Age Sites distributed by distance from the plain edge (defined by moderate slopes).

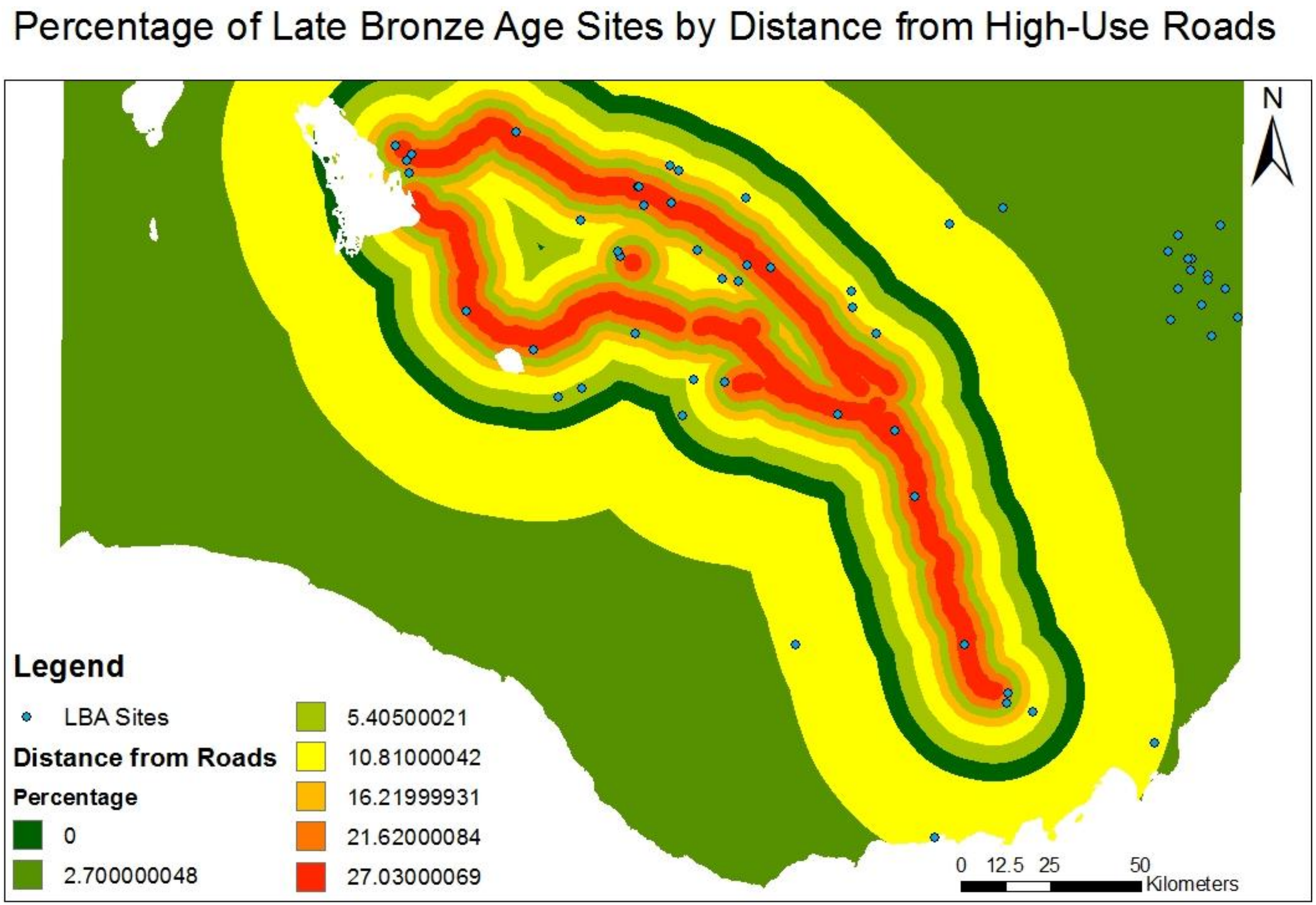

Figure 8.5. Percentage of Late Bronze Age Sites distributed by distance from high-use roads (analysis performed on incomplete database).

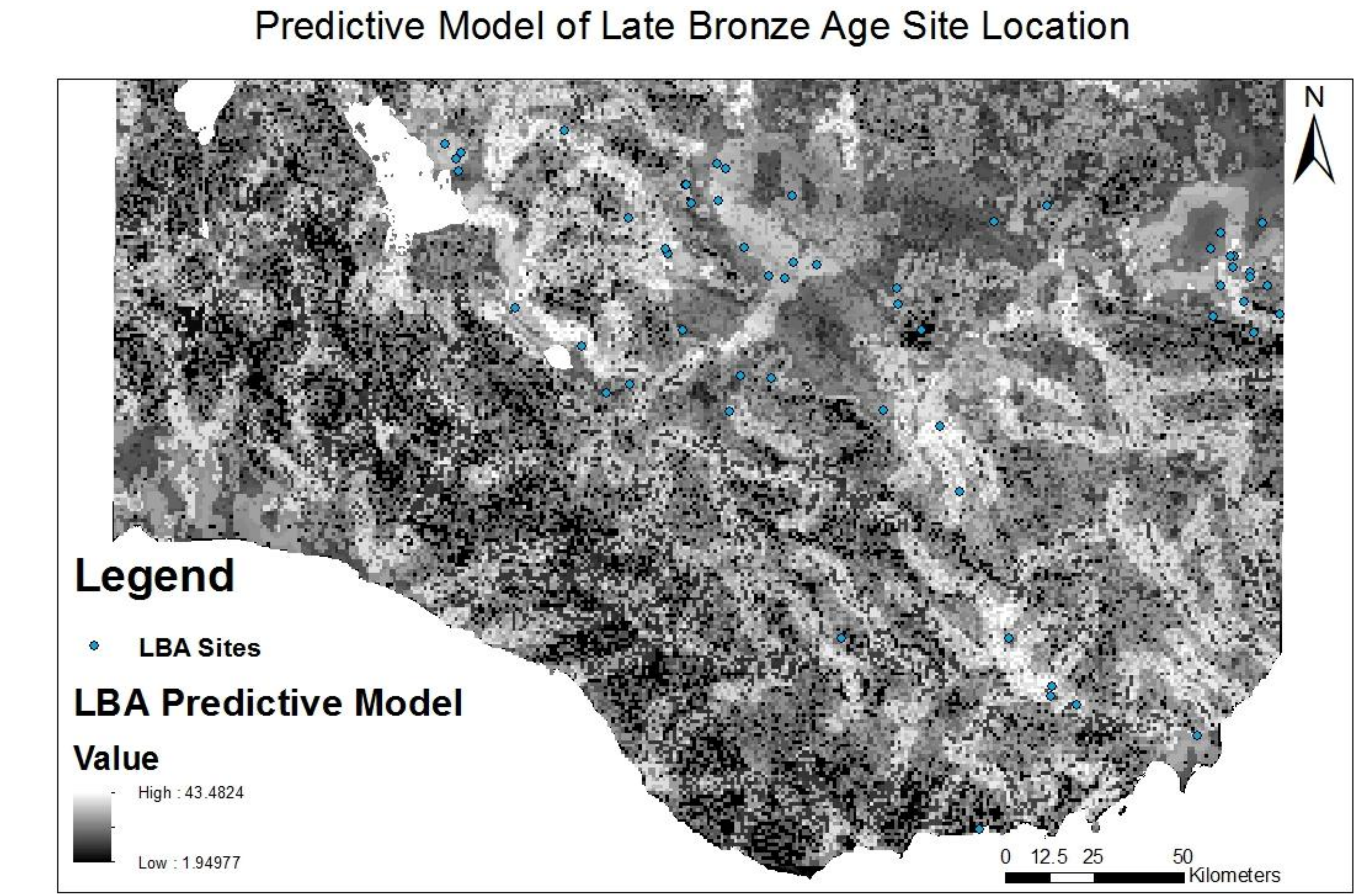

Figure 8.6. Late Bronze Age Predictive Model based on summing of the above five criteria.

As can be seen from Figure 8.6, the resulting values expressed in the predictive model range between 43.4824 (the highest chance of being the location of an important Late Bronze Age settlement) and 1.94977 (the lowest chance). Areas with a high value can be readily identified at certain key locations within the landscape - the areas to the east of Lake Beyşehir and north of Lake Suğla in the upper Çarşamba valley, the western edge of the Konya Plain near modern Hatunsaray, the area south of Karadağ around modern Karaman, some of the smaller valley systems emerging onto the south-eastern edge of the plain, and the lower Göksü Valley.

Areas with a very low value primarily consist of high altitude and mountainous areas within the Taurus range, near the Mediterranean Coast west of the Göksü valley, the main peak of the Karadağ massif and the north-eastern expanse of the Konya Plain north of Lake Hotamış and west of modern Karapinar.

It is noteworthy that, even though this model has been produced using statistical data derived from sites within the same landscape, there are some high-value areas which do not necessarily include known sites. This is particularly noticeable on the south-eastern edge of the Konya Plain, and around the modern town of Beyşehir and to the east of the lake. While this model's main aim is to identify potential locations for Tarḫuntassa from the known archaeological sites and assess the conclusions of previous studies, it is also interesting to note that the fringes of the Konya Plain between Konya and Ereğli are distinctly lacking in Late Bronze Age sites, despite this area's high score in the predictive model. The intensive survey carried out around Ereğli by Maner (2014-2016) revealed a high volume of Late Bronze Age sites which had not been identified by previous surveyors such as Mellaart and

Bahar. The predictive model may well indicate that a similar survey carried out around the modern towns of Sudurağı and Akçaşehir would prove similarly fruitful.

The next phase of the predictive modelling process is to extract the values from the model into the database of Late Bronze Age sites. Through doing this, it will be possible to observe the 'scores' allocated to previously suggested sites of Tarḫuntassa and assess whether those suggestions are borne out by the results, as well as highlight further Late Bronze Age sites which have scored highly and have not previously been suggested. The results of this can be seen in Table 8.2 below and continuing overleaf.

SITE NAME	**SITE DATES**	**PRED MOD SCORE**
Hatunsaray	EBA, 2nd Millennium, LBA, EIA	40.646057
Ortakaraviran Buyuk	EBA, 2nd Millennium, LBA, IA	40.646057
Hamza Zindani Höyük	**LBA**	**39.553871**
Cingantepe	EBA, LBA	38.89167
Isiklar Dagi Mevkii Yerlesimi	LBA, IA	38.616443
Kozlubucak	EBA, 2nd Millennium, LBA, IA	38.570163
Bagirtlak Pinari Yerlesimi	EBA, 2nd Millennium, LBA, IA	36.862056
Tekirkoy	EBA, LBA	36.729671
Damtepe	EBA, 2nd Millennium, LBA, IA	36.729671
Zoldura/Lystra	**EBA, 2nd Millennium, LBA, IA**	**35.648674**
Hacimemis Höyük	EBA, 2nd Millennium, LBA, EIA	35.107673
Kilise Tepe	**EBA, 2nd Millennium, LBA, IA**	**34.963096**
Seydisehir II Höyük	EBA, 2nd Millennium, LBA, IA	34.008754
Kocadere Höyük	LBA	34.008754
Mula Höyük	EBA, 2nd Millennium, LBA	33.181343
Kapakli Kalesi	LBA, IA	33.002407
Okcu Höyük	EBA, 2nd Millennium, LBA, IA	32.956123
Eflatunpinar	2nd Millennium, LBA	32.926754
Sircali Höyük	2nd Millennium, LBA, IA	32.605247
Yaylapinar Höyük	EBA, 2nd Millennium, LBA, IA	31.846759
Suleymanhaci Höyük	2nd Millennium, LBA, IA	31.846755
Comakli	EBA, 2nd M, LBA, EIA	31.834569
Kızıldağ	**LBA, IA**	**31.115631**

Alibeyhuyugu 1 & 2	EBA, LBA, IA	30.794124
Tekintas Höyük	EBA, 2nd Millennium, LBA, IA	30.794124
Sadikhaci-Bayat Höyük	EBA, 2nd Millennium, LBA, IA	30.149108
Balkaya	LBA, EIA	30.011264
Saksak Höyük	EBA, 2nd Millennium, LBA	29.683757
Tont Kalesi	EBA, 2nd Millennium, LBA, IA	29.424709
Isiklar Dagi Yerlesimi	EBA, 2nd Millennium, LBA, IA	29.142757
Acipinar Tepesi	EBA, 2nd Millennium, LBA, IA	27.38837
Gudelesin	EBA, 2nd Millennium, LBA	25.489412
Yellice Koyu Kepez Yerlisimi	EBA, LBA, IA	25.283105
Ali Tepe	EBA, LBA	25.214183
Harminpinar Yug Tepesi	EBA, LBA, EIA	25.122352
Alibeyhoyugu	2nd Millennium, LBA	24.799844
Bolluca Höyük	EBA, 2nd Millennium, LBA, IA	24.581352
Kuyunun Dagi Hoyugu	EBA, 2nd Millennium, LBA, EIA	23.459796
Orentepe/Mut	EBA, LBA	22.780685
Ilisira	EBA, 2nd Millennium, LBA, IA	22.711765
Hatip Kale	**LBA, IA**	**22.642841**
Hatip Monument	LBA	22.642841
Sazli Höyük	EBA, 2nd Millennium, LBA, IA	22.59729
Domuzbogazliyan	EBA, 2nd Millennium, LBA, IA	22.274782
Pamukcu	EBA, 2nd Millennium, LBA, EIA	22.049564
Cicek Höyük	EBA, 2nd Millennium, LBA, IA	21.923902
Ermenek Monument	LBA	21.504104
Ciller Höyük	EBA, 2nd Millennium, LBA, IA	21.423458
Beysehir Höyük C	EBA, 2nd Millennium, LBA, IA	20.295177
Akhuyuk	EBA, 2nd Millennium, LBA, IA	20.019948
Sirnik Höyük	2nd Millennium, LBA, IA	19.536685
Dibek Kalesi	2nd Millennium, LBA, IA	18.829473
Eregli Karahoyuk (Hupisna)	EBA, 2nd Millennium, LBA, IA	17.914684
Sarioglan/Beloren	EBA, 2nd Millennium, LBA, EIA	17.052177
Karahoyuk 2	EBA, 2nd Millennium, LBA, EIA	13.123605
Karadağ	LBA	6.759037
Kelenderis (Saranduwa)	LBA	N/A

Table 8.2. All Late Bronze Age Sites with associated Predictive Model Values. Sites identified as possible locations of Tarḫuntassa are highlighted in bold text.

Given the values of the input rasters representing the five criteria in the model, the highest possible output value for the predictive model would have been 43.48244133. The mean value (not including the site of Kelenderis/Saranduwa which returned a value of -9999 due to a processing error) is 28.20925845, while the median value (perhaps more pertinent in this case due to the relatively low number of low-scoring outliers) is 29.554233. Evidently, no site within the database is located in one of these maximum value cells. Of the sites previously suggested as locations for Tarḫuntassa, the highest scoring is Hamza Zındanı Höyük, with 39.553871. This very high score is by virtue of it being located in the highest value areas for four of the five criteria, and in the second highest scoring area for the remaining criteria (altitude). The only sites scoring higher were Hatunsaray, located in the north-west of the Konya plain near Zoldura/Lystra Höyük, and Ortakaraviran Buyuk, near Lake Suğla. However, while both of these sites score very highly, they are both sites that were continually occupied from the Early Bronze Age all the way through to the Iron Age. While this proves that these sites were occupied in prime locations within the landscape, Singer's (2006) suggestion that Tarḫuntassa would almost certainly have been a newly constructed settlement in the Late Bronze Age would seem to put these two sites out of contention, while Hamza Zındanı Höyük does fulfil this criteria, leaving it the highest ranking potential site of Tarḫuntassa. However, as has already been discussed, it is by no means certain that the site of Tarḫuntassa would not have been previously occupied - all that can be said with certainty is that the site was not important enough before its selection by Muwatalli II to have been named in textual sources. This does not mean that the site of Tarḫuntassa would have no evidence at all of previous settlement.

Hamza Zındanı Höyük may not have the substantial archaeological standing remains that characterise Kızıldağ, but in terms of its position in the archaeological landscape and relationship with other settlements and routes of communication, its importance is unparalleled. Having tested the criteria by which scholars have previously suggested specific sites for Tarhuntassa, or on which they have based broader theories regarding Hittite settlement and use of the landscape, and having quantified, synthesised and visualised those criteria which have been reflected by the available archaeological data in the form of a statistical model, it seems clear from these results that of the previously suggested locations for Tarḫuntassa, Hamza Zındanı Höyük is the site most deserving of future archaeological attention, especially in light of its subsequent manmade damage due to the use of the site by a park and a hotel.

Following Hamza Zındanı Höyük are two further sites that would have constituted 'new settlements' in the Late Bronze Age, Cingantepe in the Göksü valley and Isiklar Dağı Mevkii Yerleşimi near Ereğli. Both of these sites are on the very peripheries of Tarḫuntassa's borders, as outlined in the Bronze Tablet, and would seem less likely to be locations for the region's capital. The same applies to the relatively high scoring site of Tekirköy. The next two highest ranking sites that had previously been suggested as the location of Tarḫuntassa are Zoldura/Lystra and Kilise Tepe. Both sites had been occupied in earlier periods, and Kilise Tepe lies at the periphery of the Tarḫuntassa region. However, Zoldura remained important well into the Iron Age and Greco-Roman periods, so it would be difficult to imagine that it was not already an important settlement in its earlier phases of occupation, including the Late Bronze Age. The site was also an important enough focus of trade during the Late Bronze Age for its residents to be acquiring and using Mycenaean pottery, suggesting a certain level of wealth and not only national but international connectivity (Bahar et al

2005). It is fairly centrally located, in a position that certainly fulfils Mielke's (2011a) statement that important Late Bronze Age sites are found at the edges of larger valleys and controlling important routes of communication, being situated on the May river which enters the Konya plain on its western edge, south of the spur of high ground that enters the plain, and provides a point of entry into the mountains separating the Konya plain from the area surrounding Lake Beyşehir. Certainly, the results of the predictive model on top of the known archaeology of the site suggest that, at the very least, Zoldura/Lystra is a site deserving of further intensive archaeological investigation, given its importance in the Late Bronze Age and in the period of transition between the collapse of the Hittite Empire and the Early Iron Age. It is possible that during this time the potential rival dynasty established by Kurunta and continued by Hartapu may have controlled the region, and any further evidence to either prove or disprove this hypothesis would be of critical importance in further understanding the political situation of Southern Anatolia in the 'Dark Ages' that followed the collapse of the centralised Hittite Imperial administration.

Perhaps the most important result of this analysis is the position in the predictive model score rankings of the most favoured site previously suggested as the site of Tarḫuntassa, Kızıldağ, which ranks 23rd out of all 57 Late Bronze Age sites, with a score of 31.115631, only just above the median value and not significant higher than the mean. Among previously suggested sites, it is the second lowest scoring ahead of Hatip Kale. This low score is due to its location scoring poorly in proximity to both roads and rivers, as well as altitude. Since some of the criteria used in the construction of the predictive model were specifically mentioned in studies which favoured the choice of Kızıldağ as a likely capital, this leads us to an important conclusion with regards to the usefulness of this methodological approach in future studies of Anatolian historical geography. This conclusion is that, if spatial reasoning is going to be used to justify an archaeological conclusion, it has to be actually tested rather than simply assumed or guessed at through basic observations. This has been shown to be particularly true with regard to the proximity of Kızıldağ to trade networks, a criteria specifically mentioned by Dinçol et al (2000) in supporting the choice of Kızıldağ, but which has been shown not to be the case.

Furthermore, this methodological approach has shown that it is perfectly possible for the criteria by which previous scholars have formed their hypotheses to hold true, but for the hypotheses themselves to be flawed. Again, the example of Dinçol et al (2000) is a perfect demonstration of this. The analyses showed that Late Bronze Age sites are indeed more likely to be within close proximity to hypothetical 2nd Millennium trade networks, but Kızıldağ, the site which Dinçol et al conclude must be Tarhuntassa, does not actually fit into this pattern. Their conclusion has been proven to be flawed using the very criteria they themselves based that conclusion on.

The lowest scoring suggested site for the location of Tarḫuntassa is Hatip Kale. Since this site is very close to the northern border of the region, it was always unlikely to be the site of the capital, and this particularly low score only further confirms this suspicion. However, the presence of the monument of Kurunta and its proximity to the most frequently used routes of communication suggest that the site of Hatip would have been an important settlement in the geo-political context of Late Bronze Age southern Anatolia, particularly regarding the possible conflict between the dynasties of Kurunta and Tudhaliya IV.

Other sites which should be noted include Çiçek Höyük, highlighted by Bahar (2007) as the possible location of an important Late Bronze Age crossroads between communication routes heading west-east from the upper Çarşamba valley to the Konya plain and Cilician Gates, and north-south from the Anatolian plateau to the Göksü valley and eventually the Mediterranean coast. However, neither the least-cost path analysis nor the predictive model score (21.923902) indicate the likelihood of this site being anything more than an isolated Late Bronze Age settlement, if a sizeable one. At the other end of the scale, the settlement of Kozlubucak, a settlement in the Taurus foothills separating the Konya plain from the Göksü valley and controlling the key route of communication, scores 38.570163, the sixth highest score in the database. While the settlement was continuously occupied from the Early Bronze Age, its key strategic position in relation to the route connecting the plain to the coast makes it a priority for future investigation.

Another important site scoring similarly in the predictive model to Kızıldağ is Çomakli Höyük. This very large mound has been noted as having a large amount of pottery dating to the Middle and Late Bronze Ages, and has been investigated by Mellaart (1965), Güneri (1987), Bahar (2002) and the TAY Project team (2002). It is also one of a string of 2nd Millennium sites heading in a south-south-westerly direction from Konya Karahöyük. This has been suggested to be indicative of a trade route, but the least cost path analysis does not appear to back up this idea - however, the high-use path that was identified by the analysis is not that far from the string of sites, and it is plausible that this exact course across the mostly flat plain was used rather than the direct route identified by the least-cost path analysis. Either way, this route is not close to Kızıldağ. Çomakli Höyük is clearly an important urban centre of both the 2nd Millennium and Late Bronze Age of some significance, and should also be a priority for further archaeological investigation.

8.3 - Effectiveness of the Predictive Modelling Process

Having examined the key results of the Predictive Model, this method should be critically and reflectively assessed before its outcomes are taken for granted. The greatest benefit of this method has been that it has taken the criteria for the location of an important Late Bronze Age city that were highlighted in the literature, and applied them to the available archaeological data and the context of that archaeology within the landscape to determine whether those criteria were viable (which, in the case of settlement density, it was not) and which settlements fit most closely into the designation of an 'important Late Bronze Age city' as defined by those criteria.

However, there are two main flaws in the methodology, the first of which is the accusation of circular reasoning, in that it is driven by the hypotheses used to underpin previous studies, rather than by new hypotheses that have been drawn directly from the archaeological dataset itself. Furthermore, unlike a standard predictive model, the data derived from the modelling process has been applied back to the same landscape, rather than being used to investigate a different one. This is an admittedly unorthodox approach, and could be criticised for essentially only revealing which site in the local archaeological record most corresponds to the local patterns evidenced by those archaeological records themselves.

On the other hand, this argument does not take into account the fact that the criteria chosen are not generic and applicable to any landscape, but are specifically geared towards hypotheses regarding a specific period of time, a specific landscape, a specific cultural approach to that landscape and, in some cases, a specific style of settlement construction. Furthermore, in the case of the inclusion of Least Cost Path analysis as a way of assessing proximity to ancient trade routes, this has reduced the circularity of the process by including an extra element of landscape modelling, which is further divorced from the raw data and adds an element to the predictive model which is not directly observable in the same way as altitude or proximity to rivers, for example.

Secondly, there is an issue of the 'importance' of settlements, and how this might cause the location of a capital city to differ from other settlements in the area. Although the criteria are in some cases focussed more broadly on Late Bronze Age settlement patterns, others are more specifically related to cities which could potentially be called a capital, or at the very least play some important local geopolitical role. By including all Late Bronze Age settlements in the analyses used to form the predictive model, and not just a subset of 'important' ones, it could be argued that the results of these analyses are not accurately reflecting the statement of the original hypotheses, and that the potential truth behind the criteria has been diluted by the inclusion of 'unimportant' settlements which by their nature do not fulfil those criteria. However, if there were to be a process of designating 'important' settlements before any analysis took place, the means by which this was carried out would have to be very clearly justified in order to avoid being critiqued as a case of putting the hypothetical cart before the empirically observable horse, and would artificially skew the results towards a specific subset of settlements based on pre-determined biases, essentially negating the entire point of the modelling process.

There is a further critique to be made of the predictive modelling process, although not specifically relating to the methodology used to create the model itself. Rather, it is a continuation of the point that has already been made with regards to the results of many of the earlier analyses - these results are only as accurate or as reliable as the data that was used. In this sense, given the issues surrounding the dating of many of these sites, particularly with regard to separating Late Bronze Age settlements from those dating to the earlier part of the 2nd Millennium, the model should perhaps not be taken as a definitive picture of Late Bronze Age settlement patterns, only of those conclusions which can be drawn from the available, unfortunately flawed, data. This critique can only be addressed through either a new systematic statistical study of 2nd Millennium pottery forms to establish firmer dating, or through carrying out fieldwork. It has already been stated that the former is not within the remit of this project - however, one of key aims of this methodology is that its outcomes will inform future fieldwork. This fieldwork will act as a means by which to assess the viability of the meta-hypothesis that this project has generated, and would be the definitive test not only of the conclusion of this case study, but also of all of the tested critera on which that conclusion was based.

Finally, it should be mentioned that predictive modelling of this variety cannot account for cultural factors in the choice of settlement location. It is for this reason that those criteria discussed in the literature that it was not possible to analyse spatially using GIS analysis, specifically issues relating to monuments and the potential religious importance of the site of Tarḫuntassa, will be addressed in the final chapter of this thesis, and the results of this analysis will be viewed in the context of these 'qualitative', cultural factors. Through examining these cultural criteria alongside the results of this analysis, it will be possible to reach a conclusion on whether this methodology has successfully identified a potential location of Tarḫuntassa and therefore fulfil the aim of this project in assessing the degree to which such a methodology can be applied in the future.

9. Discussion

The previous chapter concluded all of the analyses and used predictive modelling techniques to combine the results of these analyses into a single model representing the likelihood of a particular site or location being an important Late Bronze Age city. In this chapter, the results of this final analysis, and those of previous chapters, will be discussed in the context of the literature and the research questions, regarding both this case study and the wider application of the methodology, asked at the outset of this project. This discussion does not only include the criteria that have been assessed through spatial analysis, but also those that cannot be addressed through analytical processes and must be considered retrospectively, alongside the results of the spatial analyses. Furthermore, in light of this discussion of the overall results, there will be a final discussion on whether the primary aim of this research - namely the construction of a new, digital and spatial approach to the study of Ancient Near Eastern historical geographies, has been satisfactorily accomplished.

9.1 - Site Characterisation in light of the Predictive Modelling exercise

9.1.1 - Tarḫuntassa and the 'Virgin Ground' hypothesis

It has already been stated that, given the very small number of sites within the database that were identified as having been founded in the Late Bronze Age or occupied in the Early Bronze Age and subsequently re-settled in the Late Bronze Age, Singer's hypothesis (2006) that Tarḫuntassa must have been founded on virgin ground could be called into question. There are only twelve sites founded in the Late Bronze Age with no evidence of earlier occupation. Of these twelve, four can immediately be discounted - three are the locations of monuments only (Karadağ, Ermenek and the Hatip monument) and the fourth is the theoretical location of the city of Saranduwa at the site of the classical Kelenderis/modern Gilindere, in accordance with Melchert (2007). Of these eight, six are on the very northern and eastern fringes of Tarḫuntassa's territory. This leaves only two sites - unsurprisingly, these are the two most frequently mentioned sites throughout this project, Kızıldağ and Hamza Zındanı Höyük. Taking into account those sites that were occupied in the Early and Late Bronze Ages but abandoned in the Middle Bronze Age, the Göksü valley sites of Orentepe and Çingantepe and the coastal site of Tekirkoy are brought into contention, alongside the more central sites of Alibeyhöyük 2 and Harmanpınar Yuğ Tepesi. Two other sites on the fringes of the territory can be discounted.

However, when comparing these sites to the scores from the predictive modelling exercise, it becomes apparent that there is some correlation between 'virgin ground' sites and those that have scored highly and therefore show the most characteristics of a key Late Bronze Age site in this area. Hamza Zındanı Höyük, Çingantepe and the fringe site of Isiklar Dağı Yerleşimi are all found in the top five scoring sites, while Tekirkoy, Kızıldağ and Alibeyhöyük 2 and the peripheral sites at Kocadere, Kapakli and Balkaya all score above the median value of 29.55. This is nine of the fifteen viable 'virgin ground' sites. The remaining six, however, score very poorly, with the highest score among them being 25.28.

In spite of this correlation, however, it would be imprudent to entirely eliminate almost three quarters of the Late Bronze Age sites in the database on the basis of their not being newly founded sites. If we are to take Singer's hypothesis at its word and not consider any site occupied immediately prior to the Late Bronze Age, this leaves a whole swathe of sites that score very highly in the predictive modelling exercise out of contention. As discussed in the literature review, Singer (2006) based his hypothesis on the assumption that a lack of attestations of the name 'Tarḫuntassa' in textual sources is due to its not having existed before. It is perfectly possible, however, that the site had been occupied before its selection by Muwatalli II, but was not an important enough settlement to be noted in any textual records. It is also possible that it may have been renamed to fit into the king's new religious order (though perhaps this would have been expected to have been noted in one of the later accounts), or that an earlier recording of the name simply has yet to be recovered by archaeologists. It would therefore be sensible to apply the archaeologists' maxim of 'absence of evidence is not evidence of absence' in this case, and take into consideration those sites which score highly but were occupied throughout the 2nd Millenium.

Furthermore, it must be considered that the difficulties in dating sites specifically to the Late Bronze Age using ceramic evidence could mean that it would not be sensible to use the dates in the database as the basis for narrowing down which sites are more likely to be Tarhuntassa. On the other hand, many of the sites which have been identified only as Late Bronze Age have been identified not only on the basis of pottery, but also on architectural or monumental evidence, so the data is not entirely without merit.

As such, the fact that the very high scoring site of Hamza Zındanı Höyük is a virgin ground site should not be entirely ignored, and may well be factored in as another (if minor) point in favour of its possible identification as Tarḫuntassa.

9.1.2 - Site number and size over time

The results of the statistical analysis of the database with regard to the changing size of settlements over time carried out in Chapter 4 showed that trying to identify patterns in the fluctuations of settlement size using the height of the resulting mounds did not offer a true reflection of their size. This was as a result of the much more elevated natural prominence of the locations chosen in the Late Bronze Age artificially inflating the height of those sites founded in that period, illustrating the Hittite preference for settling on elevated sites with dramatic topographies, compared to the höyüks of the earlier periods, which were typically built on flat, low--lying ground. Furthermore, since höyüks are formed through the constant construction, destruction and rebuilding of largely mud-brick buildings on top of each other, continuously occupied höyük sites will obviously be higher than sites which were only occupied in for one period, even if the latter grew to a larger size in terms of population. Even so, valley-based höyük sites may appear smaller than upland ones, particularly in the Konya plain, due to their burial by alluvial deposits after their abandonment, as noted by Yakar et al (2001). Of course, alluvial deposition would also affect the present visible diameter of höyük sites - however, the effect of this process on the visible height would be much greater. Therefore, the diameter of höyük sites must be considered a better indicator of its past size than height.

In light of this conclusion, the results of the statistical analyses regarding site number and size over time generally backed the findings of the previous surveys of the region by Mellaart (1964), Dinçol et al (2000) and Baird (2001b), as well as the corollary suggested by Glatz (2011). The overall number of sites throughout the time periods declines constantly, with a serious decline in number at the end of the Early Bronze Age and another slightly less drastic fall at the transition from the earlier 2nd

Millennium into the Late Bronze Age. The analysis of site diameter through these periods showed that Glatz was right in her assessment that while 2nd Millennium sites were fewer in number than in the Early Bronze Age, they were much larger, showing a process of nucleation and an economic shift from localised agricultural communities to larger trading centres. However, sites occupied and established in the Late Bronze Age were smaller than those of the earlier 2nd Millennium, indicating that previous centres of power did not remain as such in the latter half of the millennium. The construction of new administrative centres may have been a deliberate method of controlling the local population by the Hittite imperial authorities, and would explain the reduced size and contributing to the likelihood of Tarḫuntassa being a newly founded city rather than a pre-existing centre of power. However, there may also be more localised reasons for this apparent shrinking in settlement size which are not apparent from the available evidence.

Since the data analysis broadly supports Glatz's conclusions, it should perhaps be noted when examining the results of the predictive model that larger sites which were occupied in both the early 2nd Millennium and the Late Bronze Age are less likely to be identified with Tarḫuntassa, as these Middle Bronze Age centres of power and trade would have been unlikely to retain that status under the Hittites. While it cannot be assumed that the site of Tarḫuntassa was not occupied in the earlier 2nd Millennium, it is less likely to have been of any great importance or size in this earlier period, as this would have made it more likely to be referred to in earlier textual sources, in accordance with Singer (2006).

9.2 - Site Location in the context of Predictive Modelling results

The criteria that made up the site location analysis - altitude, slope steepness, proximity to rivers and proximity to the edge of the plain - were all heavily interlinked. In fact, it is in these hypotheses and results that the ethos behind the choice of Hittite settlement locations is most clearly defined. The analyses regarding altitude and slope steepness revealed that there is some evidence, although not dramatic, that Late Bronze Age settlements are more likely to be found at higher altitudes and on steeper slopes than those of earlier periods, backing up the assertion of Bahar et al (2005) that Hittite cities are more likely to be found at 'mountainous and sloping areas, for security reasons' (p2), as well as the general characterisation of the distinguishing feature of Hittite urban architecture being the incorporation of more dramatic topographies. The results of the analysis regarding proximity to the plain edge, as defined by proximity to steeper slopes, was in definite agreement with the hypothesis put forward in the literature by Mielke (2011a), that Hittite cities were often found on the peripheries of broad valleys and plains, as well as the above argument made by Bahar et al (2005). This was probably the most stark and clearly cut positive correlation of any of the above results, showing a clear preference for Late Bronze Age sites, particularly those newly founded in that period, to be situated less than 1km from the edge of the plain.

The results of the analysis regarding proximity to rivers was not so clear cut, and in fact seemed to run counter to the ideas put forward in the environmental studies by Boyer et al (2006). Regardless of the changing agricultural economy from low-lying alluvial farming towards the clearance and utilisation of upland sites, as represented in the data collected by Eastwood et al (1998), it would seem from the results of the analysis that a positive correlation between settlement location and rivers remained a constant throughout the Bronze Age. This positive correlation was still worthy of inclusion in the predictive model, however, given it backed up the suggestion by Mielke (2011a) that Late Bronze Age settlements often controlled river valleys which would have been important natural routes of communication. This theory also coincides neatly with the results of the Least Cost Path analysis, where those locations where rivers emerge from the mountains onto the plains frequently serve as natural way for routes between the Konya plain, the region around Lake Beyşehir and the Göksü valley to transition between plain and mountain landscapes.

By combining the results of the analyses regarding plain edge, altitude and slope with this positive correlation between Late Bronze Age site location and rivers, what emerges is that those sites which score highly in the predictive model are often sites located at these aforementioned 'points of transition', where the mountains meet the plain, and rivers serve to connect the two topographies. It is therefore in locations such as this that Tarḫuntassa is likely to be located, and while the high-scoring Hamza Zındanı Höyük fits this definition precisely, Kızıldağ lacks this sense of connectivity between different landscapes. It could perhaps be argued that by being near the Karadağ massif it is at a point of transition between the plain and steeply sloping ground, but the Karadağ massif differs from the Taurus mountains south of Karaman in that it does not form a natural barrier between two disparate territories, instead being entirely surrounded by level plains. It is not bisected by any major rivers, and does not need to be bypassed or entered by any routes of communication - it simply stands as an anomalous high point, isolated within its landscape. In other words, it may be *transitional*, but it is not *peripheral*. This may explain not only why it scores comparatively poorly in the predictive modelling exercise, but also why it does not feature prominently in the network of least cost paths.

It should also be noted, however, that the site location analyses did not support all of the criteria for the location of Tarḫuntassa put forward in previous literature. The assertion of Dinçol et al (2000) that it should be found in an area of dense 2nd Millennium settlement was proven to be false - more than half of settlements occupied in the Late Bronze Age were in fact completely isolated from areas that were settled either in the same time period or in the earlier 2nd Millennium.

This perhaps suggests that the Late Bronze Age inhabitants of the region were less concerned with placing themselves amongst previous centres of population, and more concerned with controlling movement through the landscape, whether this was due to a broad strategy implemented by the Hittites, or simply a reaction by the local population to the changing dynamics of long-distance trade and communications. It could also be argued to be indicative of forced re-settlement or re-distribution of population, as large centres of the 2nd Millennium such as Konya Karahöyük or the string of settlements around the south of the Karadağ massif may have been abandoned by the Late Bronze Age, and no new settlements were constructed in their place.

However, it should also be considered that some of these large centres dated only as '2nd Millennium' may well have been continuously occupied into the Late Bronze Age, despite not being identified as such in the database, due to the difficulties in separating Middle and Late Bronze Age ceramics. Therefore, assigning any political interpretation to such apparent changes in settlement regimes should not be done without further evidence.

As an outcome of this project, the fact that one of the supposed criteria for locating Tarḫuntassa has been shown not to correspond with the archaeological reality shows how important it is to actually study settlement patterns and the relationship between settlements and the wider archaeological landscape before making assumptions about the motivations and influencing factors behind the choice of settlement location for any given culture or time period. It is very easy to assume that a new capital city might wish to control existing populations, but these hypotheses must be confirmed before they are applied, to avoid coming to incorrect conclusions.

9.3 - Least Cost Paths and Communication Networks

The results of the Least Cost Path analysis itself has already been discussed in some depth in Chapter 6. It is clear from these results that, assuming that Late Bronze Age sites were constructed (or occupation of earlier sites continued) to control pre-existing routes of communication, that Kızıldağ is remarkably isolated from the key north-south trade route from the Anatolian plateau to the Mediterranean coast through Tarḫuntassa's territory, while Hamza Zındanı Höyük stands at a crucial junction between this major route and an east-west route towards the upper Çarşamba valley and the Lake Beyşehir region. While the analysis was carried out before the sites from the Konya-Ereğli KEYAR survey (Maner 2014-16) were added to the database, it may be useful to theorise the potential impact of these sites on the outcome of the analysis. This dense area of settlement in the very north-eastern corner of the study area is close to the main route through the Taurus Mountains which would have connected the Konya plain to the Cilician Gates, east of the study area. Throughout antiquity, this has been the main gateway from Anatolia to the Mediterranean, the Levant and eventually Egypt, via the region known to the Hittites as Kizzuwatna. Newhard et al's (2008) least cost path analysis of the routes connecting the Konya plain to the Mediterranean concluded that in the Late Bronze Age, this route would have been the most important, while the route via the Göksü valley that falls within the study area of this project would have been a lesser, more localised route. It makes sense, therefore, for the Hittite Empire under Hattusili III and his successor Tudhaliya IV to cede control of this lesser route to Kurunta's vassal state of Tarḫuntassa, while maintaining control of the more important Cilician Gates.

The large number of sites found by the KEYAR survey in the north-eastern part of the study area also raises the question of whether, if Tarḫuntassa was initially constructed with a military campaign against Egypt in mind, access to the Cilician Gates was a higher priority than controlling other routes to the Mediterranean - a conclusion which would give greater credence to the findings of Newhard et al (2008). If so, control over hypothetical routes to the East, particularly towards the Hittite cities of Hupišna and Tunna (likely located at Ereğli Karahöyük (Garstang & Gurney 1959) and Zeyve/Porsuk Höyük (Beyer et al 2010) respectively) may be worth considering alongside the routes in the study area. Kızıldağ's position sandwiched between Lake Hotamış and the Karadağ makes it an unlikely location to be in control of an east-west route. Given the extent of the Lake Hotamış as recently as the early 1980s and the vast expanse of completely level plain to the north of the lake, such a route would more likely have existed just north of Tarḫuntassa's border, heading roughly east-south-east from Konya Karahöyük towards the site of Ali Tepe in modern Karapinar, possibly via the sites of Evderesi, Tekintaş Höyük, Domuzboğazlıyan, Kerhane Höyük and Sirnik Höyük - though the Least Cost Path analysis places this potential route even further north, since the completely level terrain permits an uninterrupted straight line route. From here, this route may have headed around the south of the Karacadağ volcanic massif and to the north of the Akgöl marshes, via Kazan Höyük and Akhüyük, before reaching the region around Ereğli Karahöyük.

There is also the possibility of a southern route, continuing the road arriving in the vicinity of Karaman from the west, and roughly following the route of the modern D350 motorway via the 2nd Millennium site at Büyükgonu and the modern town of Ayrancı, emerging on the eastern shore of the Akgöl at the Late Bronze Age site of Adabağ. From here, the route may have rejoined the northern road, or headed into the mountains to the east via Hacımemiş Höyük and the numerous river valleys which can be crossed to reach the Ulu Deresi, the main route to the Cilician Gates. These valleys are controlled by a number of Late Bronze Age hilltop 'castle' sites, and in particular, the valley of the Ivriz Deresi must have remained an important route well into the Iron Age, as indicated by the presence of a Neo-Hittite relief at modern Ivriz/Aydınkent. The 'castles' of Kapaklı Kalesi and Avdalli Kalesi in particular control a crucial pass which connects the Ivriz and Ulu valley systems, allowing access to the main route to the Cilician Gates from the south as well as the west. If such a southern route existed, then a city in the vicinity of modern Karaman would have sat at a vital crossroads, controlling access to both the Göksü valley and the approach to the Cilician Gates from the south-west.

In the context of the results of the predictive modelling exercise, the relative isolation of Kızıldağ and the connectedness of Hamza Zındanı Höyük/Karaman is borne out in their respective scores. Hamza Zındanı sits right on top of this crucial junction of frequently used routes, while Kızıldağ is something of a dead end. Of course, there are valid concerns over the methodology of least cost path analysis for the creation of hypothetical trade routes, and the network created for the purposes of this study should only be taken as a rough guideline as to the most likely location for these roads and not an exact map. However, there can be no denying that the Kızıldağ, while it may have the advantage of a dramatic and easily defended position, is not a prime location for controlling any major routeways for either military or trade purposes, while Hamza Zındanı is well situated in this regard.

There are other sites which both score highly in the predictive modelling exercise and are very closely linked to key routes or intersections of routes. Sirçali, Okçu and Çomakli Höyüks all score higher than Kızıldağ, and are all mounds with continuous occupation since at least the 2nd Millennium found along the main route through the Konya Plain. This suggests that, as expected, the main routes through this landscape were probably established in the 2nd Millennium during the Middle Bronze Age *kharum* colony period, and confirms that this trading network extended much further south than the site at Konya Karahöyük. However, in the Late Bronze Age, the routes connecting the Anatolian interior to the Mediterranean coast became of greater importance as the Hittites focussed on trade with the Levant and Cyprus - it is only in the Late Bronze Age that the coastal regions of southern Turkey, equating to classical Rough Cilicia, became culturally 'Anatolian', as indicated by the sudden adoption at Mediterranean coastal sites of stereotypically Hittite ceramic forms that had been evolving in the Anatolian interior since the Middle Bronze Age (Gates 2011). Several sites which scored highly in the predictive modelling exercise are found on this road through the Göksü valley route to the coast, including Cingantepe, Kozlubucak, Tekirkoy, Damtepe and Kilise Tepe. Of these five sites, three appear not to have been settled in the earlier 2nd Millennium, lending further credence to the suggestion that the use of the Göksü valley for both trade and settlement was more important in the Late Bronze Age.

One site which can certainly be discounted from the discussion of potentially important Late Bronze Age settlements is the site at Çiçek Höyük, which, despite the suggestion by Bahar (2007) that it may have been positioned on a key Late Bronze Age crossroads, does not appear to have anywhere near that level of importance, as reflected by its rather dismal score of 21.92. The route connecting the plain to the coast is found further west, while the east-west route connecting the Konya plain to the upper Çarşamba valley and Beyşehir region stayed on the edge of the plain north of Çiçek Höyük, crossing the mountains further west near either Akören Karahöyük or May Höyük.

9.4 - Comparisons to the Hattuša region

9.4.1 - Hittite settlement, roads and use of the landscape

The comparative analysis performed against the database of sites within 60km of Hattuša showed that the decline in the number of settlements between the Early Bronze Age and the 2nd Millennium was similarly drastic in both regions, but the subsequent decline between the earlier 2nd Millennium and the Late Bronze Age appeared far less marked in the Hittite heartland than in the far south. However, with regard to the relationship between settlement and the physical geography of the region, the distribution of Late Bronze Age sites compared to those of the 2nd Millennium is very much comparable with the study area for this project, in spite of the significant topographical differences between the two regions. It is very noticeable in the distribution of settlement sites that, while 2nd Millennium sites are focussed around the slightly lower-lying and more level plains and broad river valleys around, and to the east, of modern Alaca, Late Bronze Age sites were found at the edges of highlands and at the heads of river systems, particularly where these valleys met the highlands that separate modern Çorum and Yozgat provinces. This bears a remarkable resemblance to the pattern found in the study area of this project, with the clear preference for these peripheral sites where rivers allow passage between low-lying and highland landscapes.

This is perhaps suggestive of a broader change in attitudes to settlement location as a result of Hittite influence and changing priorities with regards to factors such as trade, communication and defence. While it still cannot be concluded with any certainty that the settlement patterns observed in the spatial analyses of the study area are definitively Hittite in nature (since the outcome of this study is only to provide a meta-hypothesis for Tarḫuntassa's location, rather than a firm answer to the question), these similarities with the settlement patterns of the Hattuša region increase the likelihood that there was, at the very least, some level of Hittite or Central Anatolian influence (although perhaps not outright Imperial control) on the settlement patterns of the Konya Plain, as opposed to purely localised cultural developments.

The comparison between the potential Hittite road networks identified by Strobel (2008) and least cost path analysis showed that there are some potential difficulties with the use of least cost path analysis to recreate ancient routes, particularly where river valleys were actively preferred as points of access to the highlands, as opposed to the most gentle slopes. In general, least-cost path analysis was most successful when used on more open landscapes or those mountainous regions bisected by one major river valley system, whereas the more difficult and stereotypically 'Anatolian' landscapes of severely undulating mountain ridges and plentiful small streams proved the least likely to have the least-cost path match the roads marked by Strobel. This is noteworthy and worth considering in future studies, particularly in those cases where the least cost paths have failed to take into account particularly small, steep gorges due to the lower resolution of the digital elevation models used. However, for the purposes of this study, there are far more open plains and larger valleys in the Tarḫuntassa study area, and far fewer 'typically Anatolian' landscapes, and therefore the least cost paths can probably be considered a fairly accurate reflection of the likeliest routes for ancient roads in the region.

9.4.2 - Direct comparisons of potential Tarḫuntassa sites to Hattuša

If Muwatalli II wished to establish a new capital city with the intention of it replacing or even surpassing the existing capital at Hattuša, it stands to reason that he may have used the original capital as a blueprint for choosing a new site. Hattuša is also without a doubt the most well excavated, intensely studied example of a large-scale Hittite city, and therefore many questions about the exact nature of Hittite urban sites in and of themselves, such as civic architecture and urban topography, can be answered by looking at Hattuša. It can then be noted whether any of the high-scoring sites in this study area can be directly compared in this manner with the old capital.

In terms of topography, Hattuša stands on a steep slope between two river gorges. There are two sharply rising rock outcrops which face each other across the gorge to the east - the Büyükkaya, on which the very earliest settlements at the site were built in the 6th millennium BC, is separated from the main body of the settlement on the north side of the gorge, while the royal palace complex on the Büyükkale lies on the south side and was accessible from the Upper City by means of long causeway (Burney 2004). This utilisation of dramatic and difficult terrain is typical of Hittite urban architecture, and has often been used to differentiate it from the lowland 'höyük' mounds of earlier periods. The main settlement is separated into an upper and lower city. The lower city is dominated by the great temple, likely dedicated to the chief deities, the Storm God and the Sun Goddess, while the upper city contains a greater number of small temples, as well as the ceremonial entrance gateways to the city and an artificially steepened defensive rampart along the southernmost wall, the Yerkapı. Most of the city's monuments, such as the SUDBURG and Nişantas inscriptions, are found in the upper city, while aside from the great temple, the lower city seems to be set aside for storage rooms and the residences of artisans. The city, particular its upper part, has a number of steep rocky outcrops such as Nişantas, Yenicekale and Sarıkale. Many of these outcrops have structures built onto their summits. The entire city is surrounded by a circuit of massive stone walls of casemate construction, interspersed with both small and larger ceremonial gates (Burney 2004).

To the south of the city is a rugged, mountainous landscape through which a number of small, steep-sided river valleys flow, while to the north is a more open landscape around a wide river valley which would have been used for farming and settlement by the city's agricultural population. The landscape would, in general, have been more wooded in the Bronze Age, providing the population with plenty of timber, while the varied landscape involving both highlands and river valleys would have allowed for a wide agricultural regime involving the grazing of herd animals and the growth of cereals, as well as possibly vines, fruit and nuts.

When comparing the topographical situation of Hattuša directly with some of the previously suggested sites of Tarḫuntassa, and indeed some of those which have been raised as further candidates by this study, a favourable comparison can be drawn with Hamza Zındanı Höyük in particular, while Kızıldağ does not compare as well with the original capital. While the settlement at Kızıldağ can be seen as typically Hittite in its integration of the dramatic topography of the hill itself into the architecture of its walls and buildings, its position on the south-eastern shore of Lake Hotamış, as well as its distance from any sizeable rivers, means that it lacks the potentially varied agricultural landscape of Hattuša. Furthermore, by being restricted on its north side by the lake and with much of the hillside itself too steep for building, it has little room for the expansion either of the potential hilltop 'palace compound' or of an extra-urban farming population - that the capital city site should have room for expansion is one of the criteria listed by Dinçol et al (2000), and again, their chosen site does not seem to fulfil that very requirement.

The densest spread of Late Bronze Age pottery and architectural remains at the site can be found on the south-south-western slopes of the hill (Yakar et al 2001), but south and south-east are realistically the only directions in which significant expansion could have happened, due to the presence of the lake to the north and west, and further volcanic cones of the same chain to which Kızıldağ itself belongs to the east and south-east. Bearing in mind that the city of Hattuša covers an area measuring nearly 2km from its northern end to the Yerkapı rampart at the southern end, the hill at Kızıldağ which would presumably have constituted the body of the city itself barely measures 800m north-south and 700m east-west, and the terrain in that much smaller space is largely too steep to realistically accommodate any great volume of stone-built architecture.

Hamza Zındanı Hoyük, on the other hand, covers a much larger and less dramatically sloping area. The promontory on which the site sits measures 1.5km north to south, and 1.3km from east to west. This promontory is but a part of a larger topographical feature, a plateau measuring around 3.5 by 2.5km. This slope is far more gentle than that at Hattuša, which ascends over 260m over 2km, while the Hamza Zındanı Hoyük promontory only rises by 60m over 1.5km. This plateau sits between two streams which emerge from narrow gorges through the foothills of the Taurus mountains to the south. One of these, the Gödet Deresi, can be followed for some distance into the mountains - it has already been shown through the total least cost path analysis that a major route from the plain to the Mediterranean via the Late Bronze Age settlement at Kozlubucak and the Göksü valley may well have followed the line of this valley, passing directly by Hamza Zındanı Hoyük at the point of transition between the plains and the mountains. A third stream runs down the centre of the plateau, originating at its far southern end, providing a source of fresh water. This topographical situation should sound very familiar - as well as matching the physical description of Hattuša to a remarkable degree, the Hamza Zındanı site also shares its potential for a varied agricultural landscape, with the streams on either side of the plateau irrigating the Konya plain to the north, providing ample opportunity for agriculture, while the plateau itself and the surrounding highlands to the south would have been perfect pastureland and possibly a source of timber. The clearance of wooded upland landscapes is a feature of the Beyşehir Occupation Phase, and this may be indicative not only of upland agriculture but also the increased utility of timber. Unlike Kızıldağ, Hamza Zındanı offers the room for urban expansion and extra-urban agriculture that were deemed one of the important factors in the choice of a new capital by Dinçol et al (2000), in a topographical setting which mimics that of Hattuša in several notable ways.

A similar argument can be made for the sites on the western fringe of the Konya plain which also score highly in the predictive modelling exercise - Hatunsaray and

Zoldura/Lystra. Though neither of these sites occupies a particularly prominent topographic position (Zoldura/Lystra follows the earlier tradition of 'höyük' sites, being positioned within the river valley), Hatunsaray is also situated between the confluence of two streams, the May river and one of its tributaries. It lies at the very eastern end of a spur which ascends into the Erenler mountains to the west - again, this is a site which occupies a point of topographic transition, providing the opportunity for a wide variety of agricultural practices and ample room for expansion.

The site at Kozlubucak, already mentioned as scoring highly in the predictive model and being on the probable route from the plains to the coast, also bears special mention as being one of the few known sites which is situated in the heart of the Taurus foothills. This region almost certainly requires further study to assess its archaeological value, particularly around the valleys like the one which Kozlubucak overlooks. Sites like Kozlubucak share with Hattuša and other key Hittite settlements that balance between river-based agriculture, upland pasture and the defence of key routes of communication. For example, the topographical situation of Kozlubucak can be directly compared to that of the site of Yassıhöyük, around 23km east of Hattuša, which also sits on a relatively level plateau in a mountainous area, overlooking a key river valley. This region is at high risk from recent hydrological programmes, particularly the construction of hydroelectric dams in these valleys and in the upper Göksü valley itself - studies have already been carried out in the main body of the Göksü valley, but this region between the Göksü and the Konya plain is also worthy of further archaeological survey work, given the likelihood of finding more sites similar to Kozlubucak controlling these valleys.

9.5 - Religious Context

As highlighted in the literature, one of the key motivations for Muwatalli's relocation of the Hittite capital to the Lower Lands was his dedication to his personal cult of the 'Storm God of Lightning', whose Luwian epithet, *pihassiss Tarhuntas*, suggests a southern Anatolian origin for the cult and its adherents.

It has been suggested by Yakar (2014) that Karadağ would have been the cultic centre of Muwatalli's new religious order, and that the presence of cultic buildings on Karadağ's summit, as well as the monumental inscriptions of Hartapus at both Karadağ and Kızıldağ, suggests a link between the two sites similar to that between Hattuša and its cultic centre at Yazılıkaya. The mountain is certainly the most prominent landmark on the otherwise flat surrounding Konya plain. Hittite religion was inextricably linked to the features of the natural landscape, and mountains, along with rivers and springs, were often considered to be associated with divinities and seen as places where those divinities resided could be worshipped. In some cases, mountains were considered divine in their own right (Harmansah 2014b), and local deities could be referred to either with the cuneiform determinative for either god ('DINGIR') or mountain ('HUR.SAG') (Beckman 2013). In the Luwian cuneiform inscription at the summit of Karadağ, Hartapus refers to the location as being dedicated to 'the celestial Storm-God, the divine Great Mountain (and) every god...', cementing the identification of Karadağ as a holy site and linking it to the cult of the local Storm-God (Hawkins 2000). Whether the 'celestial Storm-God' in question is a reference to the standard chief God of the Hittite pantheon, or more specifically to Muwatalli's *pihassiss Tarhuntas*, is unsure, although Singer (2006) certainly believes the latter to be the case.

Certainly the religious link between Kızıldağ and Karadağ is not in question. At the very least, by the time of Hartapu these two sites, the settlement at Kızıldağ and the temple on the holy mountain, were two parts of a wider cultic whole, and this would almost certainly also have been the case for Kurunta and Muwatalli before him. However, what cannot be concluded so easily is that this automatically makes Kızıldağ the most likely candidate for the site of the new capital city, as Singer (2006) seems to suggest. There is no doubt that the settlement at Kızıldağ was of *cultic* importance, perhaps in a similar manner to the cities of Nerik or Zippalanda in the Hittite heartland, but it cannot be assumed that this equates to it being the heart of Muwatalli's new Hittite political centre as well.

If a link to the cultic centre at Karadağ is a key criteria for the location of Tarḫuntassa, then Kızıldağ is not the only site which can be considered to have such a relationship. Hamza Zındanı Höyük, while not as close to the mountain as Kızıldağ, is still inter-visible with the Mahalaç summit of the mountain where the cultic temple is located. In fact, Mahalaç is on Karadağ's southern flank, and can reached directly from the foot of the mountain on its southern side via a wide stream valley and the ridge that follows it on its eastern side. A modern road still ascends this route, and the 2nd Millennium and Iron Age site of Susan Höyük sits at the foot of this valley. An ascent from the north, on the other hand, would involve reaching the foot of the mountain proper near modern Üçkuyu, ascending the slightly lower northern edge of the rim of the extinct volcano's crater, then continuing to climb the ridge while circumnavigating the crater. While also followed by a modern road, this ascent is a far more dramatic but challenging approach to the Mahalaç temple, and may have resulted in a more intense religious experience, particularly if the volcano's crater was a part of its cultic significance. Regardless of which route was used in cultic practices, however, it cannot be claimed that Kızıldağ is unique in its visual and physical connections to the holy mountain.

9.6 - Monuments, Settlement and the Landscape

As has been discussed in the literature review (chapter 2), monumentalising the natural landscape was an important means by which the Hittites expressed their worldview, both in terms of religion and political control. The practice of monumental architecture, the use of carved stone and the incorporation of difficult and dramatic terrain into the built landscape are all defining features of Hittite culture, which distinguish it from earlier periods, but which are also continued in a remarkably uninterrupted manner into the Iron Age (Harmanşah 2011). The monuments of urban environments mainly took the form of ceremonial gateways, vast defensive walls, palaces and temples, but in the case of the capital at Hattuša, also included a number of royal inscriptions, rock monuments and sacred pools (perhaps mimicking the natural features such as springs monumentalised elsewhere) (Harmanşah 2011). Extra-urban monuments, on the other hand, were constructed in very specific locations, often holding some form of religious significance. This was particularly true in the case of the 'DINGIR.KAŠKAL.KUR' or 'Divine Road of the Earth' - this name is used in Hittite texts and inscriptions to refer to a variety of sacred sites where underground water emerges above the surface or is visible from the surface, including springs, gorges, caves and sinkholes (Gordon 1967, Harmanşah 2014b). The Bronze Tablet contains a reference to the '^{D}KAŠKAL.KUR of Arimmatta', likely a reference to the monumental spring at Eflatunpınar. The term occurs again later on in the phrase '^{D}KAŠKAL.KUR *watar hinnaruwaš*', a feature near Mount Sarlaimi. This likely refers to the Meke Gölü volcanic lake on the slopes of the Karacadağ (Dinçol et al 2000).

The definition of a 'DINGIR.KAŠKAL.KUR' could also be applied to a number of other monumental sites within the study area. The monument at Hatip overlooks a stream which emerges from the cliff face, while Kızıldağ itself would once have had a stream emerging from its north-western face, where the 'throne' monument stands (Harmanşah 2014a). Other monuments in the region, such as the Keben and Ermenek rock-carvings and the aforementioned cultic building and inscriptions at Karadağ, are also associated with particular features of the landscape, particularly steep-sided river valleys and prominent rock outcrops. All of these extra-urban monuments hold in common an association with 'living rock' or, to use the phrasing of Harmanşah (2014b, p66), 'naturally eventful places'. These sites may already have been centres of local cultic practices long before the arrival of the Hittites, but their monumental structures were then imposed on these sites, appropriating them as an act of political performance.

What, then, does the discussion of the location and purpose of monuments have to do with the identification of Tarḫuntassa? Both Dinçol et al (2000) and Singer (2006) make reference to the monumental rock carvings and inscriptions of Hartapu at Kızıldağ as a justification for its identification as Tarḫuntassa, with the former suggesting that the monuments emphasise 'the royal character of the settlement' (p16). However, considering the above characterisation of the location and purpose of extra-urban monuments, to identify Kızıldağ as a capital city on the basis of the presence of monuments located at a site which bears the hallmarks not of urban architecture but of the 'naturally eventful places' which play host to cultic buildings and practises seems slightly strange.

Certainly there is considerable evidence for there having been settlement of some form at Kızıldağ, in the form of Late Bronze Age pottery, the Cyclopean walls and building foundations on the summit (although the dating of these to the Late Bronze Age can be called into question (Karauğuz et al 2002)), the possible open-air 'sanctuary' on the south-western slopes which almost certainly predate the Hartapu inscriptions, and the reference in one of the inscriptions to Hartapu or his father Mursili (Urhi-Teshub) having 'built this city' (Kızıldağ 3 as translated by Hawkins 2000, p438). However, there is no evidence to suggest an extensive urban environment, with the spread of pottery being limited to the outcrop's southern slopes and the cyclopean walls at the summit having a diameter of just 90 metres. Furthermore, the presence of the monuments and the earlier sanctuary seem to suggest not a city, but the appropriation of a *cultic* rather than a *civic* site by Hartapu; a locally powerful ruler engaging in a piece of political performance through monumentalising a meaningful location in a liminal country on the fringes of the collapsing Hittite Empire. Whether the 'city' referenced in his inscription was built by him or by Urhi-Teshub in his brief reign as Mursili III before Hattusili III usurped the throne is unclear, but it seems unlikely that the inscription is referring to Muwatalli II, and the new city in question may have only been a settlement of cultic, rather than political value.

Taking into account the other monumental sites in the study area and their associations with settlement, it becomes clear that there is very little correlation between the monuments and large Late Bronze Age settlements. While there are settlements associated with the monumental pool at Eflatunpınar and the monument of Kurunta at Hatip, the former is a very small settlement mound at less than 200m in diameter, and the latter is not contemporary, with the höyük dated to the Early Bronze Age and the hilltop fortress of Early Iron Age date. Other monumental sites, such as the carvings at Keben and Ermenek, were entirely isolated, and rather than being associated with settlements, were instead markers of political control over important routes through difficult landscapes. Ullman (2014) raises the interesting point that perhaps these monuments were not meant to be obviously visible at all, but were instead deliberately concealed from view, and were established at locations on the threshold between two topographies, as is certainly the case at Hatip and arguably at Ermenek, where the monument would have been on a steep hillside on the periphery of a large valley through the Taurus mountains. He also suggests the use of monuments as places for the military to gather and consult with the gods over the legitimacy of a military endeavour. Certainly there are no grounds in either of these interpretations to assume that the presence of monuments necessarily gives Kızıldağ a 'royal character', or an urban character of any kind.

North of the study area is the Yalburt ceremonial pool and sacred pool complex built by Tudhaliya IV, the landscape surrounding which has been heavily investigated by Harmanşah (2014b), and which makes a fine case study for the purpose of the monuments of the Hittites (and indeed their rivals) in these more distant parts of the empire's territory. He notes that there is long-term occupation around the site, which sits on high ground surrounded by valleys, and that the Hittite Empire had heavily invested in a programme of settlement, agricultural improvement and water management in these surrounding valleys. However, the site itself was, again, chosen because of its nature as a 'DINGIR.KAŠKAL.KUR', a spring where underground water emerged above ground, and therefore a place of connection to the ancestors and to divinities. Furthermore, the site is located on top of a potentially sacred mountain, giving it further religious significance (Harmanşah 2014b).

Tudhaliya's decision to build his monument in this particular location was not simply to mark the location of one particular city or site of religious significance, but was done to coincide with direct Hittite involvement and investment in this peripheral region of the Empire. Furthermore, the inscription details his military expansions in the West of the Empire. This site would have been in the South-Western corner of the Hittite Empire, near a major road to the Aegean region which had just been subjugated. The monument is therefore an appropriation of an already religiously important site to express a message of Imperial military might, but also of its willingness to engage with the more far-flung parts of its territory (Harmanşah 2014b). This fits with the 'costly signalling theory' proposed by Glatz and Plourde (2011), where Hittite monuments were deliberately built away from major population centres and the empire's heartland to emphasise the cost in terms of both resources and travel that they were willing to spend in order to reach areas of political instability. The message of the monument is therefore implicitly expressed in the lengths to which the builders went to construct it, as much as it is explicitly stated in any inscription or imagery. The monument at Eflatunpınar does not express as militaristic or political a message as that of Yalburt, but is still an expression of Hittite involvement in a liminal region. Harmanşah (2014b) suggests that the frequent mentions of 'DINGIR.KAŠKAL.KUR' monuments along with sacred mountains and springs is a reflection of the Hittite belief that these sites were places where divinities and ancestors could interact with this world, and that to include them in political agreements such as border treaties was to have them, in a sense, observing and endorsing these events. If Eflatunpınar is the 'DINGIR.KAŠKAL.KUR' mentioned in the Bronze Tablet, this also suggests that the monument was built in order for this already divine location to be politicized in this fashion.

The motivation to build monuments, then, was often driven by a combination of religious and political motivations, and rarely as a marker of a large centre of population. In fact, the opposite was often the case. Where monuments are present in large urban centres, they are often mimetic, echoing the natural form and purpose of the more remote monuments. An example of this is the SUDBURG ritual pool and grotto with its accompanying inscription at Hattuša, which Hawkins (1995) and Harmanşah (2014b) both identify as replicating a 'DINGIR.KAŠKAL.KUR', with its stone-built niche representing a cave or narrow gorge, and the pool representing a spring. The Nişantaş inscription of Suppiluliuma II at Hattuša is a straightforward piece of military propaganda detailing the king's conquests, but its position is again incorporating a dramatic natural feature, this time a rock outcrop in the Upper City. The monuments at Kızıldağ, on the other hand, are not replicating a natural religious site, but rather are located at a genuine one - though the spring has now dried up, there is no doubt that it's elevated nature and link to the underworld would have made it a 'DINGIR.KAŠKAL.KUR'. Therefore, it could be considered that, rather than adding monuments to an existing city built by one of his predecessors, Hartapu was instead building a new religious centre around a known cultic location, in order to express his ownership over this politically unstable region as Hittite Imperial influence was waning - much as Tudhaliya IV had done for the Hittites at Yalburt and Eflatunpınar.

With this discussion in mind, therefore, it becomes evident that the presence of monuments at a site is just as likely to indicate the *absence* of a large-scale settlement as it is to indicate the presence of one. Since these were the distinguishing feature of Kızıldağ compared to many other sites with evidence of settlement in this region, it is unsurprising that it should attract attention as a potential location for Tarḫuntassa, but this is an equation that simply doesn't add up, particular given its unsuitability in regards to some of the other criteria which have been spatially analysed and assessed.

9.7 - A new location for Tarḫuntassa?

Having addressed each of the input criteria and the analyses performed to assess them, in the context of the results of the predictive modelling exercise, the final point to discuss regarding this case study is simply this; has this project achieved its aim of using a new approach to suggest a new hypothesis for the location of Tarḫuntassa? While this hypothesis cannot be confirmed until archaeological evidence is found, and taking into account the fact that this conclusion is based only on the testing of criteria put forward in previous scholarship, what the above discussion of the results has highlighted is the fact that Kızıldağ, for all of its natural drama, monumental building remains and royal inscriptions, does not fit in with the wider patterns of Late Bronze Age use of, or relationship with, the landscape identified in this study. It does not control any major natural routeways through the landscape; it does not stand near any major river systems; it does not occupy a 'peripheral' position on the boundary between highland and lowland landscapes. Even taking into consideration those monuments which give it a 'royal character', these point more firmly towards a site of religious significance than an important city. While there was undoubtedly a religious element to the relocation of the Hittite capital, there must also have been geo-political and possibly even military aspects to its location, and the evidence presented in this thesis shows that Kızıldağ's location simply does not fit with what we know of the location of major Hittite political centres.

The vicinity of Karaman, on the other hand, and in particular the site of Hamza Zındanı Höyük, ought to be given much greater consideration in locating

Tarḫuntassa. This site occupies a location which bears a remarkable topographical similarity to Hattuša, and fits into the wider narrative of Hittite settlement location in this region. It controls a major junction between the north-south road connecting the Anatolian plateau to the Mediterranean via the Göksü valley and the east-west route connecting the Beyşehir region to the area around modern Ereğlli and, ultimately, the Cilician Gates. This makes it a perfect location for controlling not only overseas trade via the port at Ura, but passage by land to Kizzuwatna, Ugarit, the Levant and Egypt. With the relocation of the capital back to Hattuša, however, and the drawing up of the borders between Hatti and Tarḫuntassa, Ura no longer came under the latter's jurisdiction. This may account for the importance of Kilise Tepe as an administrative centre for the Hittite authorities and the merchants of Ura (who were given relative freedom to carry out the transportation of goods from the Mediterranean coast to the Hittite heartlands). It may have served as the last stopping point before the coast, the point where merchants would begin to travel by boat rather than by land, and as a Hittite border town before crossing into, or after leaving, the territory of the vassal kingdom of Tarḫuntassa.

Hamza Zındanı Höyük also fulfils the criteria of being close to the edge of the plain, near a river valley and on (or close to) higher altitudes and sloping ground - in other words, it would have been both peripheral and transitional, allowing for a mixed agricultural regime and source of timber for the extra-urban population (as indicated by the Beyşehir Occupation Phase) and an easily defended site on higher ground for a potential 'upper city'. Furthermore, while it is not as closely linked to the holy landscape of Karadağ as Kızıldağ, it is still very much intervisible with the mountain, and even the summit sanctuary at Mahallaç specifically. Finally, while it cannot be said for certain that Tarḫuntassa was a newly built settlement, there is no evidence for earlier occupation at Hamza Zındanı Höyük.

Unfortunately, the Hamza Zındanı site has already been so heavily built on and landscaped that any archaeological investigation carried out there will be of the 'rescue' variety, and the likelihood of finding any well preserved archaeology is slim. This shows the importance of carrying out further surveys in this fragile region, as urban expansion and large-scale civic projects such as hydro-electric dams and reservoirs continue to severely alter and damage the archaeological landscape. The results of the study certainly raise the possibility of a wider archaeological assessment of the region around Karaman, and particularly of the valleys which enter the Taurus mountains from this southern area of the Konya plain and the surroundings highlands, where currently very few settlements are known but more should surely exist. The Konya-Ereğli (KEYAR) survey of Maner (2014-16) has shown that an intensive survey in a small region with a similar landscape of steep valleys in the Taurus foothills can reveal many new sites, and with the likelihood of a key route linking the plain and the Göksü valley going from Karaman to Mut, this region should be the focus of future archaeological survey, and with regards to sites such as Hamza Zındanı and Kozlubucak, excavation should be a serious consideration.

9.8 - Has the methodology been successful?

While this case study has come to a new conclusion regarding the likely location of Tarḫuntassa, the most important and far-reaching consequence of this research for the wider study of historical geography and ancient landscapes throughout the Ancient Near East was the methodology developed and applied.

In the sense of whether the technical and analytical aspects of the methodology have been applicable and useful for the study of questions of ancient historical geography, this project has been successful. It has shown that it is not only possible to identify changing patterns of settlement through time, but also to test existing hypotheses for settlement location and apply the results of statistical analyses, based on these hypotheses, to a model which can help identify important sites and areas for future intensive survey work - all through the use of GIS software. This gives researchers of the historical geography of Anatolia and the Near East recourse to a new methodology, where previously only textual sources or direct archaeological evidence could provide a way to break the impasse regarding such questions. This methodology can act as a toolkit for quantifying and visualising the assumptions that have been made regarding the spatial criteria that underpin previous hypotheses, can test these criteria against the available archaeological data, and can provide new overarching hypotheses regarding settlement patterns, the relationships between the built and natural landscape and specific site locations, which can be tested through targeted fieldwork in future.

Such a methodology is also more reliable than making observations from site visits. While the character of individual sites can only be truly appreciated on the ground, conclusions regarding the wider setting of these sites within the landscape and patterns of site location cannot be effectively drawn through observations made in the field alone. Such conclusions can only be verified through an analytical, quantifiable and repeatable approach to the archaeological landscape such as the one pursued in this study.

A potential critique of this study is in the assumption that the results of the spatial analyses are reflective of definitively Hittite approaches to the landscape - that any and all later 2nd Millennium or Late Bronze Age sites and the ways in which they have been positioned in the landscape are the result of the direct imposition of Hittite Imperial influence, when this area was not only a far flung part of the Empire, but also one which may have had more culturally in common with the Luwian speaking neighbouring regions in the Lukka Lands and Kizzuwatna, which only came under Hittite control in the decades preceding Tarḫuntassa's construction. How sure, then, can we be that the results of these analyses are reflecting the same criteria that would have been used by Muwatalli when choosing the site of his new capital, and to what extent are they purely localised?

The answers to this critique can not only be observed in the results of the comparison study with the Hattuša region, but also addressed by considering the nature of the study itself. Firstly, the comparison study has shown that there are similarities between the changes in settlement patterns which appear to take place in the Late Bronze Age in both the Hittite heartland and the study region, with regard to the proximity to rivers, slopes, routes of communication and, in a more specific sense, liminal places of transition between landscapes. While further spatial analysis projects would be beneficial in confirming these admittedly fairly broad observations, it is enough to at least suggest a level of Hittite influence (though perhaps not control) over the area under consideration in this project.

Furthermore, it is worth considering the very nature of this project when addressing this critique. It was discussed, in Chapter 3, that the aim of this project is *not* to make an absolute claim as to the location of Tarḫuntassa on the basis of any *new* evidence or data. The methodology being used only aims to use the available datasets to consider a meta-hypothesis - if existing hypotheses for the location of an ancient city (in this case, Tarḫuntassa) are taken at face value, the spatial criteria used to justify them are assessed against the archaeological data using GIS, and those criteria which are reflected in the data are quantified and visualised as a model, this may be able to provide a new hypothesis for the location of that city, allow us to re-assess the previous hypotheses and provide new perspectives on the use of the landscape through time. As such, the result of this project is only a hypothesis, which must be tested again through targetted fieldwork, and regardless of the outcome, there will be further questions to consider, among which would be the question of whether the patterns observed here are local or Hittite in character.

Perhaps the most interesting outcome of the use of this methodology in this case study has been that the site suggested in previous hypotheses, Kızıldağ, does not necessarily fit the criteria used in formulating those very hypotheses, when those criteria are quantified and visualised, while Hamza Zındanı Höyük is a much better fit. Therefore, returning to the critique that the results of these analyses may not reflect Hittite approaches to the landscape, if the hypothesis proposed here is tested by archaeological fieldwork and no evidence is found to back it up, then this critique could be considered as a factor. Similarly, if Kızıldağ were shown definitively to be the site of Tarḫuntassa, then the question must be considered of why it did not fulfil the very criteria used to suggest it, whether the site itself is in some way unique, or the criteria themselves are flawed. In either case, since the findings would be counter to the quantification and visualisation of spatial criteria suggested by previous scholarship as being 'Hittite' in nature, it would force a re-examination of our understanding of how the Hittites interacted with the landscape, particularly in regions at the edges of their territory, or whether they exerted any influence on settlement patterns in these areas at all.

Until such testing occurs, however, it can only be reaffirmed that the meta-hypothesis put forward in this study has been generated using a methodology of testing existing spatial criteria for the location of an important Hittite/Late Bronze Age city in this region against the available archaeological data, and that while initial observations made as a part of this methodology suggest that there was a Hittite influence on Late Bronze Age landscape use in this region, alternative perspectives regarding local influences must, and have, also be considered.

A more significant flaw in this framework that has been identified in the course of this research is not a flaw in the methodology itself, but in the available data used to carry out the analyses. This is the case with any such methodology - it is only as good as the data used to build it. Many aspects of the data collected for this project proved suspect - while location data was mainly accurate, there were some flaws, but dating (while known to be difficult to definitively prove) was of highly variable precision and accuracy, and which sites and areas received the most detailed attention was entirely down to the whims and approaches of the surveyors. A data-driven methodology is only ever as accurate or successful as the data available, and with regards to this case study, it must be conceded that the data was, in many cases, of questionable quality.

However, since the methodological process was not driven by the data itself, but by the hypotheses being tested, it was only necessary for the data to be appropriately accurate with regard to those criteria being assessed. The data was accurate enough with regards to location to test those criteria that were based on the position of sites in relation to other features of the landscape, to each other and to trade routes, and accurate enough with regards to size that questions on settlement size were answerable. It was therefore unfortunate, but by no means disastrous, that the dating evidence is difficult and unreliable. It is simply another factor to take into account when assessing the success of the overarching hypothesis provided by this methodology, once it has been tested through targetted fieldwork.

This project, therefore, provides a successful case study for the application of a new analytical approach to studying ancient historical geographies, and a framework for future studies of a similar nature, with one significant caveat. A consistent, cohesive and accurate approach to archaeological field surveys, as well as a standardised national framework, implemented on a regional level, for the collection and recording of such data for future research and conservation purposes (along the lines of the Historic Environment Records used in the UK), are of critical importance for the success of a methodology such as this.

Should such accurate data become available, then a more accurate picture of the political geography of Hittite Anatolia could be effectively pursued without being completely bound to inventories and border treaties, or to the results of those precious few excavations of key sites. This is not to say that this methodology should supersede these sources. In fact, as a hypothesis-generating toolkit which both reflects on previous theories and establishes new ones, it can only properly be tested by future fieldwork. This method cannot provide the certainty that textual or artefactual evidence affords, particularly with regard to questions of specific site locations like that of Tarḫuntassa. What it can provide is a suggestion which best fits the proven patterns regarding the relationship between settlements and the natural landscape, in conjunction with a careful consideration of cultural and religious factors which cannot be spatially analysed. It may also help future studies into historical geography to avoid dangerous assumptions and unproven statements regarding the archaeological landscape and the nature of specific sites, as has previously been the case in this area with the site of Kızıldağ. The use of a methodological framework such as the one developed and tested in this study can provide the necessary statistical evidence to back up hypotheses which may previously have been made based only on observations. Even if the ultimate conclusion of this study regarding the location of Tarḫuntassa can never be completely certain, or is even proven incorrect, if the use of such a methodology can help researchers to avoid the post-rationalisation of site identifications using unverified claims about a particular site's relationship to the landscape, then it will have served a valuable purpose in the future study of ancient historical geographies.

10. Conclusions

The aim of this thesis was to develop, apply and assess a new methodological approach to questions of Ancient Near Eastern historical geography, particularly in Anatolia. This was achieved through carrying out a case study.

At the outset of the thesis, it was shown that the city of Tarḫuntassa, which played a pivotal role in the politics of the Hittite Empire in its final century, had not satisfactorily been located by previous studies, and therefore provided a perfect case study for this new methodology. Despite acting briefly as capital of the Empire under Muwatalli II, as the heart of a vassal kingdom established by Hattusili III, and finally as the seat of a rival dynasty a rebellious thorn-in-the-side of the Hittite Empire in its declining years, multiple attempts to locate the city itself have not proved conclusive. Without any archaeological or toponymic evidence to go on, the arguments proposed in studies by the likes of Gordon (1967), Freu (1990), Alp (1995), Hawkins (1995), Dinçol et al (2000), Bahar (2005 and 2007) and Melchert (2007) were reliant upon observation, comments on the 'character' of sites and the landscapes and topographies which they occupy, and the presence of impressive monumental architecture. However, none of these can be said to be conclusive evidence for the location of the city of Tarḫuntassa. Many of these studies (Alp, Dinçol et al and Bahar, as well as Singer (2006)) suggest Kızıldağ as the most likely location for the city based on its impressive hilltop location, the presence of several monuments and inscriptions belonging to a king named Hartapu who may have been contemporary with the final kings of the Hittite Empire, and other pieces of defensive and monumental architecture. Dinçol et al (2000) go so far as to declare that the site has 'royal character'.

In the course of these studies, a number of spatial observations and hypotheses were put forward in order to give greater credence to their arguments for the location of the city, but until now, none of these statements had been verified. Further studies into Hittite cities and their relationship with the landscape (such as Mielke 2011a) have offered similar statements on Hittite settlement location in general which, while not directly related to the city of Tarḫuntassa, make spatial observations without offering proof, or any spatial statistical evidence, to back up these statements.

Consequently, in providing a new answer to the question of where Tarḫuntassa is most likely to be located, this study has also helped to add a level of rigour, through the newly developed methodology, which had previously been lacking. This has involved the use of spatial analysis techniques to quantify and assess the validity of the spatial criteria put forward in these previous studies, the identification of common themes and the synthesis of the criteria reflected by these analyses, and the visualisation of the results in the creation of a statistical model showing where an important Late Bronze Age city would be most likely to be located in this particular region, and which currently known sites score highest in this model. The use of GIS for this study was therefore not simply a case of taking a question of historical geography, throwing computational analyses at it and seeing what stuck. Instead, it was the most appropriate tool for the task, given not only the inherently spatial nature of the research question, but also the need for a statistical approach where previous studies have been somewhat blasé in their approach to putting forward spatial hypotheses.

The application of the methodology to this case study has shown that Kızıldağ is less likely to be the location of Tarḫuntassa than has previously been suggested. Through quantifying and visualising the criteria used in previous studies, the case study has shown that one of the spatial criteria used in putting forward the suggestion of Kızıldağ as Tarḫuntassa was in fact completely untrue, that being the suggestion that Tarḫuntassa should be found in an area of dense 2nd Millennium settlement - it was in fact more likely for newly established Late Bronze Age settlements in the region to be located in areas of relative isolation from earlier settlement foci. Furthermore, when the other hypotheses were shown to be correct, and the results of the analyses showing this to be the case were fed into the statistical 'predictive' model, Kızıldağ turned out to score fairly poorly by the standards outlined in the very studies which had suggested it as a location for the capital in the first place.

The case study also highlighted a much more likely candidate for the location of the city - Hamza Zındanı Höyük, a large Late Bronze Age site around 2km west of the modern city of Karaman. The location of Tarḫuntassa near Karaman was first suggested by Edmund Gordon, and the site of Hamza Zındanı Höyük itself was later pointed out by David French to J.D. Hawkins (1995), who summarily dismissed the possibility on the basis of it being in the 'border territory' of the Hulaya River Land - an interpretation of the Tarḫuntassa border treaties which has since been shown to be incorrect, with the Hulaya River Land being a *part* of Tarḫuntassa and not a separate entity. The site scores very highly in the statistical model, and is located on an important crossroads of possible ancient trade routes through this region, as modelled in the course of this study. It certainly stands at the all-important 'transitional' zone between lowland and upland, at the fringes of a large, low-lying area where natural routes (in the form of rivers) allow access to the highlands and the Mediterranean region beyond.

This idea of Hittite cities occupying such 'fringe' locations between contrasting topographies is a consistent theme identified by Mielke (2011a) and again confirmed in the course of this study. It also fits with the shift in the agro-economic regime in the Late Bronze Age identified in the 'Beyşehir Occupation Phase' (Eastwood et al 1998), where pollen records indicate the clearance of upland sites and an increased emphasis on fruit, nuts and vines, at a time when the number of settlements occupying lowland floodplains had drastically reduced. This shift in settlement location throughout the Bronze Age, away from the centre of the Konya plain and the Çarşamba alluvial fan and towards the mountain fringes was also clearly indicated in the results of this study.

Cultural and religious factors have also been taken into account in discussing the results of the modelling process, especially the recent work on monuments and the relationship between the Hittites and the natural landscape carried out by Omur Harmansah (2014 & 2015). In examining the differences between the locations of cities and monumental sites, as well as the topographic features which were both revered and exploited by the Hittites in their expressions of political and religious legitimacy, there is a convincing argument to be made that the Kızıldağ site bears more of the characteristics of a religious site than of a civic one. The visual connection of the site to the almost certainly religiously significant mountain of Karadağ, as well as the presence of a former spring which would have been identified as a 'DINGIR.KAŠKAL.KUR' and its relative isolation from natural routes through the landscape and potential ancient trade networks all point towards the presence of the monuments at the site being a result of its religious significance, rather than it being a centre of political power. The presence of monuments, particularly inscriptions like the ones at Kızıldağ, rarely denote the presence of a large civic centre - rather they were a method of formalising and 'making known' sites which were already of religious significance and incorporating them into political discourse.

The identification of Hamza Zındanı Höyük as Tarḫuntassa is by no means certain, and it can never truly be so until some archaeological or textual proof is found. However, through analysing and verifying the viability of the criteria that have been suggested in previous studies for Tarḫuntassa's location and applying the results in a systematic process of statistical modelling, it has been shown that Hamza Zındanı Höyük is a far better candidate for the location of Tarḫuntassa than the previously favoured site at Kızıldağ. This conclusion should serve to advance the debate on the historical geography of this region in the Late Bronze Age, as well as help to further characterise the relationship between the Hittites and the landscape, and the nature of Hittite settlement location.

Another key outcome of this project has been the construction of a full, consolidated spatial database of Bronze Age sites for this region, which will be available on request to any who wish to conduct further GIS-based study in this region. The value of this database as a future resource cannot be overstated, given the disparate and inaccessible nature of the available data before it was brought together for this study.

However, the most important conclusion of this research relates to its principal aim, this being the development and assessment of the method that has been used throughout the course of this study - the identification of criteria hypothesised as influencing settlement location in the available literature, the testing of these criteria through spatial analysis, the application of those criteria reflected in the resulting data as part of a statistical 'predictive' model, and finally the identification of possible site locations using this model, all through the use of GIS software. It is hoped that this may, in future, provide a framework for similar studies both in Anatolia and across the Ancient Near East. However, the success of such a methodological framework is reliant on having a consistent and accurate dataset to work with, and this will only be possible with further archaeological field survey work, combined with a cohesive approach to the accurate recording, collating and maintaining of archaeological records at a national and regional level.

Even taking these limitations into account, given only a small percentage of Hittite sites alone whose names are known from textual sources have been reliably identified on the ground, a systematic method that can help to critically assess uncertain identifications, or even locate ancient settlements for the first time, particularly where archaeological or toponymic evidence is lacking, will be of enormous value to Anatolian and Ancient Near Eastern landscape archaeology and historical geography in the future. By examining the relationship between settlement sites and the landscape, both in terms of natural features and manmade constructs such as borders and trade networks, it is hoped that further studies of this nature in other regions of Anatolia, and in the wider Near East, may help to expand and deepen our knowledge of Hittite historical geography more than any number of additional surveys or toponymic studies.

Appendix A. Full Databases

Table A.1 - Full Database of Bronze Age and Iron Age sites within the study area. Key to Frequent Sources: B/B et al = Bahar/Bahar et al; E/E et al = Erbil/Erbil et al; F = French; G = Güneri; I = Isparta Kültür Envanteri; K = Karaman Kültür ve Turizm; Ma = Maner; Me = Mellaart; Se et al = Serifoglu et al; So = Solecki; TAY = TAY Project.

FID	UTM EASTING	UTM NORTHING	LAT/LONG (DD)	SITE NAME	SITE DATES	VILLAGE	PROVINCE	SIZE M (NS)	SIZE M (EW)	HEIGHT M	SOURCES
0	514869	4126102	37.281395, 33.167734	Abdullah/ Davda Hoyuk	EBA	Yuvatepe	Karaman	187	155	5	Me (1961, 1963); K
1	577151	4150516	37.498346, 33.872822	Adabag	EBA	Adabag	Konya	232	239	3	TAY (2002); Ma (2015)
2	396032	4152210	37.510985, 31.823614	Akcalar Hoyuk	EBA	Akcalar	Konya	306	187	2	Me (1963)
3	429889	4116879	37.19574, 32.210001	Akcapinar Hoyuk	EBA	Akcapinar	Konya	151	186	10	B (2002, 2010, 2011)
4	543025	4145962	37.459526, 33.486494	Akcasehir	EBA	Akcasehir	Karaman	138	118	3	Me (1961, 1963); B (2004); K
5	517186	4115486	37.185655, 33.19362	Akyokus	EBA	Karaman	Karaman	652	367	7	Me (1963)
6	455973	4178954	37.756843, 32.500186	Alakova Hoyuk	EBA	Alakova	Konya	372	310	3	B (2004); TAY (2004)
7	548006	4173592	37.711557, 33.544654	Ali Tepe	EBA, LBA	Karapinar	Konya	411	495	24	Me (1963); B (2002)
8	470459	4154298	37.535287, 32.665651	Alibeyhoyugu	2nd M, LBA	Alibeyhoyugu	Konya	659	756	15	Me (1963); G (1988); B (2004)
9	474793	4153726	37.530166, 32.714707	Alibeyhuyugu 1 & 2	EBA, LBA, IA	Alibeyhuyugu	Konya	264	344	4	Me (1963)
10	456466	4136124	37.370822, 32.508329	Apasaraycik	EBA	Apasaraycik	Konya	236	205	5	Me (1963)

11	351538	4206665	37.995505, 31.309201	Armutlu Hoyuk	EBA	Armutlu	Isparta	280	242	4	I (1988)
12	533769	4050423	36.598699, 33.377556	Attepe	EBA	Mirahor	Mersin	274	337	12	Me (1963); F (1965); Se et al (2014)
13	410193	4138595	37.389766, 31.985468	Bagra	EBA	Gokhuyuk	Konya	463	490	21	Me (1963)
14	469390	4142835	37.43183, 32.654011	Balcikhisar Hoyuk	EBA	Balcikhisar	Konya	229	179	4	B (2004)
15	477621	4152682	37.523755, 32.746532	Batum Hoyuk	EBA, 2nd M	Beylerce	Konya	264	246	2	Me (1961, 1963)
16	448366	4169975	37.675516, 32.414471	Bayat Hoyuk	EBA, EIA	Bayat	Konya	225	240	10	Me (1961, 1963); B (1999, 2014)
17	365539	4159679	37.574345, 31.477315	Bayindir Kalesi	EBA	Bayindir	Konya	0	0	0	B (2007)
18	396094	4169370	37.665635, 31.821872	Bektemir Hoyuk	EBA	Bektemir	Konya	190	275	5	Me (1954); TAY (2001); E et al (2016)
19	383789	4183820	37.794364, 31.680084	Beysehir Hoyuk C	EBA, 2nd M, LBA, IA	Sadikhaci	Konya	207	303	7	Me (1961, 1963)
20	454148	4170666	37.682054, 32.479995	Boyali Hoyuk	EBA	Boyali	Konya	154	239	5	Me (1963); B (2004)
21	489944	4160565	37.592097, 32.886089	Boyali Tumegi 1	EBA	Urunlu	Konya	453	161	2	Me (1961, 1963)
22	491271	4161563	37.601108, 32.901109	Boyali Tumegi 2	EBA	Uchuyukler	Konya	144	173	1	Me (1961, 1963)
23	513301	4128338	37.301573, 33.150083	Boz Hoyuk	EBA	Kilbasan	Karaman	298	405	3	Me (1963)
24	381721	4168815	37.658887, 31.659032	Burun Hoyuk	EBA	Karadiken	Konya	210	127	2	Me (1963)
25	510925	4166542	37.645959, 33.12384	Buyuk Aslama	EBA	Buyuk Aslama	Konya	608	493	20	Me (1963); G (1988, 1990)

26	533205	4123824	37.260383, 33.374467	Buyukgunu	2nd M	Suduragi	Karaman	552	368	10	Me (1963); G (1989); K
27	406576	4134199	37.349793, 31.945174	Buyuktepe/ Suberde/ Gorukluk Tepe	2nd M	Golyuzu	Konya	446	462	10	Solecki (1965)
28	529378	4124110	37.263086, 33.331328	Can Hasan 2	EBA	Alacati	Karaman	252	116	2	Me (1963)
29	463038	4168295	37.661079, 32.580931	Cariklar	EBA	Cariklar	Konya	153	120	3	Me (1963); G (1988)
30	374175	4201420	37.661079, 32.580931	Cavus Hoyuk	2nd M, IA	Cavus	Konya	517	394	35	G (1990); B (2001)
31	530014	4125820	37.278485, 33.338565	Cayirli Hoyuk	EBA	Alacati	Karaman	371	482	3	K
32	462554	4126761	37.286696, 32.577551	Cicek Hoyuk	EBA, 2nd M, LBA, IA	Cicek	Konya	291	352	23	B (2004, 2007)
33	549069	4037395	36.480596, 33.547782	Cingantepe	EBA, LBA	Kislakoy	Mersin	149	194	8	F (1965); TAY (2001); Se et al (2015)
34	456256	4175454	37.725303, 32.503608	Comakli	LBA	Comakli	Konya	460	620	15	G (1988); B (2004)
35	481248	4154953	37.541379, 32.787729	Cumra East	EBA	Okcu	Konya	150	159	2	Me (1963)
36	481516	4161376	37.599272, 32.790602	Cumra Huyuk C Kuyezi	EBA	Cumra	Konya	200	200	0	Me (1963)
37	479186	4157631	37.565467, 32.764313	Cumra Mezarlik	EBA	Cumra	Konya	383	355	6	Me (1963)
38	482135	4165736	37.638585, 32.797514	Dedeli Hoyuk	EBA	Alemdar	Konya	309	182	3	Me (1963)
39	465169	4137758	37.385921, 32.60654	Dineksaray	EBA, 2nd M, IA	Dineksaray	Konya	459	414	20	Me (1963); B (2004)
40	462502	4165114	37.632391, 32.575019	Diruyuk	EBA	Cariklar	Konya	130	150	3	Me (1963)
41	476867	4176753	37.737768, 32.737448	Domuzbogazliyan	EBA, 2nd M, LBA, IA	Abditolu	Konya	771	534	20	Me (1963); G (1988); B (2002)

42	501842	4117939	37.209567, 33.02025	Dudugun Yugceyizi	EBA	Yollarbasi	Karaman	303	181	4	B (2005, 2007)
43	383031	4187090	37.823735, 31.670944	Eflatunpinar	2nd M, LBA	Sadikhaci	Konya	164	162	3	Me (1961, 1963); B (2001, 2006)
44	514963	4152554	37.519823, 33.169328	Egilmez Yamac Yerlesmesi	2nd M	Egilmez	Konya	0	0	0	B (2002)
45	444952	4153686	37.528506, 32.376987	Eksile/Catoren	EBA	Catoren	Konya	190	250	2	B (1999)
46	508222	4131149	37.324816, 33.096329	Eminler	EBA, 2nd M	Eminler	Karaman	592	379	16	Me (1963); G (1989); K
47	504230	4170030	37.677452, 33.047966	Emirler Hoyuk	EBA, IA	Ismil	Konya	300	304	7	Me (1963); G (1988, 1990)
48	490842	4053522	36.627194, 32.897571	Ermenek Monument	LBA	Ermenek	Karaman	0	0	0	Bittel (1939); Kohlmeyer (1983)
49	397149	4159632	37.577993, 31.835201	Evregi	EBA, 2nd M	Irmakli	Konya	425	117	11	Me (1963)
50	516866	4119950	37.225903, 33.190123	Findikdede	EBA	Karaman	Karaman	105	134	0	Me (1963)
51	496080	4120098	37.227381, 32.955807	Gaferiyat/Asar/ Hisar Hoyuk	EBA, 2nd M	Kazimkarabeki r	Karaman	385	485	9	Me (1963); G (1989); B (2005)
52	476049	4127344	37.292398, 32.729772	Gavur Hoyuk/ Karasinir	EBA, 2nd M, IA	Guneysinir	Konya	355	367	16	Me (1963); B (2003)
53	526401	4141313	37.418248, 33.298357	Gocu Hoyuk	EBA	Coglu	Karaman	274	295	3	Me (1963)
54	475057	4149266	37.48997, 32.717841	Gokhuyuk/ Tumras	EBA, 2nd M, IA	Gokhuyuk	Konya	225	200	10	Me (1961, 1963); G (1988, 1990); B (2004)
55	534545	4050728	36.601421, 33.386246	Gormuttepe	EBA	Mirahor	Mersin	299	363	21	Me (1963); F (1965);

											Se et al (2014)
56	377658	4198670	37.927368, 31.607946	Gorunmez Hoyuk	EBA, 2nd M	Gorunmez	Konya	294	277	7	B (2001)
57	558799	4104493	37.084882, 33.661569	Gozlek Kalesi	EBA	Taskale	Karaman	235	290	19	B (2008)
58	471136	4126042	37.280524, 32.6744	Gudelesin	EBA, 2nd M, LBA	Avcitepe	Konya	238	208	3	Me (1963); B (2003)
59	396202	4182662	37.785423, 31.821202	Gundogdu Hoyuk	EBA	Gundogdu	Konya	299	315	11	B (2006); E et al (2016)
60	473670	4123461	37.257332, 32.703074	Guragac Hoyuk	2nd M, IA	Guragac	Konya	240	237	12	B (2003)
61	518364	4112586	37.160126, 33.206962	Hamza Zindani Hoyuk	LBA	Karaman	Karaman	296	187	9	K (1981)
62	425068	4121693	37.238751, 32.1552	Harminpinar Yug Tepesi	EBA, LBA, EIA	Harmanpinar	Konya	333	243	15	B (2002, 2014)
63	447217	4179992	37.765731, 32.400713	Hatip Kale	LBA, IA	Hatip	Konya	126	183	34	B et al (2007)
64	447327	4179858	37.764530, 32.401971	Hatip Monument	LBA	Hatip	Konya	0	0	0	B et al (2007)
65	442257	4160778	37.592259, 32.345927	Hatunsaray	EBA, 2nd M, LBA, EIA	Hatunsaray	Konya	233	478	11	B (2005)
66	397864	4163682	37.614571, 31.842731	Homa Huyuk	EBA	Yukariesence	Konya	287	344	4	Me (1963)
67	353061	4199755	37.9335, 31.327952	Homat Kale	2nd M	Sarikaya	Isparta	381	363	9	Me (1954)
68	376956	4101728	37.954817, 31.599427	Huyuk	EBA, IA	Huyuk	Konya	201	204	10	Me (1963); B (2001)
69	552540	4155057	37.541004, 33.594729	Govezli Hoyuk	EBA, 2nd M	Kavuklar	Karaman	564	584	10	G (1989);
70	518837	4113456	37.167327, 33.212172	Huyuk Degirmende/ Karaman Gavur	EBA, 2nd M	Karaman	Karaman	306	354	10	Me (1963); K (1980); B (2014)
71	524709	4139134	37.398647,	Ibrahim Hoyuk	EBA	Coglu	Karaman	360	300	2	Me (1961,

			33.279172								1963)
72	502409	4116820	37.197841, 33.027144	Ilisira	EBA, 2nd M, LBA, IA	Yollarbasi	Karaman	462	463	22	Me (1963); G (1989); B (2005, 2007)
73	480692	4162432	37.608775, 32.781238	Ilmek Hoyuk	2nd M	Fethiye	Konya	309	153	2	Me (1963)
74	391895	4182209	37.78084, 31.772363	Isakoy 1/Kesekoy	EBA	Emen	Konya	318	305	4	Me (1963)
75	498949	4135466	37.365917, 32.988131	Islihisar Gavur Hoyuk	2nd M	Islihisar	Karaman	313	374	12	G (1989); B (2001); K
76	501235	4135495	37.366178, 33.013947	Islihisar Hoyuk	2nd M	Islihisar	Karaman	501	366	6	G (1989); B (2001); K
77	532853	4160437	37.590414, 33.372127	Islik (North)	EBA, IA	Islik	Konya	115	150	2	Me (1963); B (2002)
78	553139	4145068	37.450941, 33.600792	Kalekoy Hoyuk	EBA	Kalekoy	Karaman	464	544	27	K (1986)
79	525336	4131520	37.330004, 33.285996	Kanac Hoyuk	EBA	Beydili	Karaman	690	433	12	Me (1963)
80	405144	4141049	37.41138, 31.928133	Kanal Hoyuk	EBA	Kesecik	Konya	379	284	3	Me (1961, 1963)
81	502591	4163962	37.622764, 33.029362	Kara Hoyuk - Guney	2nd M, IA	Turkmenkarah uyuk	Konya	886	609	30	Me (1963); G (1988, 1990)
82	399381	4147317	37.467263, 31.862163	Karabulak Hoyuk	EBA	Karabulak	Konya	230	184	1	Me (1963)
83	482256	4175663	37.728061, 32.798645	Karaca 2	EBA	Kucukkoy	Konya	300	356	9	Me (1963)
84	513065	4139177	37.399274, 33.147618	Karadag	LBA	Uckuyu	Karaman	0	0	0	Hawkins (2002)
85	398167	4168236	37.655643, 31.845534	Karahisar	2nd M	Karahisar	Konya	322	277	7	Me (1963); E et al (2016)
86	451414	4186048	37.820545, 32.447957	Karahoyuk 1	EBA, 2nd M	Konya	Konya	616	726	14	Me (1961, 1963); G (1988)
87	446322	4139457	37.400335, 32.393528	Karahoyuk 2	EBA, 2nd M,	Karahoyuk	Konya	309	365	17	Me (1963); B (1999)

					LBA, EIA						
88	387036	4179040	37.751698, 31.717694	Karakum Hoyuk	EBA	Ciftlikkoy	Konya	198	358	5	B (2006)
89	518325	4115090	37.182065, 33.206452	Karaman Castle	EBA	Karaman	Karaman	388	384	14	Me (1963); K
90	479301	4168820	37.666327, 32.765304	Karatas Hoyuk	EBA	Dedemoglu	Konya	230	245	2	Me (1963); B (2005)
91	359881	4205145	37.983138, 31.404479	Karayaka Hoyuk	EBA	Karayaka	Isparta	228	239	5	I
92	489971	4170353	37.680322, 32.886261	Karkin	EBA	Karkin	Konya	308	243	5	Me (1963)
93	366191	4154900	37.531378, 31.485566	Kasakli	EBA	Yesildag	Konya	306	266	5	Me (1961, 1963)
94	502196	4141627	37.421449, 33.024818	Karren/ Kasoba Hoyuk	2nd M, IA	Kasoba	Karaman	288	244	5	G (1989); B (2001); K
95	389977	4154719	37.532888, 31.754735	Kavak	EBA	Kavakkoy	Konya	176	135	3	Me (1963)
96	419495	4124828	37.266548, 32.092039	Kayacik	EBA	Kayacik	Konya	462	520	20	Me (1963); G (1990); B (2004)
97	451173	4166280	37.642366, 32.446546	Kayhuyuk	2nd M, IA	Kayhuyuk	Konya	183	166	5	B (1999)
98	568402	4165001	37.629589, 33.775201	Kazan Hoyuk	EBA, 2nd M	Kazanhoyugu	Konya	277	290	3	B (2002); TAY (2004)
99	529103	4000035	36.144001, 33.323753	Kelenderis (Saranduwa)	LBA	Aydincik	Mersin	0	0	0	Gurney (1997); Dincol et al (2000); Melchert (2007)
100	475456	4151721	37.512109, 32.722281	Kepirce 1	EBA	Cumra	Konya	298	364	3	Me (1961)
101	476123	4152190	37.516355, 32.729804	Kepirce 2	EBA	Cumra	Konya	345	245	2	Me (1961)
102	489042	4176285	37.73378, 32.875639	Kerhane Hoyuk	EBA	Hayiroglu	Konya	570	525	10	Me (1961, 1963); G (1988,

											1990)
103	532040	4133672	37.349196, 33.361754	Kerti Huyuk - Derbe	IA	Ekinozu	Karaman	609	391	19	B (2004); G (1989); K
104	502163	4133533	37.348488, 33.024418	Keyren	EBA	Demiryurt	Karaman	570	310	5	Me (1961, 1963)
105	549555	4039835	36.502569, 33.553366	Kilise Tepe	EBA, 2nd M, LBA, IA	Kislakoy	Mersin	332	390	20	F (1965); Me (1954); Postgate & Thomas (2007)
106	370136	4198262	37.922648, 31.522457	Kireli	EBA	Kireli	Konya	382	269	4	Me (1954); TAY (2002)
107	502323	4136675	37.376821, 33.026249	Kisecik Hoyuk/ Cobanali Hoyuk	EBA	Kisecik	Karaman	294	365	11	Me (1963); B (2001); K
108	470451	4146401	37.464011, 32.665859	Kisikyayla Hoyuk	EBA	Balcikhisar	Konya	221	304	10	B (2004)
109	367102	4203317	37.967755, 31.487015	Kiyakdede	EBA	Kiyakdede	Isparta	277	277	6	I
110	525248	4124806	37.269485, 33.28447	Kizik	EBA	Kizik	Karaman	352	183	1	Me (1963); TAY (2002)
111	487813	4172560	37.700189, 32.861758	Kizil Hoyuk 1	EBA	Kucukkoy	Konya	304	295	3	Me (1963)
112	506204	4150959	37.505547, 33.070198	Kizildag	LBA, IA	Adakale	Karaman	137	157	10	B (2001); K
113	485452	4175833	37.729656, 32.834909	Kizlar	EBA	Kucukkoy	Konya	306	256	4	Me (1963)
114	517554	4118539	37.213173, 33.197848	Koca Huyuk 1	EBA	Karaman	Karaman	464	370	9	Me (1963); G (1989); B (2004); K
115	508849	4117923	37.207739, 33.099722	Miledana Hoyuk/ Koca Hoyuk 2	EBA, 2nd M	Bolukyazi	Karaman	211	307	1	Me (1963); G (1989); K
116	523510	4125176	37.272867, 33.265179	Kocakoy Hoyuk	EBA	Kizik	Karaman	359	245	3	K
117	459613	4187620	37.835113, 32.541024	Konya Hoyuk East	EBA	Konya	Konya	192	147	7	Me (1963)
118	523602	4094347	36.999245, 33.260185	Kozlubucak	EBA, 2nd M, LBA, IA	Kozlubucak	Karaman	158	183	9	Me (1963); K

119	362527	4178484	37.743334, 31.439672	Kubad-abad	EBA	Golyaka	Konya	287	264	6	Me (1963); B (2006)
120	532098	4123512	37.257608, 33.361977	Kucuk Gono	EBA	Suduragi	Karaman	230	278	2	Me (1963); K
121	513125	4120328	37.229372, 33.147959	Kucuk Huyuk 1/Cigdemli Hoyuk	EBA	Cigdemli	Karaman	199	258	2	Me (1963)
122	512975	4161827	37.603437, 33.146993	Kucukaslama	EBA	Kucukaslama	Konya	378	243	6	Me (1963)
123	485768	4172170	37.69664, 32.838562	Kucukkoy Baraka	EBA	Kucukkoy	Konya	368	141	1	Me (1963); B (2005)
124	479753	4172915	37.703245, 32.770314	Kurtbaba Hoyuk	EBA, EIA	Dedemoglu	Konya	379	315	8	Me (1963); B (2005)
125	374429	4188080	37.831506, 31.573053	Kusluca	EBA	Kusluca	Konya	0	0	0	B (2006)
126	383512	4167754	37.649556, 31.679511	Liz Hoyuk	EBA	Bademli	Konya	302	133	5	Me (1963)
127	376430	4155561	37.538759, 31.601302	Manastir	EBA	Uzumlu	Konya	0	0	0	Me (1963)
128	504975	4131985	37.334529, 33.056165	Mandasun	EBA, 2nd M	Demiryurt	Karaman	433	268	6	Me (1963); G (1989); K
129	438122	4148183	37.478468, 32.300144	May Hoyogu	EBA, 2nd M, EIA	Kayasu	Konya	242	236	6	B (1999)
130	568356	4149035	37.485696, 33.773194	Mezarlik Hoyuk	EBA	Bogacik	Karaman	266	186	2	TAY (2002)
131	553604	4101529	37.057069, 33.601586	Miske Kalebasi	EBA	Gucler	Karaman	581	551	51	B (2008)
132	431215	4170666	37.680619, 32.21992	Mula Hoyuk	EBA, 2nd M, LBA	Gokyurt	Konya	148	141	3	B (1999)
133	527375	4145243	37.453637, 33.30951	No Name (Coglu)	EBA	Coglu	Karaman	285	248	2	Me (1963)
134	483777	4157435	37.5638, 32.816309	Okcu Hoyuk	EBA, 2nd M, LBA, IA	Okcu	Konya	304	259	6	Me (1961, 1963); B (2001)
135	537559	4053283	36.624345, 33.420063	Orentepe/Mut	EBA, LBA	Mut	Mersin	170	301	12	F (1965); Se et al (2014)

136	487815	4167198	37.651854, 32.861863	Oronduku	EBA	Karkin	Konya	383	274	4	Me (1963)
137	418207	4134930	37.357477, 32.076396	Ortakaraviran Buyuk	EBA, 2nd M, LBA, IA	Asagi Karaoren	Konya	339	345	9	Me (1963); B (2002, 2006)
138	417474	4136400	37.37066, 32.067964	Ortakaraviran Kucuk	EBA, IA	Asagi Karaoren	Konya	142	364	5	Me (1963); B (2002, 2006)
139	522784	4163634	37.619534, 33.258176	Ortaoba/Ekinlik	EBA, 2nd M, IA	Ortaoba	Konya	472	420	17	Me (1963)
140	525732	4135114	37.369270, 33.305429	Osmaniye Guney Hoyuk	EBA, IA	Osmaniye	Karaman	233	120	2	G (1990); B (2002, 2004); K
141	527253	4136899	37.378433, 33.307828	Osmaniye/Sinneli Hoyuk	EBA	Osmaniye	Karaman	294	240	4	B (2004); K
142	489143	4123078	37.254189, 32.877570	Ozyurt Hoyuk	EBA	Ozyurt	Karaman	299	353	6	B (2010)
143	448913	4174648	37.714680, 32.426311	Pamukcu	EBA, 2nd M, LBA, EIA	Pamukcu	Konya	131	164	3	Me (1963); B (1999, 2014)
144	501501	4149668	37.493928, 33.016984	Pinarbasi	EBA	Ortaoba	Karaman	121	171	3	TAY (2002); Baird (2003)
145	481564	4173815	37.711393, 32.79083	Reis Tumegi	EBA	Kucukkoy	Konya	323	300	2	Me (1963)
146	384673	4188760	37.839904, 31.688950	Sadikhaci-Bayat Hoyuk	EBA, 2nd M, LBA, IA	Sadikhaci	Konya	530	271	21	B (2001); B (2006)
147	473942	4159738	37.582831, 32.698572	Sakalar Hoyuk	EBA	Icericumra	Konya	135	161	2	Me (1963); G (1988)
148	463636	4162401	37.60798, 32.588007	Saksak Hoyuk	EBA, 2nd M, LBA	Icericumra	Konya	282	234	10	Me (1963); G (1988); B (2011)
149	529105	4128571	37.303313, 33.328418	Salir Hoyuk	EBA	Salur	Karaman	294	215	2	Me (1961)

150	500096	4172598	37.700609, 33.001094	Samih Hoyuk	EBA, IA	Ismil	Konya	410	360	9	Me (1963); G (1988, 1990)
151	486739	4165736	37.638661, 32.849699	Sancak Hoyuk	EBA	Karkin	Konya	126	169	2	Me (1963)
152	459632	4116531	37.194365, 32.545151	Sarioglan/Beloren	EBA, 2nd M, LBA, EIA	Sarioglan	Konya	384	361	16	B (2004, 2007)
153	493545	4161442	37.600037, 32.926872	Sarlak Hoyuk	EBA	Uchuyukler	Konya	516	544	16	Me (1961, 1963)
154	431726	4124058	37.263554, 32.232390	Sazli Hoyuk	EBA, 2nd M, LBA, IA	Sazli	Konya	150	143	7	B (2002, 2007)
155	457556	4158686	37.574237, 32.519336	Secme A Hoyuk	EBA	Secme	Konya	312	297	14	B (2011)
156	484919	4162693	37.611206, 32.829122	Seydihan	EBA, 2nd M, IA	Guvercinlik	Konya	458	426	15	Me (1961, 1963); G (1988)
157	399738	4145578	37.451627, 31.866442	Seydisehir II Hoyuk	EBA, 2nd M, LBA, IA	Seydisehir	Konya	511	658	35	Me (1963); B (1999, 2006, 2008)
158	501419	4129711	37.31404, 33.016017	Sigirci	EBA	Karalgazi	Karaman	360	330	4	Me (1963)
159	582124	4026115	36.376658, 33.915561	Silifke Kale	EBA	Silifke	Mersin	0	0	0	Me (1963)
160	477258	4158285	37.571149, 32.742544	Sircali Hoyuk	2nd M, LBA, IA	Cumra	Konya	691	657	23	G (1988); B (2005)
161	533315	4169498	37.672096, 33.377809	Sirnik Hoyuk	2nd M, LBA, IA	Hotamis	Konya	384	421	12	G (1990); B (2001)
162	458130	4171666	37.691249, 32.525093	Sivrice	EBA, 2nd M	Boruktolu	Konya	303	306	6	Me (1963); G (1988)
163	506451	4146714	37.467282, 33.072951	Suleymanhaci Hoyuk	2nd M, LBA, IA	Suleymanhaci	Karaman	456	243	11	G (1989); B (2001); K
164	519661	4132264	37.336846, 33.221952	Susan Hoyuk	EBA, 2nd M, IA	Kilbasan	Karaman	509	368	9	B (2002); K

165	449875	4126090	37.280052, 32.434568	Tahtali Hoyuk	EBA, 2nd M	Tahtali	Konya	105	104	7	B (2010)
166	403839	4138703	37.390107, 31.913692	Tasagil	EBA	Tasagil	Konya	273	242	2	Me (1963)
167	458456	4184526	37.807177, 32.528395	Tekintas Hoyuk	EBA, 2nd M, LBA, IA	Konya	Konya	227	224	4	B (1999, 2004)
168	589952	4026232	36.377012, 34.002835	Tekirkoy	EBA, LBA	Atayurt	Mersin	87	128	2	Me (1963)
169	368182	4196541	37.906861, 31.500547	Tolca	EBA	Tolca	Konya	389	370	8	Me (1954)
170	496645	4157267	37.562422, 32.962006	Uchuyuk 2	EBA	Uchuyukler	Konya	385	368	13	Me (1963); G (1990)
171	384933	4176940	37.732513, 31.694160	Unnamed Hoyuk	EBA	Ciftlikkoy	Konya	354	259	3	B (2006)
172	402210	4160603	37.587297, 31.892381	Uyuk	EBA	Tol	Konya	211	245	4	B (2006)
173	419332	4128721	37.301615, 32.089775	Yalihoyuk	EBA	Yalihoyuk	Konya	619	491	27	Me (1963)
174	531526	4164495	37.627029, 33.357278	Yaniktepe Hotamis/ Kesveli Hoyuk	EBA	Hotamis	Konya	301	222	3	Me (1963); B (2002)
175	386596	4174639	37.711986, 31.713387	Yassiviran Hoyuk	EBA	Beysehir	Konya	297	180	3	B (2006)
176	466744	4159402	37.581066, 32.623353	Yavsan Hoyuk	EBA	Icericumra	Konya	139	184	2	Me (1963); G (1988); B (2011)
177	456083	4185735	37.817961, 32.501024	Yaylapinar/ Evderesi Hoyuk	EBA, 2nd M, LBA, IA	Konya	Konya	383	146	5	Me (1963); B (1999, 2004)
178	355038	4204724	37.976725, 31.345426	Yenikoy Hoyuk	EBA	Yenikoy	Isparta	312	242	4	I
179	441597	4161855	37.601924, 32.338361	Zoldura/Lystra	EBA, 2nd M, LBA, IA	Guneydere	Konya	445	424	25	Me (1963); B (1999); B (2005); B et al (2005)
180	522152	4129846	37.314995, 33.250001	Siranli Hoyuk	2nd M	Hamidiye	Karaman	328	300	3	G (1989)

181	418276	4191225	37.864834, 32.070887	Kiziloren	EBA, 2nd M, IA	Kiziloren	Konya	383	364	15	Me (1963); B (1999, 2002)
182	379951	4191221	37.859451, 31.644753	Kocadere Hoyuk	LBA	Yenice	Konya	463	224	12	Me (1961, 1963)
183	543598	4103813	37.079583, 33.490516	Godet Yolu Hoyuk	EBA, 2nd M	Çimenkuyu	Karaman	85	299	4	B&K (2012)
184	383701	4182609	37.783467, 31.679273	Kirsecik	EBA	Gölkas	Konya	245	238	4	E (2015)
185	596470	4151576	37.506095, 34.091472	Hacimemis Hoyuk	EBA, 2nd M, LBA, EIA	Hacimemis	Konya	382	227	14	Ma (2014)
186	604838	4155607	37.541508, 34.186696	Acipinar Tepesi	EBA, 2nd M, LBA, IA	Kuscuncuk	Konya	365	485	29	Ma (2014)
187	604971	4153950	37.526572, 34.186821	Bagirtlak Pinari Yerlesimi	EBA, 2nd M, LBA, IA	Kuscuncuk	Konya	93	60	1	Ma (2014)
188	608242	4169076	37.662490, 34.227201	Eregli Karahoyuk (Hupisna)	EBA, 2nd M, LBA, IA	Aziziye	Konya	330	357	11	G (1989); Ma (2014)
189	594692	4143202	37.430793, 34.070282	Yellice Koyu Kepez Yerlisimi	EBA, LBA, IA	Yellice	Konya	133	75	0	Ma (2014)
190	442578	4179886	37.764496, 32.348043	Cayirbagi Hoyuk	EBA	Cayirbagi	Konya	150	118	10	B (2011)
191	452261	4109582	37.131379, 32.462527	Bagbasi Baraji Hoyuk	EBA	Bagbasi	Konya	304	115	11	B (2011)
192	413540	4194952	37.897984, 32.016608	Balkaya	LBA, EIA	Derbentteke	Konya	410	525	29	B (1999)
193	448313	4180531	37.770643, 32.413106	Hatip Hoyuk	EBA, IA	Hatip	Konya	293	215	7	B et al (2007); B (2014)
194	477617	4140926	37.414862, 32.747046	Avdul Hoyuk	EBA	Avdul	Konya	426	342	5	B (2014)
195	555795	4148368	37.480452, 33.631108	Ambar/Sidemara	EBA, IA	Ambar	Karaman	189	239	8	B (2014)
196	600455	4159883	37.580522,	Isiklar Dagi Mevkii	LBA, IA	Acipinar	Konya	152	221	4	Ma (2014)

			34.137689	Yerlesimi								
197	599494	4160065	37.582266, 34.126843	Isiklar Dagi Yerlesimi	EBA, 2nd M, LBA, IA	Acipinar	Konya	250	142	0	Ma (2014)	
198	457256	4158328	37.570996, 32.515959	Secme B Hoyuk	EBA	Secme	Konya	248	282	9	B (2011)	
199	600034	4156777	37.552595, 34.132464	Kuyunun Dagi Hoyugu	EBA, 2nd M, LBA, EIA	Acipinar	Konya	967	363	25	Ma (2014)	
200	609643	4151549	37.502789, 34.240115	Bolluca Hoyuk	EBA, 2nd M, LBA, IA	Yesilyurt	Konya	30	30	0	Ma (2016)	
201	605922	4138607	37.388176, 34.196542	Dibek Kalesi	2nd M, LBA, IA	Aydinkent	Konya	271	230	27	Ma (2016)	
202	612982	4143629	37.432598, 34.277046	Kapakli Kalesi	LBA, IA	Dedeli	Konya	152	191	31	Ma (2015)	
203	593850	4161884	37.599252, 34.063164	Akhuyuk	EBA, 2nd M, LBA, IA	Akhuyuk	Konya	370	282	12	Ma (2015)	
204	596664	4166349	37.639198, 34.095627	Ciller Hoyuk	EBA, 2nd M, LBA, IA	Ciller	Konya	284	283	9	Me (1963)	
205	603317	4147094	37.464954, 34.168309	Tont Kalesi	EBA, 2nd M, LBA, IA	Gokceyazi	Konya	0	0	0	Ma (2015)	
206	556441	4034875	36.457471, 33.629888	Damtepe	EBA, 2nd M, LBA, IA	Evkafcitligi	Mersin	193	150	13	Se et al (2014)	

Table A.2 - Full Database of Bronze Age and Iron Age sites within the 60km of Hattuša for the Comparative Analysis (Chapter 7). Key to Frequent Sources: C = Çorum Kültür Envanteri; Cz = Czichon; Ge = Gerber (in Strobel); Om = Omura; S&Y = Sipahi & Yildirim/Yildirim & Sipahi/Sipahi; Str = Strobel; Su = Süel; TAY = TAY Project; Y = Yozgat Kültür Envanteri.

FID	UTM EASTING	UTM NORTHING	LAT/LONG (DD)	SITE NAME	SITE DATES	VILLAGE	PROVINCE	SOURCES
0	662151	4441206	40.105542, 34.902492	Orrukaya Hoyuk	2nd M, LBA	Orukaya	Corum	Su (1990)
1	650971	4446834	40.158303, 34.772697	Eskiyapar Hoyuk	EBA, 2nd M, LBA	Eskiyapar	Corum	Ozguc/Temizer (1993), S&Y (2012)
2	644230	4455141	40.234297, 34.695441	Alacahoyuk	LBA	Alacahoyuk	Corum	Kosay/Akok (1973), Cinaroglu/Celik (2007)
3	642972	4444494	40.020391, 34.287894	Kulah	2nd M, IA	Kulah	Corum	S&Y (2011)
4	627997	4446208	40.156481, 34.502908	Kirankisla Hoyuk	EBA, 2nd M	Kirankisla	Corum	S&Y (2009)
5	614446	4441666	40.117526, 34.343034	Kemalli Hoyuk	2nd M, LBA	Kemalli	Corum	S&Y (2003)
6	628878	4413224	39.859271, 34.506703	Tavium	LBA, IA	Buyuknefes	Yozgat	Belke-Restle (1984), Str (2008)
7	622247	4415243	39.878437, 34.429581	Besiktepe	EBA	Sogutluyayla	Yozgat	Y
8	626299	4421003	39.929723, 34.478066	Haydarbeli Koyu Hoyuk	EBA	Haydarbeyli	Yozgat	Y
9	653480	4427895	39.987299, 34.797653	Cihanpasa Kalesi	LBA	Cihanpasa	Yozgat	Y, Str (2008)
10	660714	4428695	39.993158, 34.882538	Yassihoyuk	EBA, 2nd M, LBA	Yassihoyuk	Yozgat	Y, Str (2008)
11	648316	4452818	40.212664, 34.742915	Kaletepe Hoyuk	EBA, LBA, IA	Karamahmut	Corum	C, Su (1990)
12	641410	4450730	40.195054, 34.661334	Rizanin Tepe Hoyuk	EBA	Tahirabat	Corum	C, Su (1990)
13	659016	4439869	40.094100, 34.865399	Kayabuget Demirci Hoyuk	2nd M	Kayabuvet	Corum	C, Su (1990)

14	649788	4443713	40.130410, 34.758088	Dedepinari Hoyuk	EBA, 2nd M, IA	Dedepinari	Corum	Su (1991)
15	649997	4436829	40.068379, 34.758942	Bayindir Hoyuk	2nd M	Buyukhirka	Corum	Su (1991)
16	658092	4452023	40.203719, 34.857546	Hisir Hoyuk	EBA, 2nd M, IA	Bogazici	Corum	Su (1991)
17	644272	4434004	40.043938, 34.691207	Kucukhirka Hitit Yerlesimi	LBA	Kucukhirka	Corum	S&Y (2010)
18	643725	4430624	40.013591, 34.684049	Ciradere	EBA	Ciradere	Yozgat	Hachmann (1957)
19	651656	4440360	40.099880, 34.779216	Yatankavak Kayapinar Hoyuk	EBA, LBA	Yatankavak	Corum	S&Y (2010)
20	646383	4452201	40.207448, 34.720069	Buyukdere Hoyugu	LBA	Karamahmut	Corum	C
21	630072	4456356	40.247558, 34.529317	Saraycik Eski Tunc Yerlesimi	EBA	Saraycik	Corum	S&Y (2003)
22	650586	4435568	40.056918, 34.765553	Kiplanpinari Hoyuk	EBA, 2nd M	Buyukhirka	Corum	Su (1991)
23	645345	4454045	40.224234, 34.708294	Golpinar Dam	LBA	Alacahoyuk	Corum	Cinaroglu/Genc (2005)
24	634089	4460420	40.283524, 34.577380	Cihcir Tepe	EBA, 2nd M, IA	Turkhacilarhani	Corum	S&Y (2001)
25	646734	4457246	40.252818, 34.725344	Kalinkaya Cemetery	EBA	Kalinkaya	Corum	Yildirim & Zimmerman (2006)
26	656436	4410179	39.827218, 34.828013	Mercimektepe	EBA	Yozgat	Yozgat	Ozcan (1993); TAY (2002)
27	656503	4410025	39.825819, 34.828758	Cengeltepe	EBA	Yozgat	Yozgat	Unal (1968); TAY (2002)
28	637953	4430193	40.010672, 34.616351	Hattuša	EBA, 2nd M, LBA	Bogazkale	Corum	Bittel (1932-1978); Neve (1978-1993); Seeher (1993-Present)
29	690151	4458462	40.255031, 35.235890	Sapinuwa	LBA	Ortakoy	Corum	Su (2002)
30	669031	4457702	40.252720, 34.987500	Akpinar Hoyuk	2nd M	Akpinar	Corum	Su (1991)
31	642441	4470944	40.376916, 34.677938	Yenihayat EBA Cemetery	EBA	Ertugrul	Corum	S&Y (1998, 2001)
32	622850	4470430	40.375405, 34.447135	Ecerintepe Early Hittite Settlement	LBA	Kaledere	Corum	S&Y (2008)

33	612460	4483792	40.497219, 34.327141	Cagil Tepe	EBA	Ucdam	Corum	S&Y (1998)
34	611970	4482492	40.485577, 34.321130	Catal Tepe	EBA	Ucdam	Corum	S&Y (1998)
35	617540	4477849	40.442990, 34.385973	Kucukyamadi Hoyuk	EBA	Kucukerikli	Corum	S&Y (1998)
36	611155	4476650	40.433069, 34.310493	Tuglu Hoyuk	EBA, 2nd M, IA	Tuglu	Corum	S&Y (1998)
37	653631	4481909	40.473665, 34.812344	Top Tepe	EBA, LBA, IA	Tatar	Corum	S&Y (1999)
38	614616	4455156	40.239008, 34.347430	Mahmatli	EBA, 2nd M	Mahmatli	Corum	S&Y (1999)
39	604985	4460667	40.289910, 34.235136	Huseyindede Tepe	LBA	Yoruklu	Corum	S&Y (1999)
40	609798	4464201	40.321122, 34.292354	Boyali Hoyuk	EBA, LBA, IA	Guloluk	Corum	S&Y (1999)
41	600818	4476432	40.432423, 34.188614	Resuloglu EBA Cemetery	EBA	Resuloglu	Corum	S&Y (2005)
42	667117	4444678	40.135833, 34.961624	Baginardi Hoyuk	2nd M, IA	Akoren	Corum	Su (1990)
43	649412	4466980	40.340000, 34.759092	Balimsultan Tepe	EBA, 2nd M	Balimsultan	Corum	S&Y (2009)
44	677096	4468656	40.349675, 35.085303	Bogaz	EBA, LBA, IA	Baliyakup	Corum	S&Y (2004)
45	671022	4442080	40.111655, 35.006747	Bolatcik Hoyuk	2nd M, IA	Bolatcik	Corum	Su (1990)
46	674967	4447403	40.158771, 35.054453	Bozdogan Hoyuk	2nd M, IA	Bozdogan	Corum	Su (1990)
47	594955	4452824	40.220462, 34.115996	Bozyayla	EBA, IA	Bozyayla	Corum	S&Y (1999)
48	648270	4467166	40.341879, 34.745695	Buyuk Gullucek Kaletepe	EBA	Buyukgulucek	Corum	Kosay/Akok (1957)
49	656108	4456380	40.243325, 34.835304	Buyukcamili Karakavak Mevkii	EBA	Buyukcamili	Corum	S&Y (2009)
50	654456	4477117	40.430362, 34.820906	Cayhatap Hoyugu	EBA, LBA	Yenice	Corum	S&Y (2004)
51	651403	4466061	40.331366, 34.782304	Elicek Hoyuk	EBA, 2nd M	Elicek	Corum	S&Y (2009)

52	669720	4455029	40.228513, 34.994890	Gokoren Hoyuk	EBA, 2nd M, IA	Gokoren	Corum	S&Y (2011)
53	670349	4455134	40.229330, 35.002307	Gokoren Cevre Tarlalari	2nd M	Gokoren	Corum	S&Y (2011)
54	594779	4443012	40.132097, 34.112483	Guvendik EBA Istasyonu	EBA	Guvendik	Corum	S&Y (2011)
55	590646	4443261	40.134796, 34.064014	Guvendik Kale Hoyuk	EBA, 2nd M	Guvendik	Corum	S&Y (2011)
56	634839	4485844	40.512365, 34.591584	Haciahmetderesi Koyu Cevresi	2nd M	Haciahmetderesi	Corum	S&Y (2011)
57	658711	4468655	40.353366, 34.868936	Hacikoy	EBA, 2nd M, IA	Gocenovacigi	Corum	S&Y (2004)
58	668783	4478495	40.439986, 34.990083	Hantepesi	EBA	Saraykoy	Corum	S&Y (2004)
59	660616	4470989	40.374018, 34.891944	Kafali Hoyuk	EBA, 2nd M	Kilicoren	Corum	S&Y (2008)
60	665322	4441731	40.109652, 34.939811	Hisar/Degirmenalti	EBA	Kochisar	Corum	S&Y (2009)
61	601035	4475787	40.426587, 34.191069	Kaleboynu	EBA, IA	Resuloglu	Corum	S&Y (1999)
62	590117	4451887	40.212556, 34.059013	Kalekara Tepesi	EBA, IA	Inegazili	Corum	S&Y (2003)
63	611856	4464618	40.324605, 34.316644	Kaletepe	EBA, IA	Haciosman	Corum	TAY, C
64	661410	4458300	40.259608, 34.898089	Karadere Mevkii EBA Settlement	EBA	Circir	Corum	S&Y (2012)
65	646420	4473067	40.395345, 34.725278	Kartal/Kus Kayasi	EBA	Sapa	Corum	S&Y (2009)
66	587239	4453192	40.224616, 34.025375	Kirantepe	EBA	Inegazili	Corum	S&Y (2000)
67	678964	4458622	40.258938, 35.104479	Kizilhamza Hoyuk	EBA, 2nd M, IA	Kizilhamza	Corum	Su (1991)
68	638587	4433292	40.038479, 34.624439	Kocakaya	EBA, 2nd M, LBA, IA	Yekbas	Corum	Cz (2000)
69	600905	4465774	40.336413, 34.187952	Koyalti Hoyuk	2nd M	Cavuscu	Corum	S&Y (2007)
70	639641	4432550	40.031622, 34.636629	Yarikkaya	EBA	Bogazkale	Corum	Hauptmann (1969); Cz (2000)

71	649144	4466812	40.338535, 34.755898	Kumluderi Tepesi	2nd M	Balimsultan	Corum	S&Y (2007)
72	648476	4461852	40.293989, 34.746886	Kume EBA Settlement	EBA	Harhar	Corum	S&Y (2007)
73	625843	4470189	40.372788, 34.482333	Maziligin Tepe Cevresi	2nd M	Darlik	Corum	S&Y (2008)
74	684025	4436856	40.061879, 35.157737	Mercantepe Hoyuk	EBA, 2nd M, IA	Belpinar	Corum	Su (1990)
75	605495	4425956	39.977187, 34.235460	Ortakisla Hoyuk Tepe	EBA, 2nd M	Ortakisla	Corum	S&Y (2011)
76	679890	4462016	40.289297, 35.116313	Osmankalesi	EBA, 2nd M	Findikli	Corum	S&Y (2008)
77	664795	4481562	40.468401, 34.943883	Ovakarapinar	EBA, IA	Karapinar	Corum	S&Y (2004)
78	665688	4465549	40.324043, 34.950245	Pazarli Kale	EBA, 2nd M, LBA, IA	Cikhasan	Corum	Kosay (1941)
79	677723	4455487	40.230977, 35.089026	Sarisuleyman	EBA	Sarisuleyman	Corum	S&Y (2011)
80	663619	4448636	40.172161, 34.921591	Sivrihoyuk Tepe	2nd M	Unalan	Corum	S&Y (2005)
81	643314	4441922	40.115409, 34.681735	Kalecik Kaya Kale Mevkisi	EBA, 2nd M, IA	Kalecikkaya	Corum	S&Y (2012)
82	675501	4456474	40.240332, 35.063194	Sogucak Hoyuk	EBA, LBA	Sogucak	Corum	S&Y (2012)
83	642075	4450400	40.191970, 34.669071	Tahirabad Hoyugu	LBA	Tahirabat	Corum	S&Y (2010)
84	677560	4438476	40.077852, 35.082426	Tombultepe Hoyuk	EBA, 2nd M, IA	Killik	Corum	Su (1990)
85	601586	4465039	40.329710, 34.195850	Tuzla Mevkii EBA Settlement	EBA	Cavuscu	Corum	S&Y (2007)
86	690769	4457341	40.244799, 35.242818	Yug Hoyuk	2nd M, IA	Ortakoy	Corum	Su (1991)
87	682582	4446871	40.152361, 35.143659	Zindantepe	2nd M, IA	Kucukdona	Corum	TAY
88	683838	4394073	39.676716, 35.143518	Cadir Hoyuk	EBA, 2nd M, LBA, IA	Peyniryemez	Yozgat	Gorny (2006)
89	673587	4407727	39.801809, 35.027667	Taslik Hoyuk	EBA, IA	Kucuktaslik	Yozgat	Str (2008); Mazzoni & Pecchioli Daddi (2015)

90	679143	4396725	39.701593, 35.089530	Zekeriye	EBA, IA	Karaburun	Yozgat	Om (1992)
91	675694	4409020	39.813019, 35.052610	Kusakli Hoyuk/Zippalanda	EBA, 2nd M, LBA, IA	Buyuktaslik	Yozgat	Mazzoni & Pecchioli Daddi (2015)
92	657133	4425558	39.965582, 34.839854	Turkmensarilar Hoyuk 1	EBA, 2nd M, LBA	Turkmensarilar	Yozgat	Str (2008)
93	648811	4416715	39.887450, 34.740438	Evci Yilanlitepe	EBA, LBA	Evci	Yozgat	Str (2008)
94	638471	4425093	39.964656, 34.621332	Kalecik Tepe	EBA, LBA, IA	Yazir	Corum	Str (2008)
95	656433	4427862	39.986460, 34.832216	Turkmensarilar Hoyuk 2	EBA	Yassihoyuk	Yozgat	Str (2008)
96	660515	4419808	39.913168, 34.878017	Unnamed Site	EBA, 2nd M, LBA, IA	Gulluk	Yozgat	Ger (2008)
97	658487	4413986	39.861121, 34.852889	Ceska Kalesi	LBA, IA	Kocekkomu	Yozgat	Str (2008)
98	644543	4388919	39.637850, 34.684429	Hamzali Koyu Hoyugu	EBA	Hamzali	Yozgat	Y
99	658135	4395851	39.697873, 34.844410	Topcu Koyu Hoyugu	EBA, 2nd M, IA	Topcu	Yozgat	Y
100	626278	4422483	39.943057, 34.478107	Unnamed Haydarbeli Site	EBA, LBA	Haydarbeyli	Yozgat	Str (2008)
101	658053	4402091	39.754083, 34.844951	Divanli Koyu Hoyugu	LBA, IA	Divanli	Yozgat	Str (2008)
102	623255	4402580	39.764233, 34.438984	Hacicesmesi	EBA, LBA, IA	Hacicesmesi	Yozgat	Ger (2008)
103	608552	4410778	39.840080, 34.268727	Sogutcuk Pinari	EBA, LBA, IA	Arslanhacili	Yozgat	Ger (2008)
104	639871	4398921	39.728711, 34.632125	Igdecik	LBA, IA	Igdecik	Yozgat	Ger (2008)
105	643842	4400368	39.741083, 34.678760	Oren Sehri	LBA, IA	Derekisla	Yozgat	Ger (2008)
106	631666	4426534	39.978721, 34.541973	Cec Tepe Deliahmet Pinari	LBA	Delihasanli	Yozgat	Str (2008)
107	634156	4430271	40.011987, 34.571895	Karakecili	EBA, LBA, IA	Karakecili	Corum	Str (2008)
108	639786	4435619	40.059238, 34.638990	Emirler Kalesi	LBA	Emirler	Corum	Cz (1997)/Str (2008)

109	645005	4421992	39.935634, 34.697116	Bisek Hoyuk	LBA	Bisek	Yozgat	Str (2008)
110	682777	4420566	39.915483, 35.138533	Kulhuyuk (Harranassa?)	LBA	Kulhuyuk	Yozgat	Str (2008)
111	631802	4429725	40.007440, 34.544212	Karakaya	LBA	Yukarifindikli	Corum	Str (2008)
112	619941	4388749	39.640122, 34.397788	Cepni Hoyuk	EBA	Cepni	Kirsehir	Om (1989)
113	621566	4385040	39.606483, 34.416039	Colak Hoyuk	EBA, 2nd M	Cicekdagi	Kirsehir	Om (1989)
114	599025	4405089	39.789997, 34.156541	Gokhoyuk Kirsehir	EBA	Konurkale	Kirsehir	Om (1989)
115	627300	4373216	39.499146, 34.480544	Kullu 1	EBA, 2nd M	Dogankas	Kirsehir	Om (2003)
116	610332	4388846	39.642289, 34.285849	Safali Hoyuk	EBA	Safali	Kirsehir	Om (1989)
117	596593	4397074	39.718074, 34.126965	Kaleevci Hoyuk	EBA	Kaleevci	Kirsehir	Om (1989)
118	606008	4397511	39.720892, 34.236859	Hoyukler Hoyuk	EBA	Kizilkali	Kirsehir	Om (1989)

Appendix B. Raster Images used in Spatial Analyses (Chapters 3, 5 and 6)

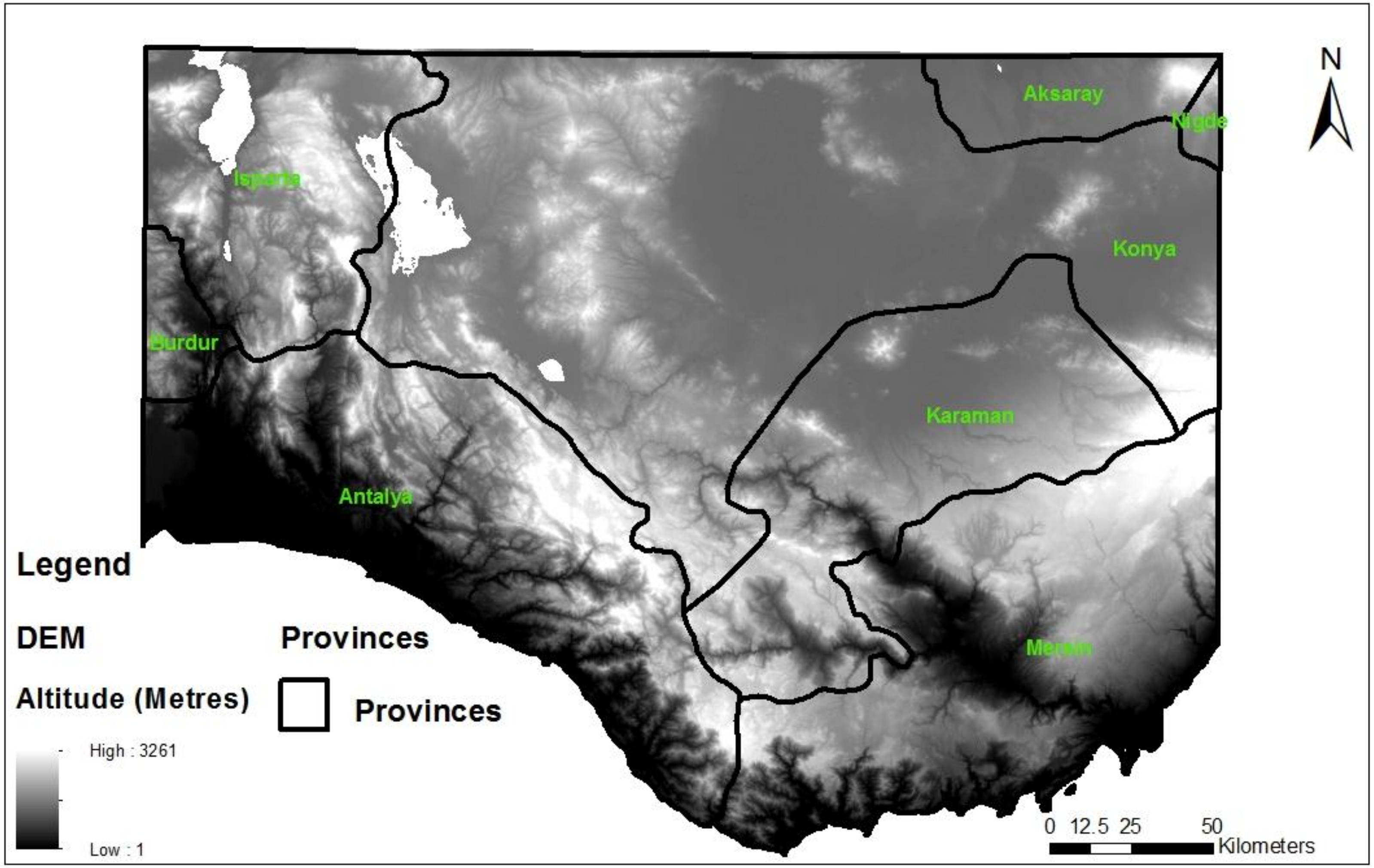

Figure B.1 - Unaltered Digital Elevation Model of the region under investigation with Turkish provincial borders.

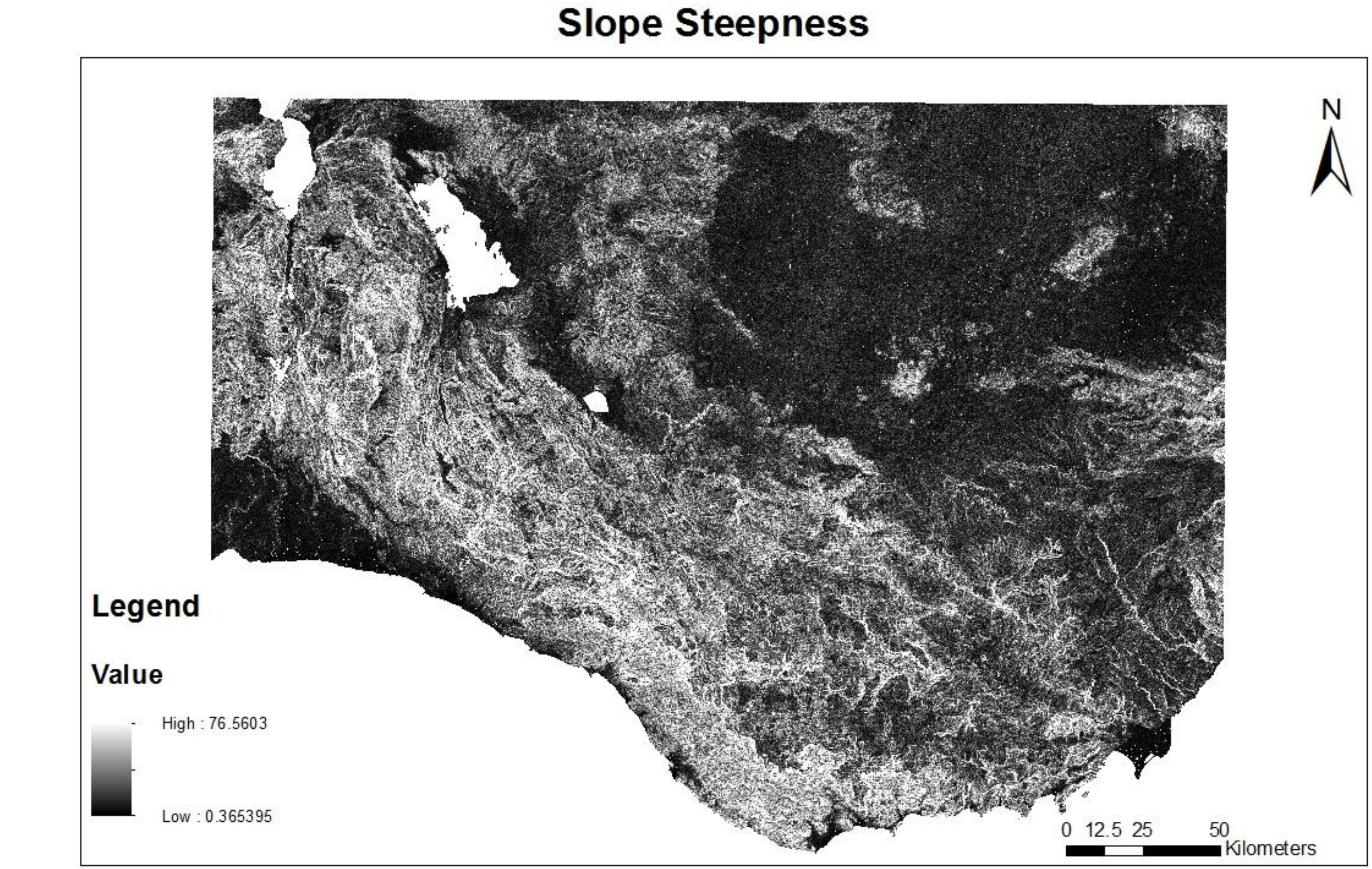

Figure B.2 - Raster showing the steepness of slopes in the study area. Slope value is a derivative of the altitude values in the DEM.

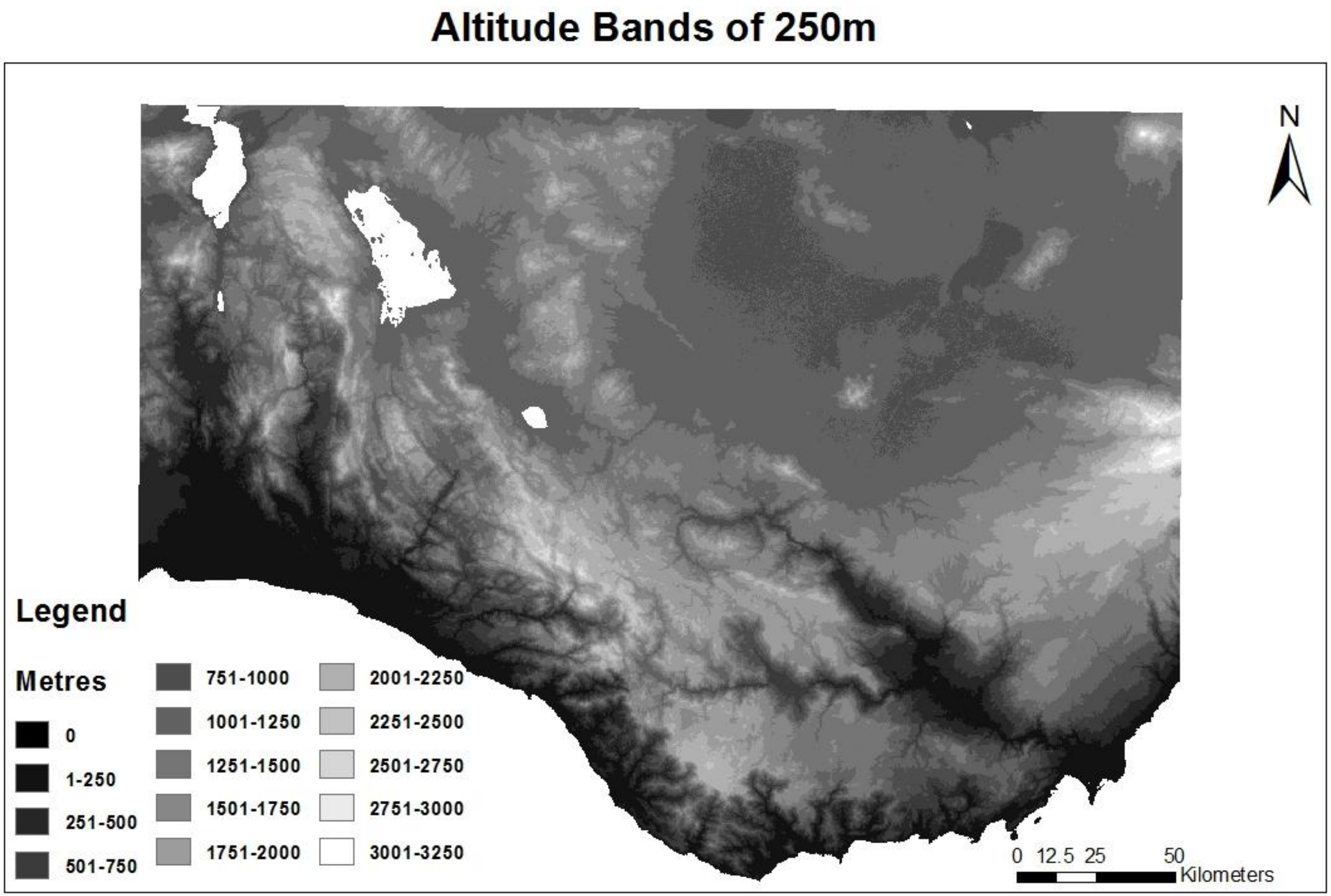

Figure B.3 - DEM reclassified into thirteen bands of 250m intervals, with an additional band representing 0m.

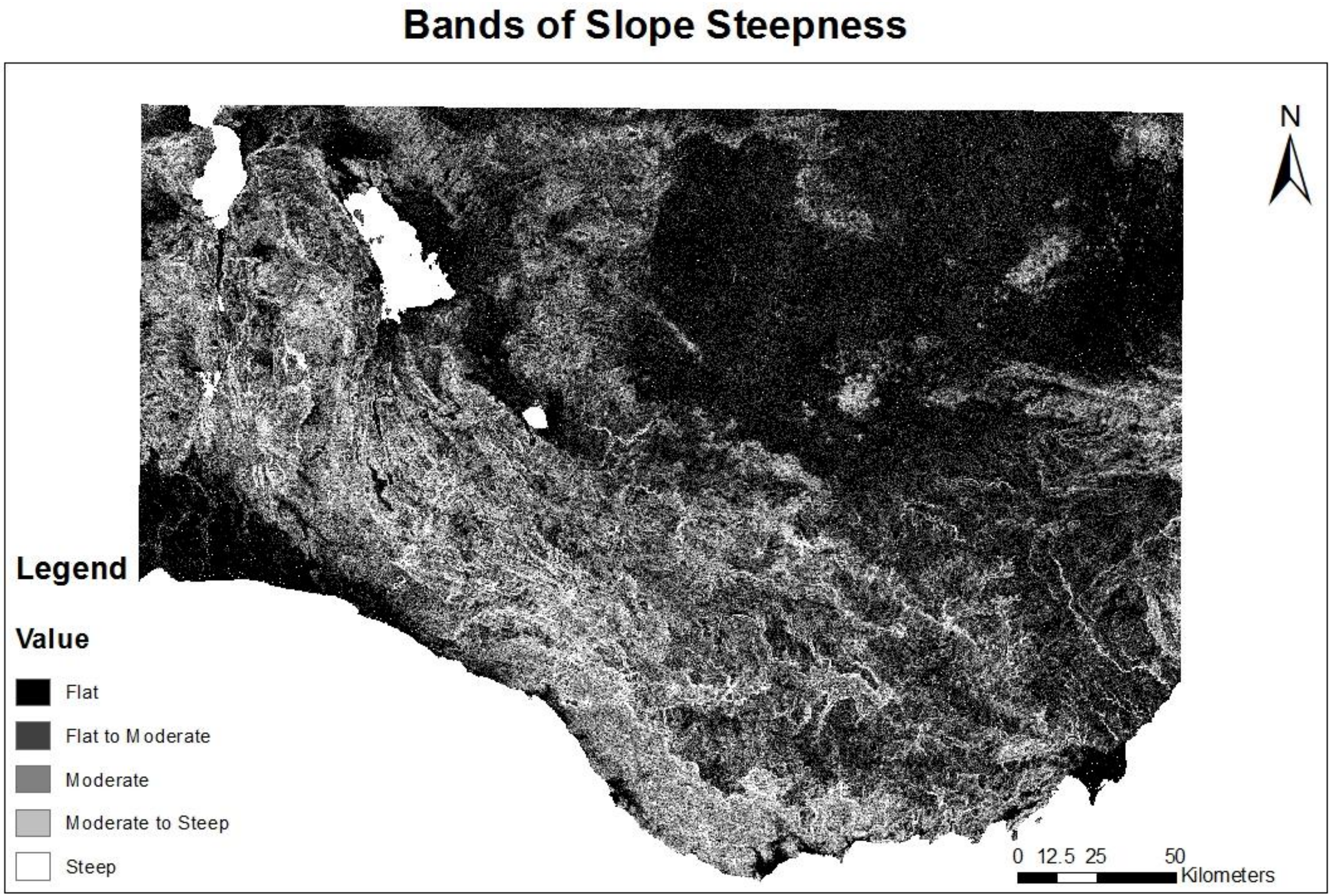

Figure B.4 - Slope raster reclassified into five bands representing categories of steepness, defined by 'Natural Breaks (Jenks)'.

Bands Representing Distance from Rivers

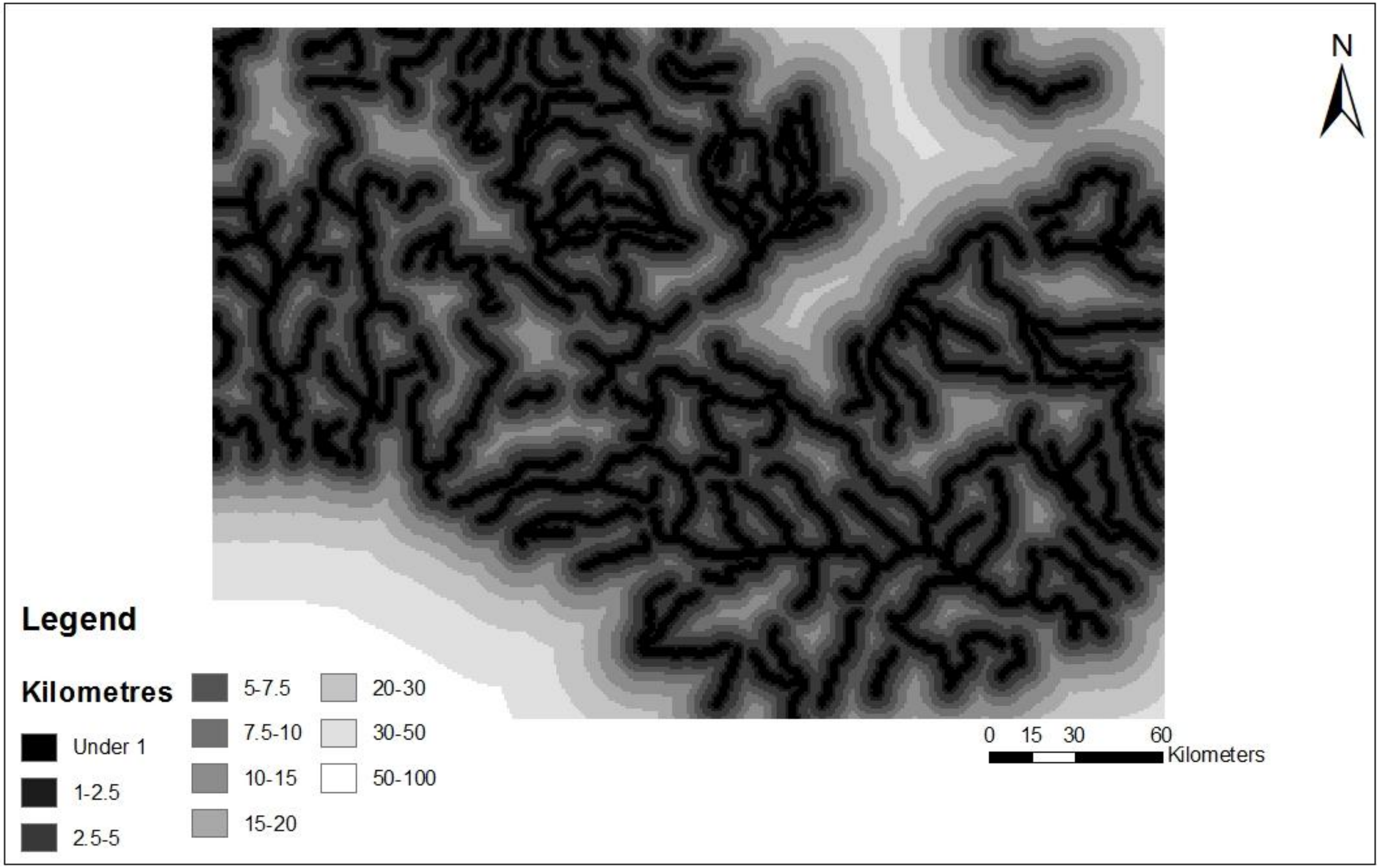

Figure B.5 - Bands representing distance from rivers in kilometres.

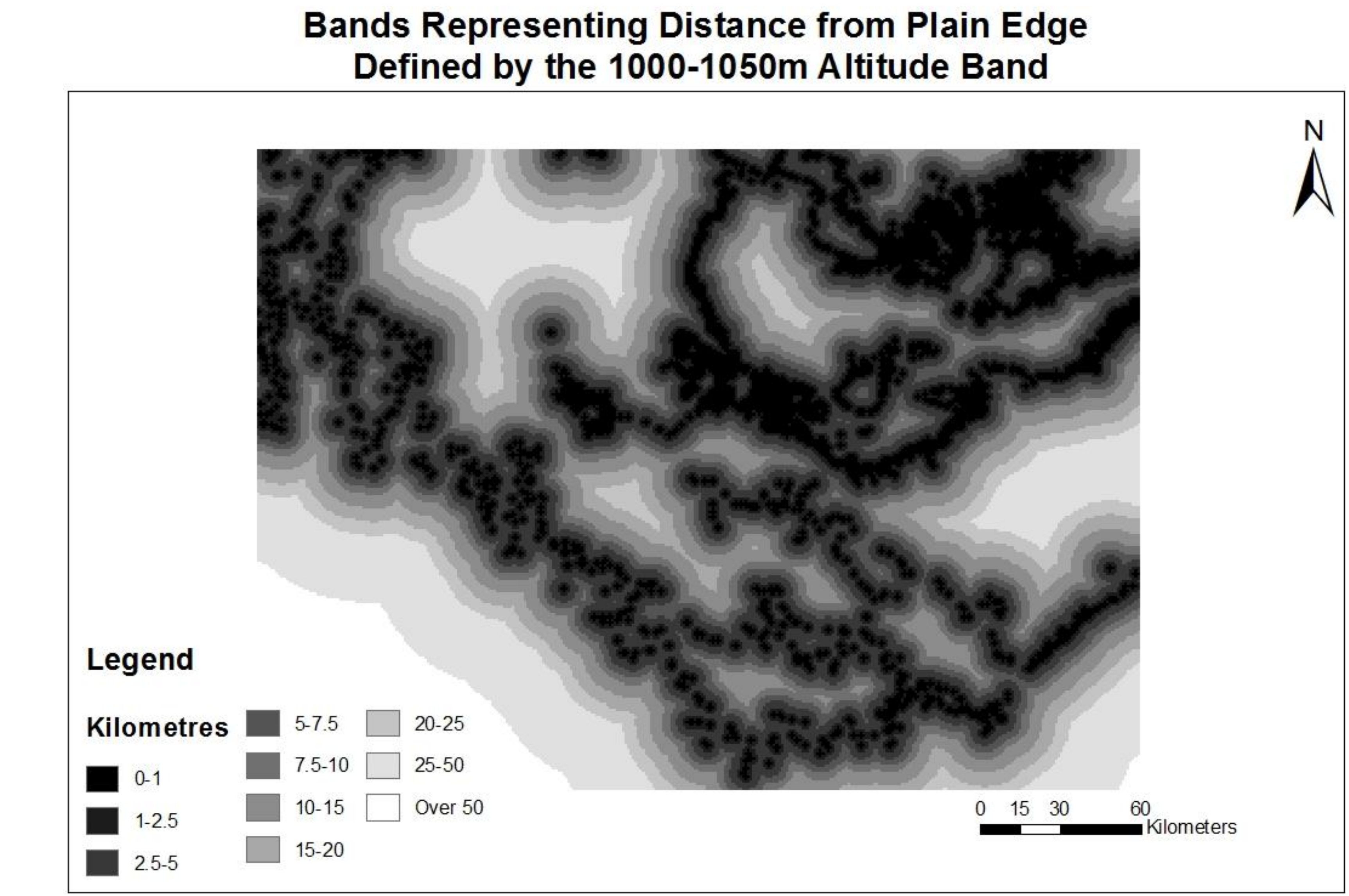

Figure B.6 - Bands representing distance in kilometres from the plain edge, as defined by an altitude of 1000-1050m.

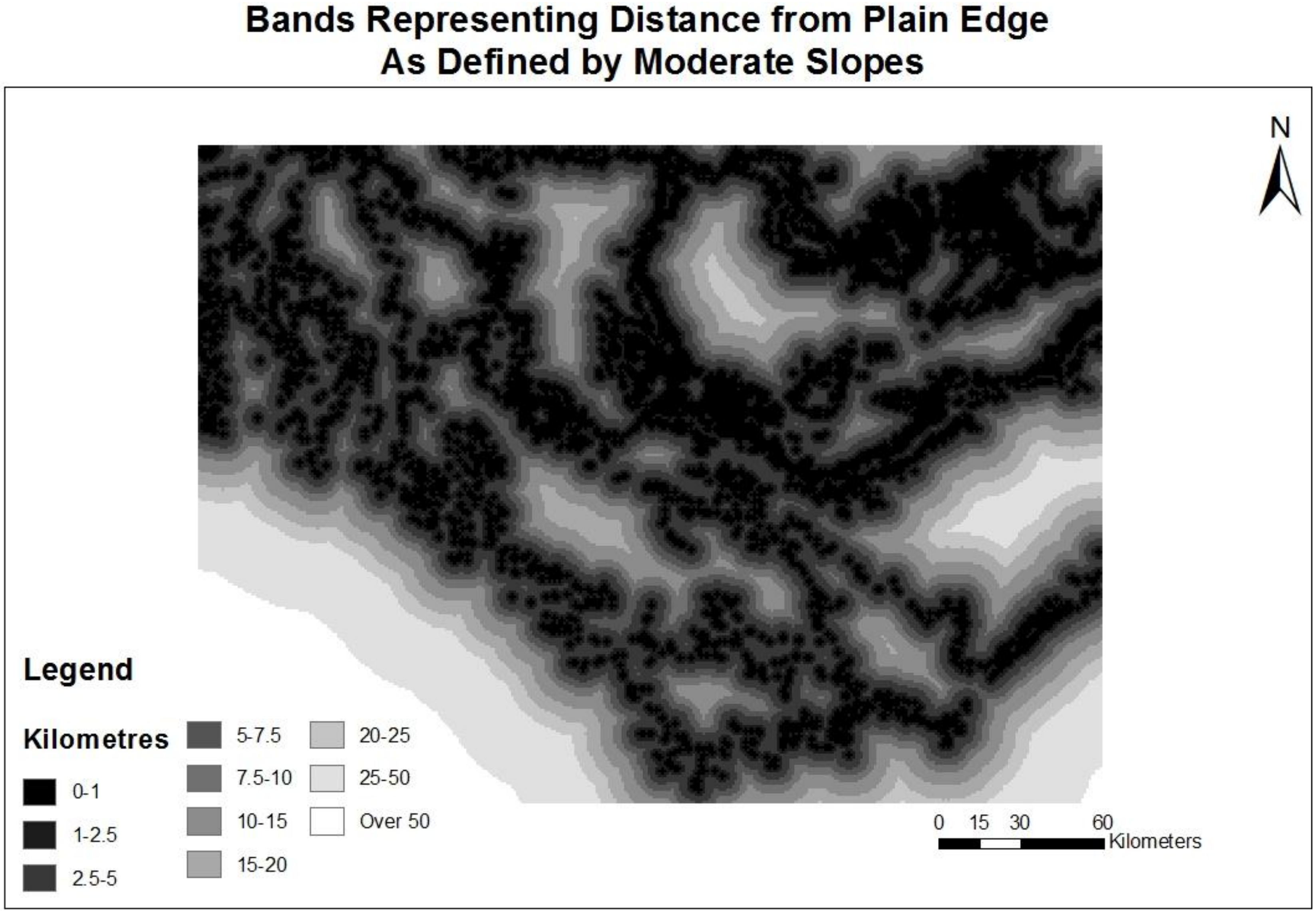

Figure B.7 - Bands representing distance in kilometres from the plain edge, as defined by moderate slope steepness.

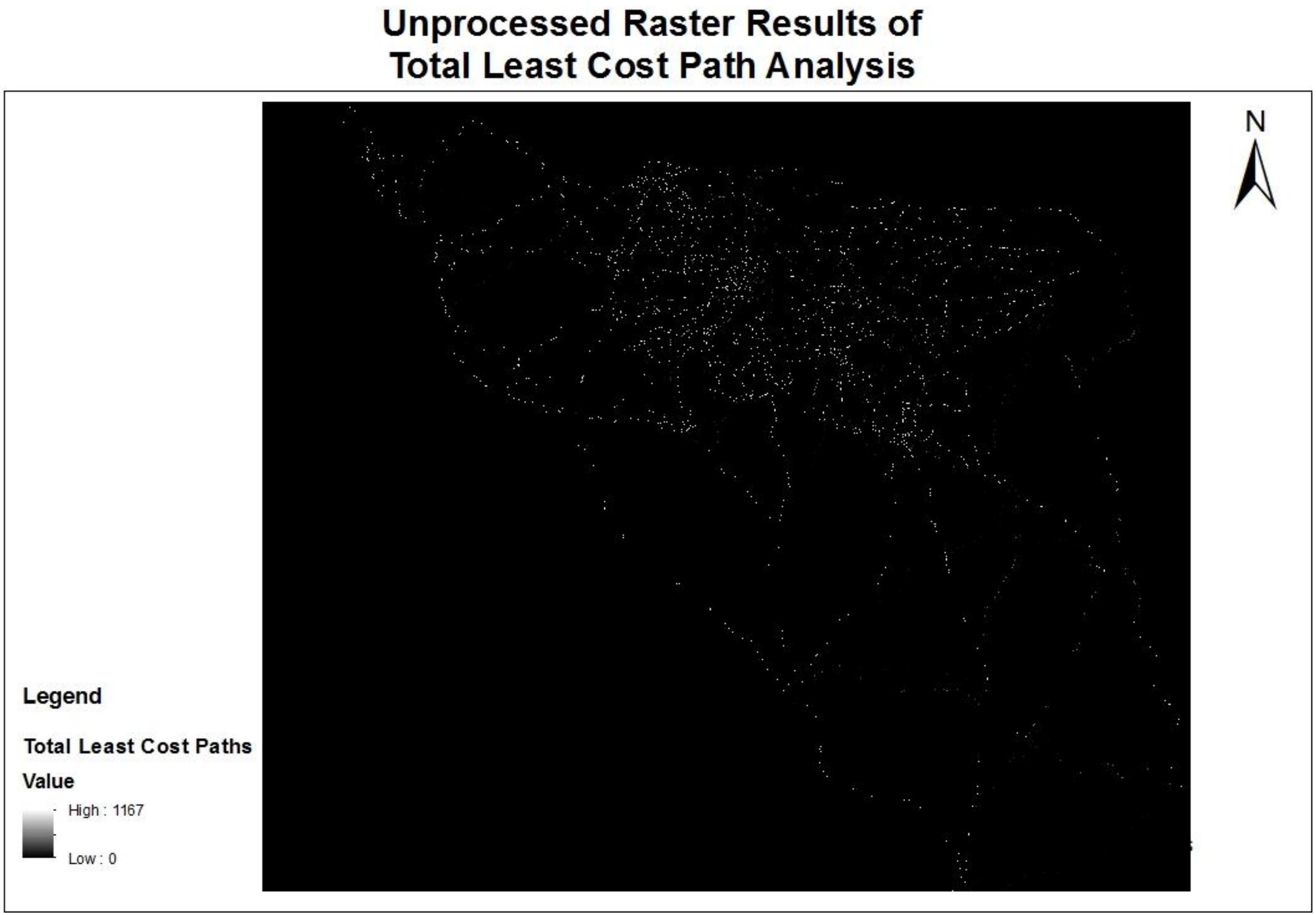

Figure B.8 - Raster results of Total Least Cost Path analysis before conversion into polylines.

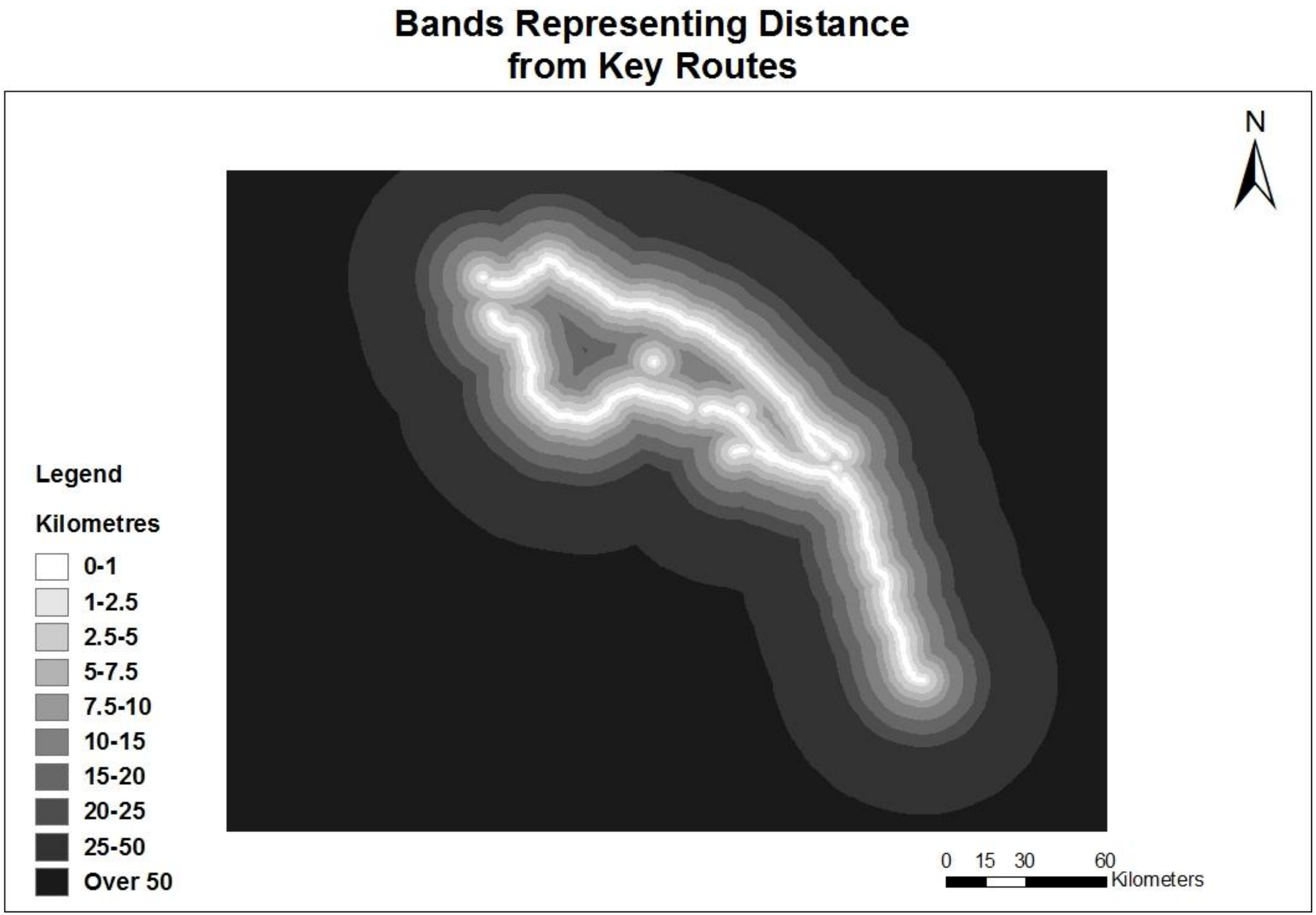

Figure B.9 - Bands representing distance in kilometres from 'key routes', defined as being in the top three bands of the TCLP results.

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