ÇEVRE KALE:
APPLICATIONS OF NEWLY DEVELOPED METHODS, TECHNOLOGY AND DATA FOR UNDERSTANDING THE IRON AGE CITY IN YARAŞLI

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Approval of the Graduate School of Social Sciences

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ABSTRACT

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The purpose of this thesis is to test the validity of applications of Remote Sensing and Geographical Information Systems in Anatolian archaeology. The focus of the study is an Iron Age fortress Çevre Kale and its associated structures.

During the course of the study, 5 km long outer wall enclosing a territory around Çevre Kale documented for the first time by employing high altitude aerial imagery. In addition to the GIS analyses, examination of the geology, land use and soil quality data showed that the outer wall is in a way acting to guard and protect inhabitants of the fortress and, perhaps more importantly, the well-watered pasture surrounding the fortress and demarcated by the enclosure wall. Evaluation of the available archaeological and historical evidence suggested that Çevre Kale might be of a site with significant military importance at least in the first half of the 6th century BC.

As a result, this thesis is underlying the importance of high and low altitude aerial imagery in terms of documentation, evaluation and monitoring of the archaeological sites as part of the archaeological research.

Keywords: Remote Sensing, High and Low Altitude Aerial Imagery,
Geographical Information Systems, Anatolian Iron Age

ÖZ

ÇEVRE KALE:
GELİŞEN METOD VE TEKNOLOJİLER İLE YENİ VERİLER KULLANILARAK YARAŞLI DEMİR ÇAĞI KENTİNİN ANLAŞILMASI

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Ortak Tez Yöneticisi: Dr. Arda Arcasoy

Nisan 2006, 160 sayfa

Bu tezin amacı "Uzaktan Algılama" ve "Coğrafi Bilgi Sistemleri" (CBS) Anadolu arkeolojisi kapsamındaki uygulamalarının geçerliliğini test etmektir. Çalışmanın odak noktası Çevre Kale adı ile bilinen bir Demir Çağı Kalesi ve onunla ilişkili diğer yapılardır.

Çalışma sırasında, Çevre Kale'nin etrafında bir alanı çevreleyen 5 km uzunluğunda bir dış duvar, yüksek irtifadan çekilmiş hava fotoğrafları kullanılmak sureti ile ilk defa belgelenmiştir. Coğrafi Bilgi Sistemleri analizlerinin yan ısıra, jeoloji, arazi kullanımı ve toprak kalitesi verilerinin incelenmesi sonucunda dış duvarın, kalede yaşayanları ve hatta daha öncelikli olarak, kalenin etrafındaki iyi sulanan ve dış duvar ile sınırlanmış bölgeyi kollamak ve korumaya yönelik olduğunu göstermiştir. Mevcut arkeolojik ve tarihi bilginin değerlendirilmesi sonucu, Çevre Kale'nin MÖ 6. yüzyılın ilk yarısında askeri anlamda önemli bir yer olabileceği sonucuna varılmıştır.

Sonuç olarak, bu tez çalışması, yüksek ve alçak irtifadan çekilmiş hava fotoğraflarının, arkeolojik araştırmalarda, arkeolojik alanların belgelenmesi, değerlendirme ve izleme açısından önemini vurgulamıştır.

Anahtar Kelimeler: Uzaktan Algılama, Coğrafi Bilgi Sistemleri, Yüksek ve Alçak Mesafe Hava Fotoğrafları, Anadolu Demir Çağı

FoR

My father

and

My mother, who helped me to walk on the road.

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This thesis would never begin and come to an end without the guidance and encouragement of Geoffrey D. Summers who always brings good things into my life. There is no word comprehensive enough to explain my gratitude to him.

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As a friend said long ago, I cannot think of writing this thesis without support of Deniz Burcu Erciyas and I want to thank Nicholas D. Cahill for providing valuable insights about all aspects of this thesis. I would like to express my thanks to Suna Güven for showing "ways of seeing" through her Seminars on Roman Architecture.

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Last but not least, I want to thank to my family; my mother, my father, my grandmother Melahat Reyhan; my precious Ayşen who has always been a source of inspiration to me with Yüksel and bunch of extraordinary aunts who trusted and supported me all the time.

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TABLE OF CONTENTS

LIST OF TABLES

TABLES

LIST OF FIGURES

FIGURES

CHAPTER 1

INTRODUCTION

The combination of recent archaeological knowledge and the availability of remotely sensed imagery and computer facilities triggered this study which focuses on an Iron Age fortress, Çevre Kale, on the central Anatolian Plateau. The discovery of an outer wall enclosing a territory around the fortress acted as a catalyst in this recent phase of study.[1]

This case study of Yaraşlı area has two major aims: first, to broaden our understanding of this complex archaeological landscape by employing recently declassified high altitude aerial imagery provided by the Turkish authorities, topographical data, and available archaeological evidence; second, to test the validity of this first application of new methods in an approach towards further understanding of the Anatolian Iron Age.

One of the main reasons that this Case Study relies heavily on applications of remote sensing and GIS is due to bureaucratic restrictions on a masters' thesis study. The author is not allowed to conduct a formal ground survey, which could provide precise measurements by using Total Station or Global Positioning System equipment. In this sense, site visits only allowed for the recognition of the study area from ground level in order to verify the data extracted from aerial imagery. The second reason was the quality and the nature of the archaeological evidence. The site of Yaraşlı has never been the subject of an intensive survey or an archaeological excavation. Although Iron Age pottery is abundant in the study area, few diagnostics have been collected, making precise dating difficult without more intensive survey and excavation. Under these circumstances, a historical setting for the site was sought within a framework constructed from ancient texts. Cultural associations were sought at sites where similar architecture or pottery repertoires exist.

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[1] During a trip with students in 2000, Geoffrey and Françoise Summers noticed the stone footings of an outer wall enclosing a territory around this fortress.

To document accurately features within the study area, topographical maps were digitised and aerial photographs were processed. The combination of those two layers of data enabled the author to analyze all the features in relation to each other and to suggest or attribute functions. The accuracy of the attributed functions was tested by using basic Geographical Information Systems analyses, such as view shed and aspect.

CHAPTER 2

THE STUDY AREA

2.1 LOCATION

The study area is located on the southeastern ridges of the Karacadağ Mountain range in the modern Kulu district of Konya province in the central part of the Anatolian Plateau. The area is 100 km south of Ankara. (**Figure 1**) The focus of the study area is the fortress known as Çevre Kale (Fortress) and it is an hour and a half by car from Ankara along the modern Ankara-Konya highway, which was also part of the Pilgrims' Road in ancient times. Çevre Kale is approximately 1 km NW of Yaraşlı Village of Kulu district. (**Figure 2**) The site is situated on one of the ridges of the Karacadağ mountain range and is comprised of several distinct elements and features. (**Figure 3**)

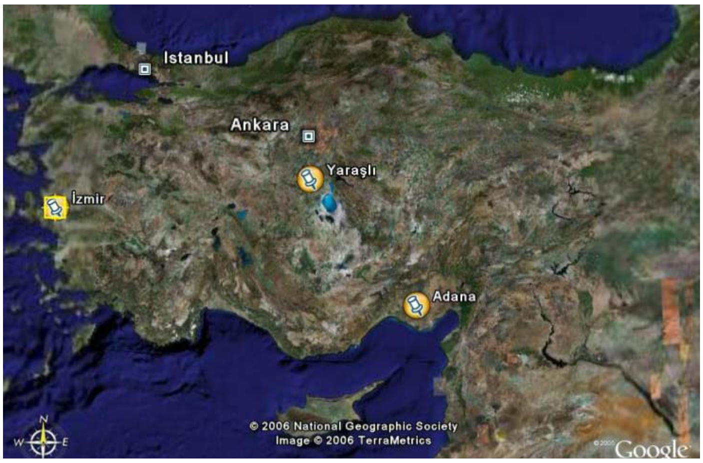

Figure 1: Satellite image taken from Google Earth showing Yaraşlı in respect to the major urban centers.

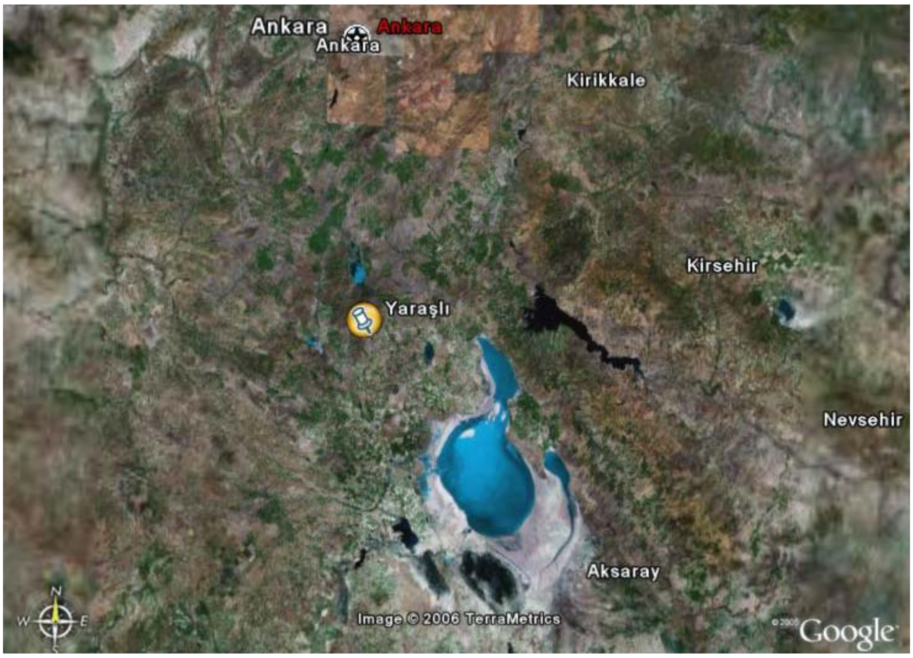

Figure 2: Satellite image of the Kulu District. Yaraşlı Villageof Kulu District is 30-35 km NW of Salt Lake. It takes less than two hours to reach the village from Ankara by taking the Ankara-Konya Highway.

Figure 3: Close up of the study area from a satellite image provided by Google Earth. Google Earth has already located Karacadağ Mountain Range. The arrow close to the right hand corner of the image is pointing out Yaraşlı Village. Adjacent to the area with a wide texture another arrow pointing out the fortress. The wall and the rampart are quite clear in this low-resolution satellite image.

The Karacadağ Mountain Range is primarily volcanic, made of a kind of andesitic thrachyte. It forms a natural boundary for the north and northwest portions of the study area. This mountain range dominates the landscape, its highest peak Kırklar Tepe attaining at an altitude of 1741 m above sea level. Outcrops of andesite create visually interesting hilltops for instance Sivri Kale Tepe, which is 400m NW of the Northern Enclosure. (**Figure 4**)

Figure 4: Sivri Tepe and Kırklar Tepe. Sivri Kale Tepe at an altitude of 1403 m and Kırklar Tepe at an altitude of 1741 m can be seen respectively on the foreground and background of the image. (Photo ID: 05yrsl0117)

A seasonal lake, Kurak Göl, is located in the saddle of the westernmost range of Karacadağ. There are a number of springs in the study area as well a stream, named Harlak Dere, which flows from a source close to the southwestern end of the fortress. The narrow valleys or rills on the southern slopes of the mountain range collect water during times of rain and when snow starts to melt during spring which is fed into this stream. (**Figure 5**)

There is a distinctive change in the topography towards the south and southeast. The southern end of the mountain range terminates sharply at the flat and agreeable lands of the Cihanbeyli Plain at 1150 m absl; the Tuz Gölü (Salt Lake) lies 35 km southeast of the study area. This part of the land is mainly used for agricultural purposes since the soil quality is suitable.

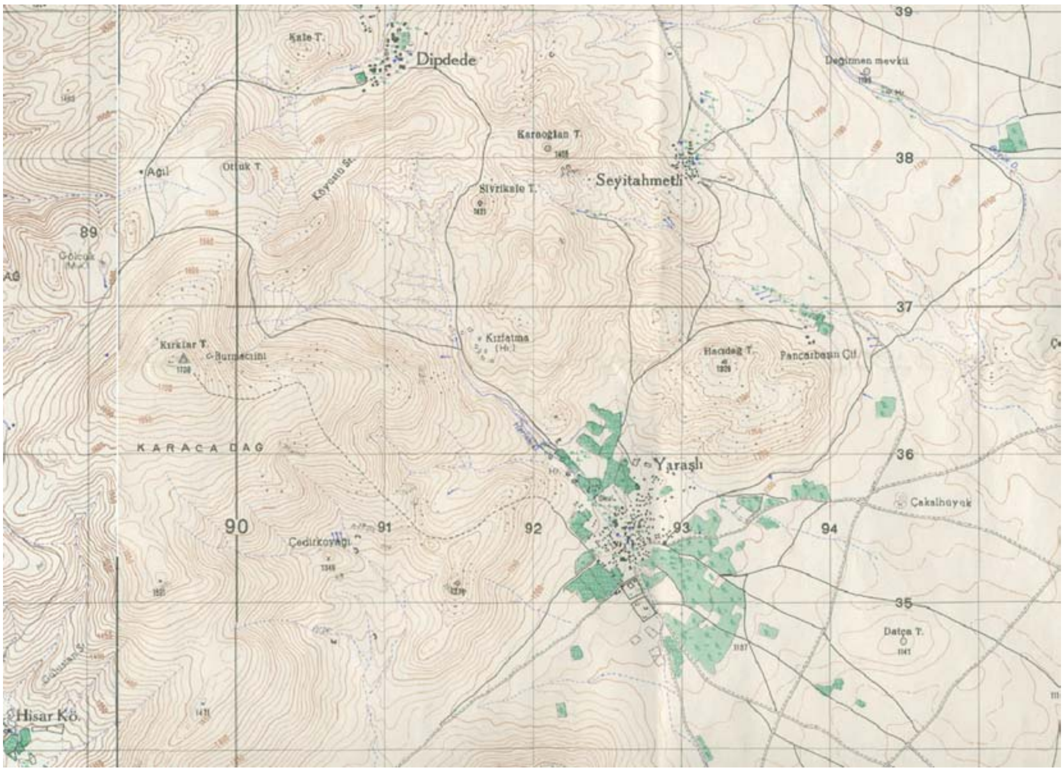

Figure 5: Topographical Map of The Study Area

2.2 FEATURES OF THE STUDY AREA

In a 1992 article in *Anatolian Studies* Geoffrey Summers described the identified major archaeological features under the following headings: "The Rampart and Ditch", "The Perimeter Wall", "Towers and Gate", "The Citadel", "The Interior of the Upper Town", "The Lower Town" and "The Ridge to the North-East". This terminology has been revised in this new phase of study. Because of the limited archaeological and historical evidence a less subjective terminology has been adopted so as to provide a more objective view prior to interpretation of the archaeological data.

Figure 6: View of Çevre Kale from top of Karacadağ. The Northern Enclosure and the west side of the wall as well as the rampart surrounding the fortress are visible in the middle of the image. Yaraşlı village and the fertile and plain agricultural fields are on the background.

The "Upper Town", protected by the rampart and ditch is now called the fortified area or "Fortress"; the "Citadel" has been renamed the "Northern Enclosure", and what was formerly named the "Lower Town" has become the "Southwest Area". In addition to these features are newly identified elements comprising "The Outer Wall", "The Dam", and "The East Gate in the Outer Wall". Details of each feature is discussed under “Descriptions of the Features Section” based on orthophotos and corrected blimp images. (**Figure 7**).

This renaming is related with the reinterpretation of Çevre Kale as a fortress rather than a town. This reinterpretation is based primarily on the strength of the defences when combined with the single gate through ramparts and the short period of occupation suggesting a special purpose rather than permanent urban settlement. (See Chapter 8 for the discussion.)

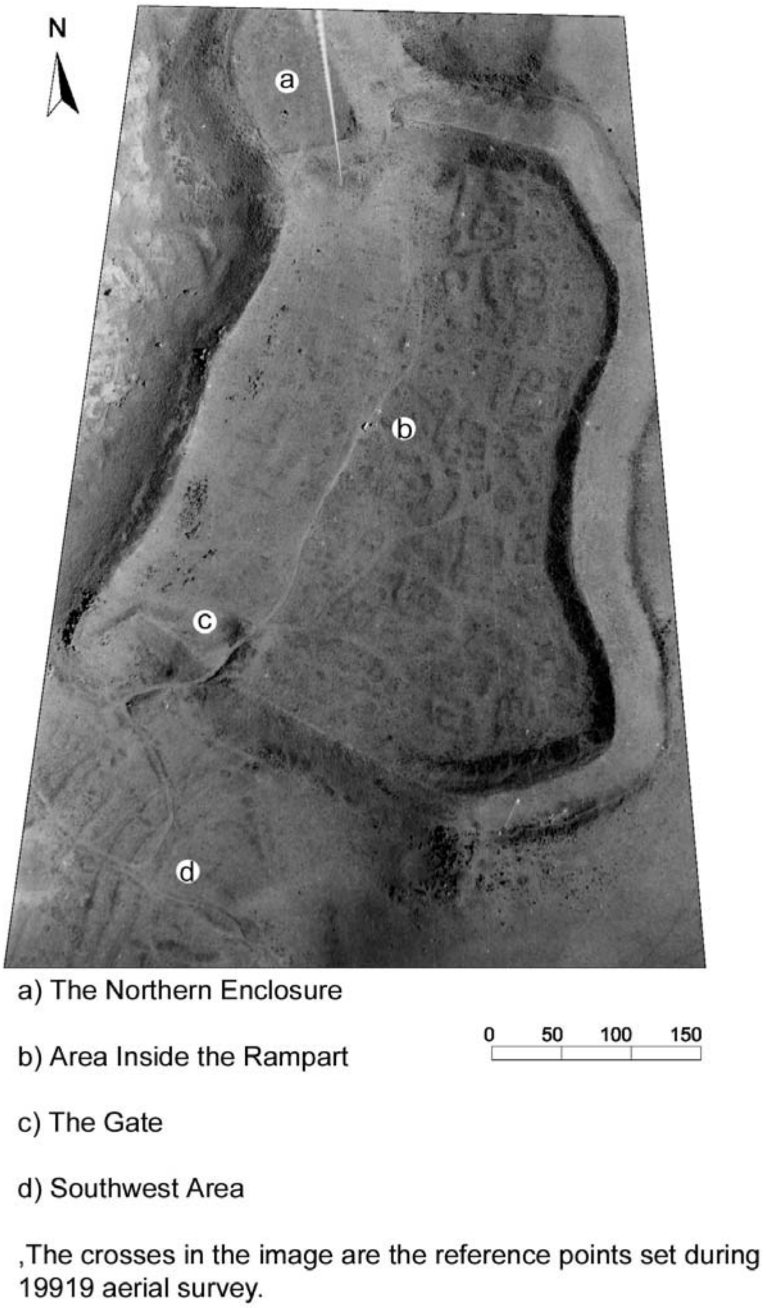

Figure 7: Rectified blimp image of the Çevre Kale made using Aerial V 5.27.The white crosses and dots on the image are the reference points set for measurements.

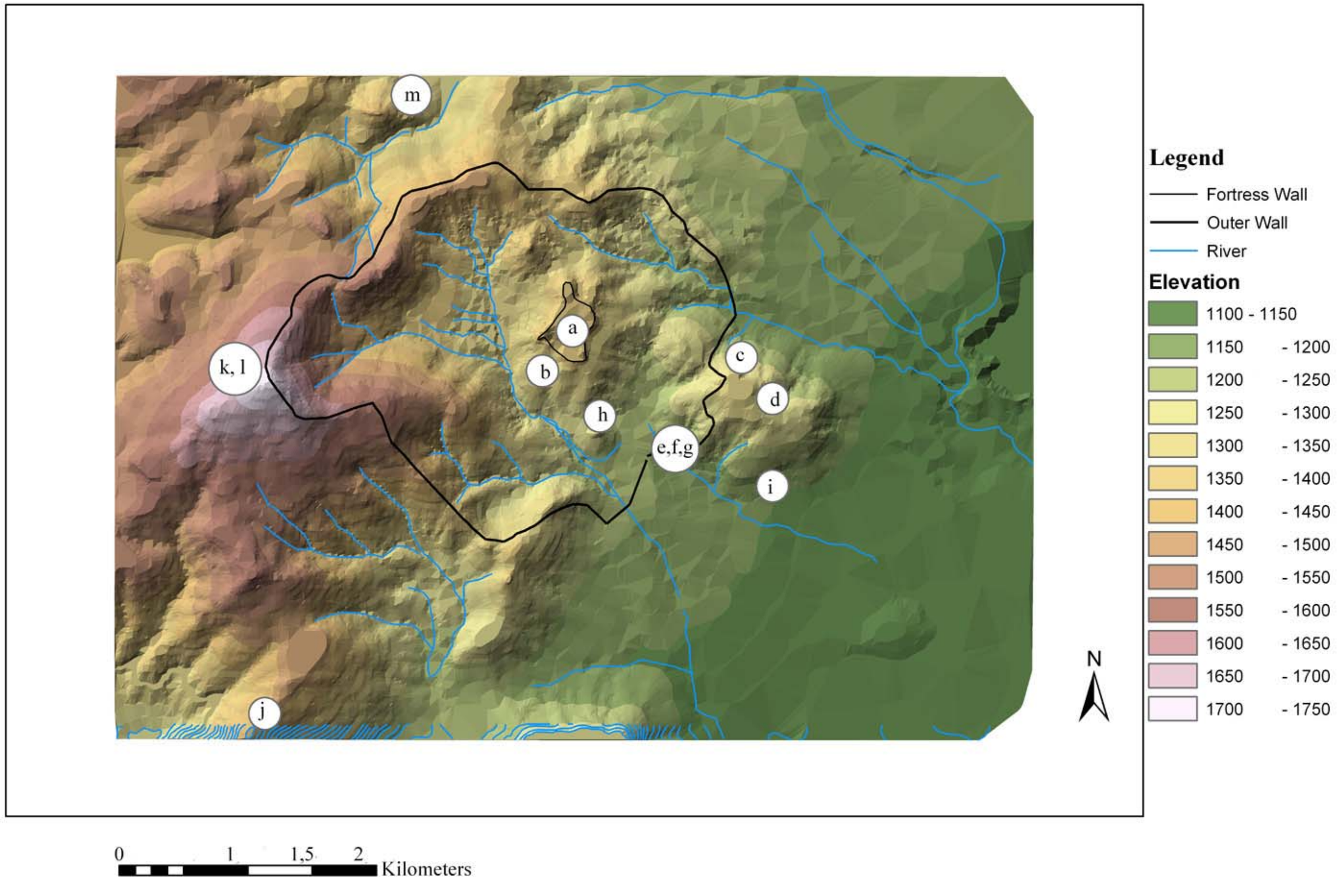

Figure 8: Features within the study area. a) Çevre Kale, b) SW Area, c) The Gate, d) Byzantine Remains, e) Yaraşlı Village, f) Grave Stones inside the village, g) Retaining Wall for the Dam, h

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2.3 OTHER ARCHAEOLOGICAL FEATURES ASSOCIATED WITH THE SITE

2.3.1 Tumuli:

There are three small tumuli visible just before entering the village from the south. [2] The taller one is robbed while the other two look very eroded. The Kaman-Kale Höyük regional survey team took GPS measurements but were unable to find any material remains during the course of their 2004 Central Anatolia Survey.[3] There are possibly other tumuli in the vicinity. (**Figure 9)**

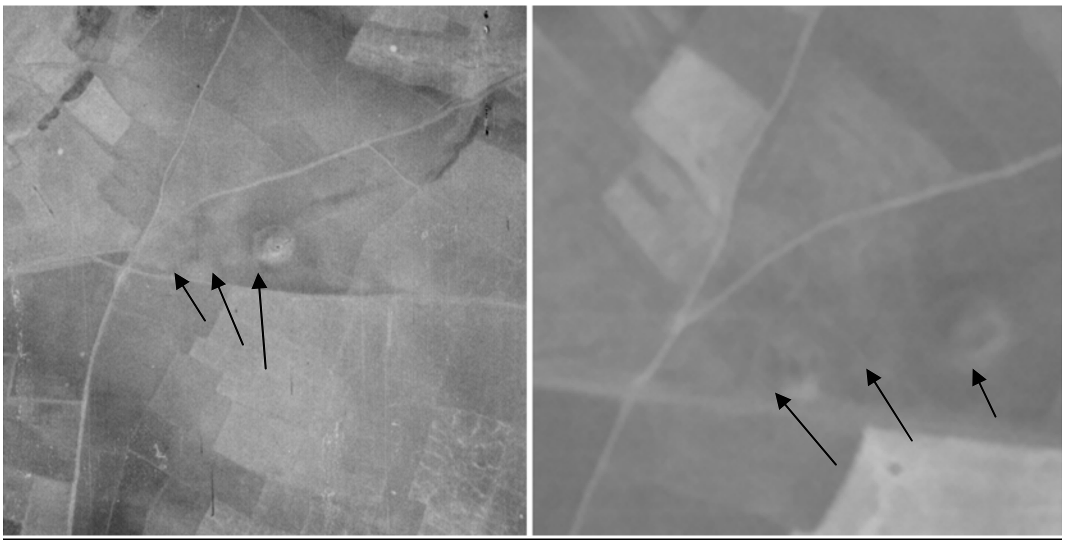

Figure 9: High altitude aerial image of three tumuli east of Yaraşlı Village. One of the three tumuli east of Yaraşlı village can be clearly seen in the aerial images. The other two are harder to locate although careful observation reveals them. (Photos are courtesy of General Command of Mapping)

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[2] Mellaart 1983, 345
[3] Omura 2005, 59-60

2.3.2 Cemetery And Possible Tumuli:

There is a (plundered) cemetery at Kırklar Tepe on the peak of the Karacadağ. Although this cemetery is plotted close to the summit of Karacadağ on 1/25 000 topographical map, its name is not given. There is also possible "cave" plotted as Burmacıini in this area, but its nature is unclear.

Figure 10: Kırklar Tepe. Tuna "Balık" Kalaycı looking at the reference point on Kırklar Tepe. Remains of plundered graves occur in the close vicinity. (Photo ID: 04yrsl02100)

2.3.3 Yaraşlı Kale:

A rocky outcrop on the northern edge of the village, which has slight traces of Hellenistic fortifications with occupation at its foot.[4]

[4] French and Mitchell 1973, 60

2.3.4 Agricultural Terraces And Field Systems, Animal Pens And Associated Features:

Inside the area surrounded by the outer wall there is evidences of field terracing as well as the outskirts of Northern Enclosure. Slight traces of these terraces are also visible in the high altitude aerial images. However, it is impossible to say if these terraces are either modern or ancient. (**Figure 11**)

Figure 11: Detail of the field terraces on the southern slope of Karacadağ. (Photo ID: 04yrsl0264)

2.3.5 A Possible Mound (höyük) and Byzantine Tombstones Built into a Çeşme in Yaraşlı Village

Most researchers to visit the site have noted remains of prolific spoila used in the village. Michael Balance and Alan Hall copied some of the inscriptions on Byzantine Grave stones during their filed trip in 1957 and squeezes are stored in the BIAA collection. During brief visits connected with this study several possible grave stones used inside water channel next to the recently built mosque were observed. Although no investigations have been made inside the village, an intensive survey might produce rewarding results in further study concerning the ancient occupation took place in this area. **(Figure 12)** It is important to establish whether or not there is a substantial Iron Age settlement beneath part of the modern village.

Figure 12: Several possible Byzantine gravestones inside the village. These were used as construction material on the water arch next to New Mosque. Though there is single stone is fully visible in the image, there are number of other gravestones used in the construction of the channel.

2.3.6 A Fortified Hilltop by the Village of Arşıncı:

This feature, previously unnoticed, is also clearly visible in the aerial images. The Kaman Kalehöyük Regional Survey Team surveyed this area in 2004.[5] Aerial images reveal traces of a rectangle shaped building. The area covered by this site is almost same as the area of the northern enclosure at Çevre Kale. The long side of the wall is around 75m and the short side is 25 m in length. (The site has not been visited). (**Figure 13**)

Figure 13: View of the fortress southeast of Arşıncı from high altitude aerial image.. The long side of the wall is around 75 m and visible short side is und 25 m. (Photo Courtesy of General Command of Mapping)

[5] Omura 2005, 61

2.3.7 Fortified Hilltop by the Village of Dipdede:

About 700m the west of Dipdede Village, and about 4 km to the northwest of Çevre Kale is a fortified conical hilltop named Kale Tepe on 1:25 000 topographical maps. (**Figure 12**) This is one of several significant archaeological features that can easily be traced from the aerial images, as well as by observation from the ridges of the Karacadağ. (**Figure 13**) This feature covers an area around 0.25 ha, which is smaller in size than the Northern Enclosure area of the fortress. The whiteness of the defensive walls may indicate the use of lime mortar, in which case a Byzantine date might be postulated. This site is not visible from Çevre Kale and does not appear to be connecting in any way with the Iron Age site. (The site has not been visited.)

Figure 14: Kale Tepe on the western side of Dipdede Village. The Roughly rectangular shape of the fortress is clearly visible. (Photo ID: 04yrsl0118)

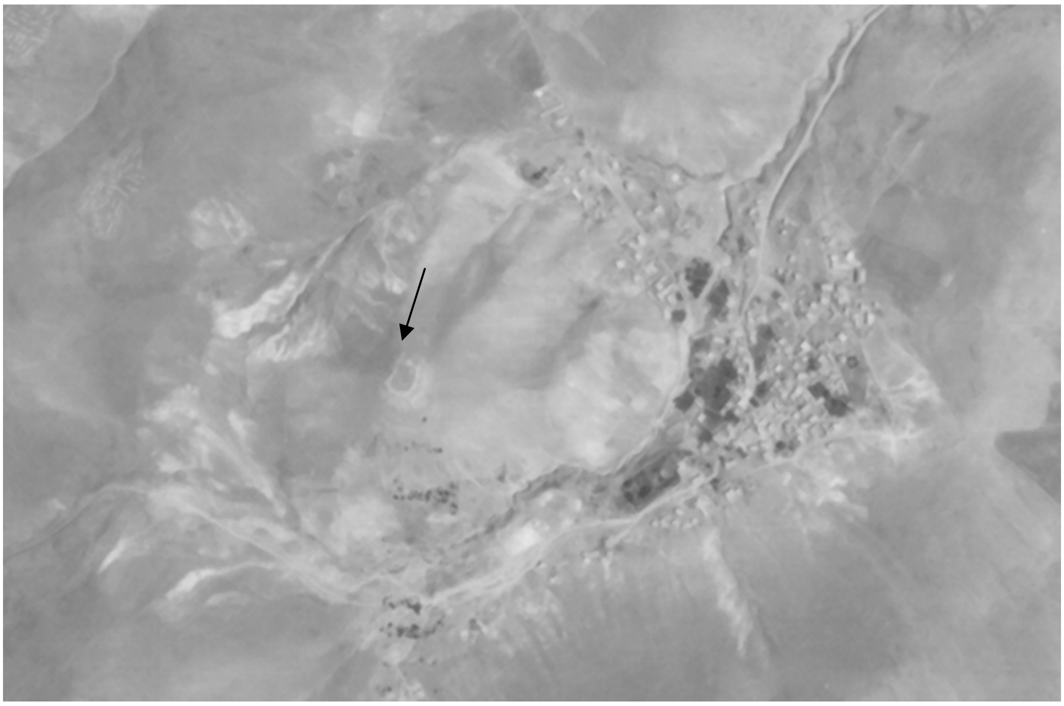

Figure 15: Kale Tepe on the western side of Dipdede Village. The Fortress walls with projecting towers or buttresses can be seen on this high altitude aerial photograph. (Photo Courtesy of General Command of Mapping)

2.3.8 Byzantine Remains on the hill to the east of the site:

There are Byzantine remains are located on top of Hacıdağ Tepe 1 km NE of Yaraşlı village. High altitude aerial images unfortunately do not provide detailed of this area.

2.3.9 Possible Beacon on the Karacadağ:

Anderson plausibly suggests that this peak was the site of the Isamos Beacon. In the 9th century AD, Leo the Mathematician calculated of a chain of 9 signal fires between İstanbul and Cilician Gates and it is assumed that one of the nine-signal points is located on Kırklar Tepe.[6] Although no evidence of a beacon was observed

[6] The information about the Isomos Beacon is provided from a web source. http://www.uni-heidelberg.de/subject/hd/fak7/hist/o1/logs/byzans-l/log.started960627/0019.html

during casual site visits, an undated cemetery and considerable recent disturbance could very well have obscured or obliterated any traces. Though the viewshed analysis made from the highest point of Kırklar Tepe shows that there invisible area surrounding the highest point, the view through further east and south is clear. On clear day, Hasan Dağı could be seen from this highest point. It is clear that summit of Karacadağ, Kırklar Tepe would be a suitable location for a beacon.

2.4 HISTORY OF RESEARCH

Çevre Kale, the other small fortress and ancient cemetery in the vicinity of Yaraşlı village have been in the archaeological literature for more than hundred years. Nevertheless, the site has never been the subject of an intensive survey or an archaeological excavation although several epigraphic surveys took place beginning from the end of 19th century.

The site was first visited by J.G.C. Anderson in 1892 during the course of his epigraphic surveys of Anatolia. He suggested that ancient Kinna was located at the village of Yaraşlı and that Karacadağ Mountain was obviously the site of Isamos Beacon, which picked up the signal from Hasan Dağı and flashed it on to the next station doubtless on the summit of Mount Dindymos (Gunusu Dağ).[7] Crowfoot also labeled Yaraşlı as Kinna locating it on the east side of the ancient road running from Ankara to the south.[8] However, the Byzantine Military Road did not passing through Yaraşlı according to Crowfoot's map.

Although Anderson associated Yaraşlı with Kinna, Mitchell located Kinna at Karahamzılı, close to the north end of the Salt Lake.[9] (**Figure 16**) Kinna is one of the sites that became a polis after North Galatia fell under Roman rule. This change in the political and administrative situation also had an impact on the settlement patterns and "hill forts of Galatian chieftains being abandoned while the first important urban centres appear under Augustus".[10] Differing from the other sites such as Tavium, Pessinus and Ancyra, which also earlier became poleis, nothing is known of the earlier status of Kinna, which became a polis somewhat earlier than reign of Antoninus Pius.[11] Mitchell accepts that the name Kinna is an indigenous Anatolian one, and it is thus not impossible that Yaraşlı was indeed Kinna. Further, it is possible that the name of Kinna could have been transferred from Yaraşlı to new Roman at Karahamzılı since identification of Karahamzılı with Kinna rests on the

7 Anderson 1899, 115
8 Crowfoot, 1988, 50, Pl. IV
9 Mitchell 1992, 21
10 Mitchell 199, 14
11 Mitchell 1992, 14

location of inscriptions, which were scattered in several villages. It is notable that Kinna, although an Anatolian name, is not known from any of the pre-Hellenistic sources. In this respect it mirrors almost all sites within the territory of the Kingdom of Phrygia.

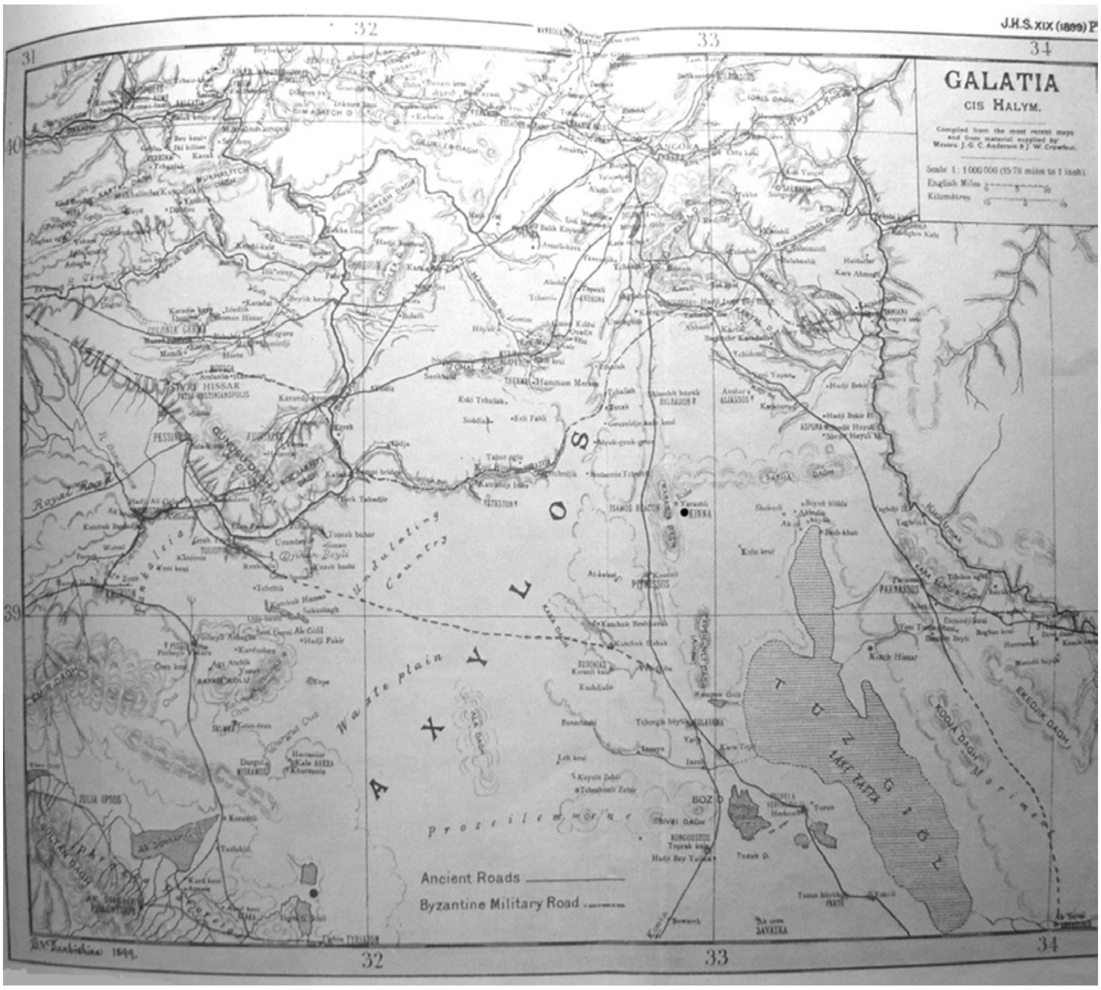

Figure 16: Karahamzılı located as Kinna by Crowfoot. (Crowfoot, 1899: Pl. IV)

Anderson pointed out that the ruins inside the village that were visible in his day did not have a very distinctive character and some of them which were composed of courses of large rough –hewn blocks without mortar, should be earlier.[12] He describes Çevre Kale and he also mentions that their guide declared the existence of an ancient roadway connecting the fortress with the summit of the Karacadağ. Anderson and his company avoided following that path under blazing August sun, but Anderson clearly mentions that he saw something looked like the line of a path.[13] However there is no detailed information about the beginning or the orientation of the wall. The roadway anecdote is quite striking for our study for two reasons. Firstly because the only documented part of the outer wall is defined as a "track" on the 1/25000 map. So it is possible that what the villager pointed out and what Anderson as a path was in fact be the remains of outer wall. However, there is another candidate for this aforementioned "path", which is the track alongside the SE section of the outer wall. Further exploration in the early years of the 20th century was mostly restricted to epigraphic surveys. It is very probable that Calder visited Yaraşlı during his epigraphical 1908-summer survey though he does not mentions the site in his 1910 article. However in order to describe the location of another ancient site; Karakilise -presumably as site with remains of an Early Christian Church-, a village on the northern slope of Karacadağ, he uses compass measurements referenced to Kinna.[14] In 1954 Ian Macpherson studied inscriptions in the Yaraşlı village though he does not describe the earlier site. In or before 1956 Early Bronze Age pottery from Yaraşlı was brought to Ankara Museum.[15]

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[12] Anderson 1899, 115
[13] Anderson 1899, 115 116
[14] Calder 1910, 298
[15] Summers 1992, 180

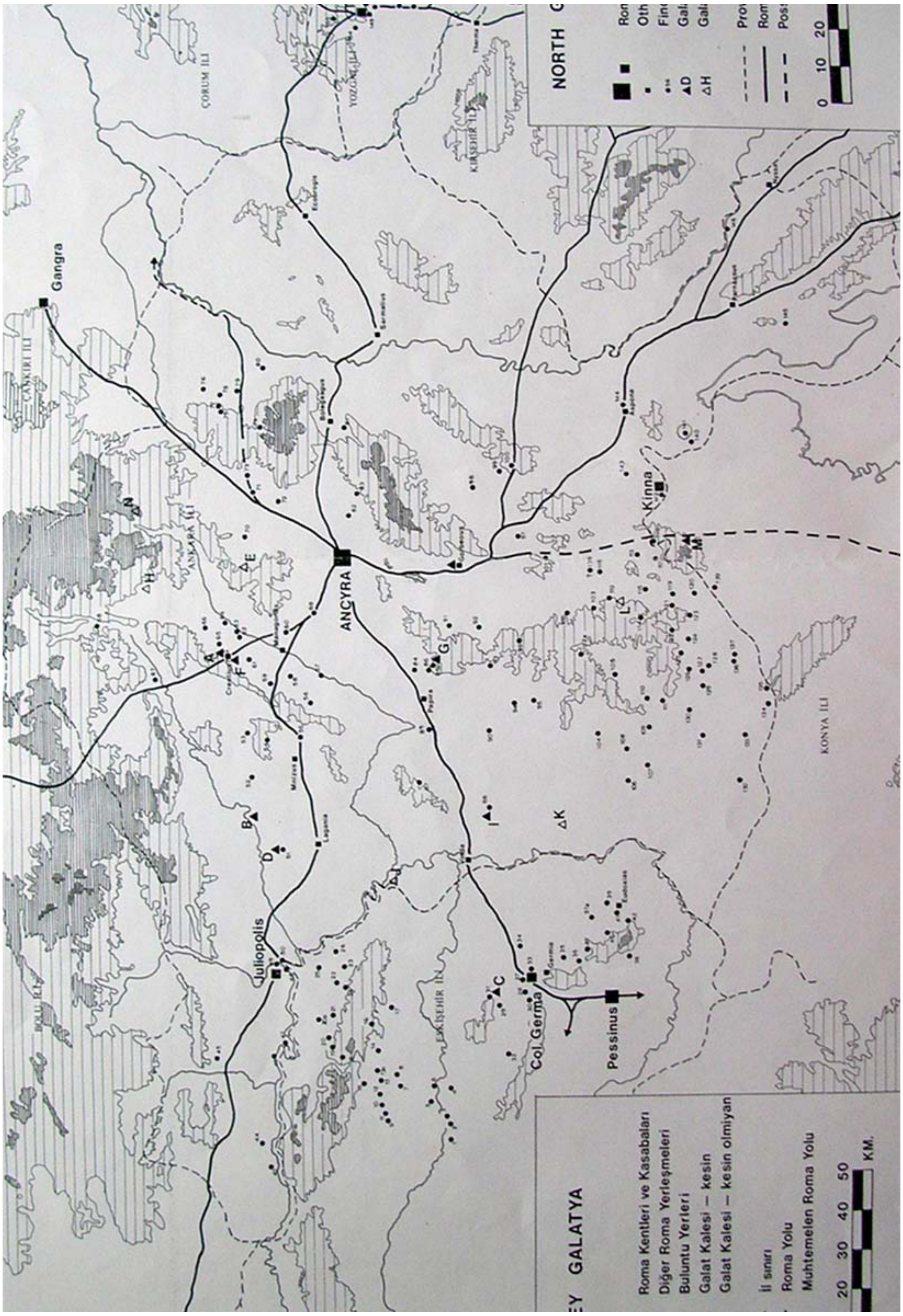
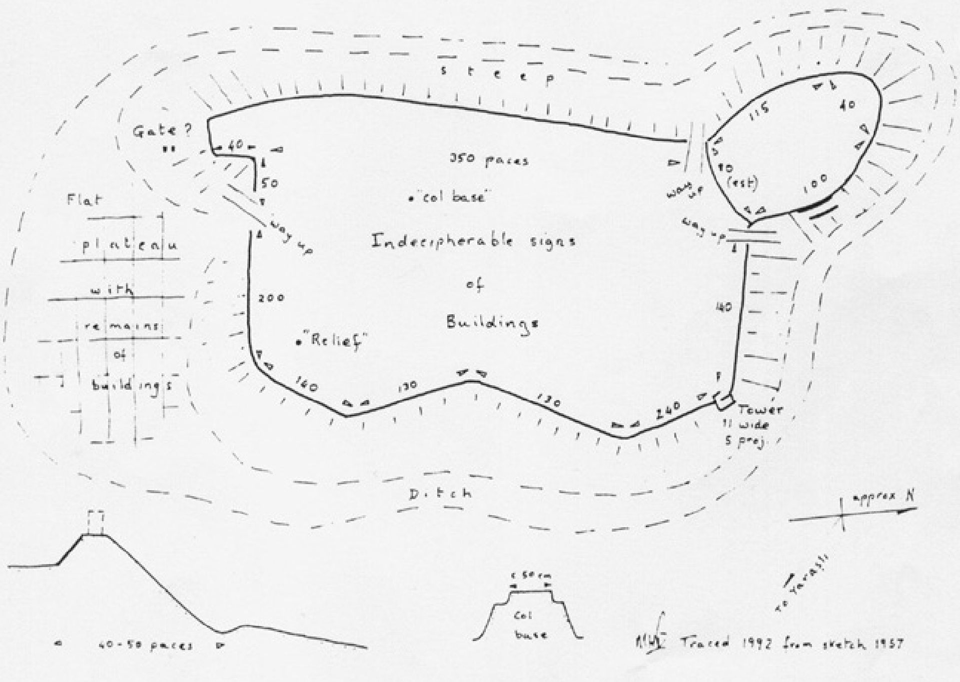


Figure 17: An alternative suggestion for placement of Kinna at Karahamzılı Village. (Mitchell, 1992)

On May 26th 1957 Michael Ballance and Alan Hall went to Yaraşlı in search of epigraphic material. During this visit they copied inscriptions of several Byzantine gravestones. Michael Balance made a sketch of the fortress (**Figure 18**). Although they collected some sherds, which are now housed in the British Institute of Archaeology at Ankara, no record of their precise provenance at the site has been located. Alan Hall made a second trip with James Mellaart and David French in October 1958. Geoffrey Summers also provided the information that Yaraşlı was the first site that Mellaart and French visited during their survey in 1958 where Çatalhöyük was discovered. In 1959 Mellaart revisited the site with Hans Güterbock and Judy Birmingham.



Ink tracing of the pencil sketch plan made by Michael Ballance in 1957.

Figure 18: Plan of Yaraşlı drawn by Michael Balance. (Summers, 1992: 182)

David French and Stephen Mitchell give a brief summary of the fortress in a guidebook prepared for the 50th anniversary of the Turkish Republic.[16] They mention that many gravestones belonging to an ancient cemetery were used in the village buildings, and two forts; one on a small hill immediately above the village (=Yaraşlı Kale) and the other Çevre Kale are the most striking features of the area. The dimensions given for Çevre Kale in the guidebook are 1.5 x 1 km and it is exagerated.[17] Summers also noted that Mitchell conducted epigraphic studies at Yaraşlı in 1970s.[18]

In 1983 article Mellaart describes Çevre Kale as being 500 x 200m or more, surrounded by a 1400 m long circuit wall of solid rubble some 4 to 5 m thick. In addition, he drew a sketch plan. Mellaart underlines the impressiveness of the glacis on the eastern side, which has been little altered and still makes a strong visual impression. Mellaart also notifies that the interior of the site was ploughed at the time of his visits. During our casual site visits, one in autumn and one in spring we observed that the area inside the fortress is not subject of agricultural purposes anymore. Mellaart also observed that while Phrygian Grey Ware is dominant inside the fortress, he noticed almost no 2nd millennium pottery. He records the Hittite type pottery found in the wall and suggests a Late Bronze Age construction date.[19] He also sketched a postern in the western part of the rampart, close to the northern enclosure. Mellaart also associated the site with Hittite Period Šallapa.[20]

In 1991, during the first intensive archaeological research done at Yaraşlı, Françoise and Geoffrey Summers conducted an "Aerial Survey" of the fortress using a 35mm camera lifted by a tethered balloon. The aim of this survey was to produce photographic data that could be used to draw an accurate plan of visible features and to determine the relationships between the various elements of the site.[21] The major reason for using balloon photography was to get around restrictions on conventional

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[16] French and Mitchell 1973, 60-62
[17] French and Mitchell 1973, 60-62
[18] Summers 1992, 183
[19] Mellaart 1983, 345
[20] Mellaart 1983, 345
[21] Summers 1992, 179

aerial photography and access to maps that were in place at the time of this study. On the other hand, computers with graphic capacities to process this sort of data did not exist. As a result, the fortress and the northern enclosure together with the extramural features in front of the fortress and some of the immediate environs were photographed using black and white, color negative, and slide films. Survey with a total station made it possible to draw profiles across the site and recorded points with xyz coordinates that permitted photographs to be printed to scale and then cut and pasted into a mosaic. (**Figure 19**) The plan drawn from this mosaic was rectified manually. (**Figure 20**) All of the aerial data is stored in the archives of the BIAA.

Figure 19: Manually made mosaic of blimp images of Çevre Kale.

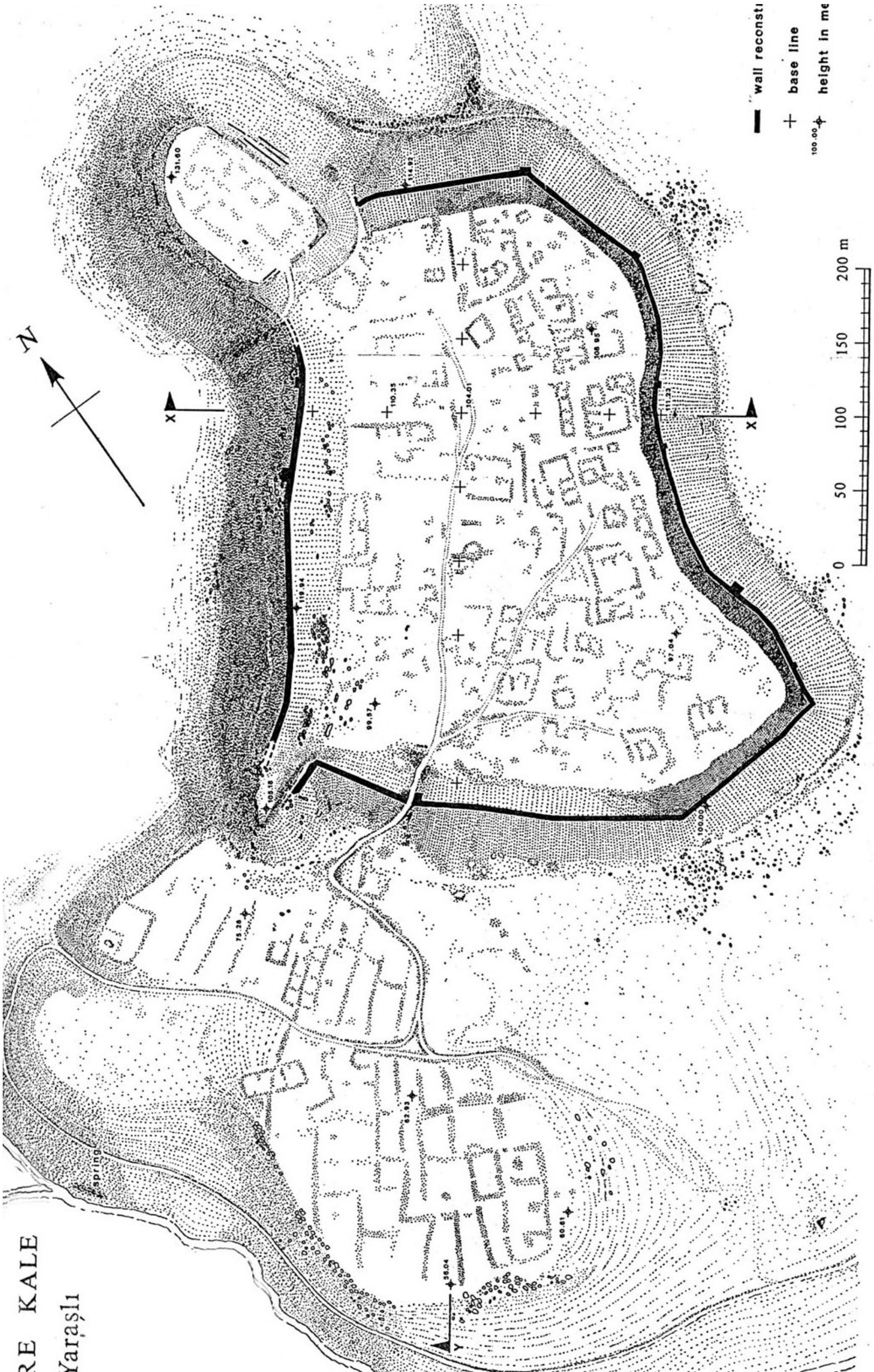

Figure 20: Plan drawn by Françoise Summers by using manually rectified blimp images. (Summers, 1992)

Finally, a team of the Kaman-Kalehöyük Central Anatolia Regional Survey investigated the three tumuli just at the south entrance of the village of Yaraşlı, and several other small fortresses in the vicinity in 2004. (**Figure 21**) They did not, however, investigate the site of the fortress.[22]

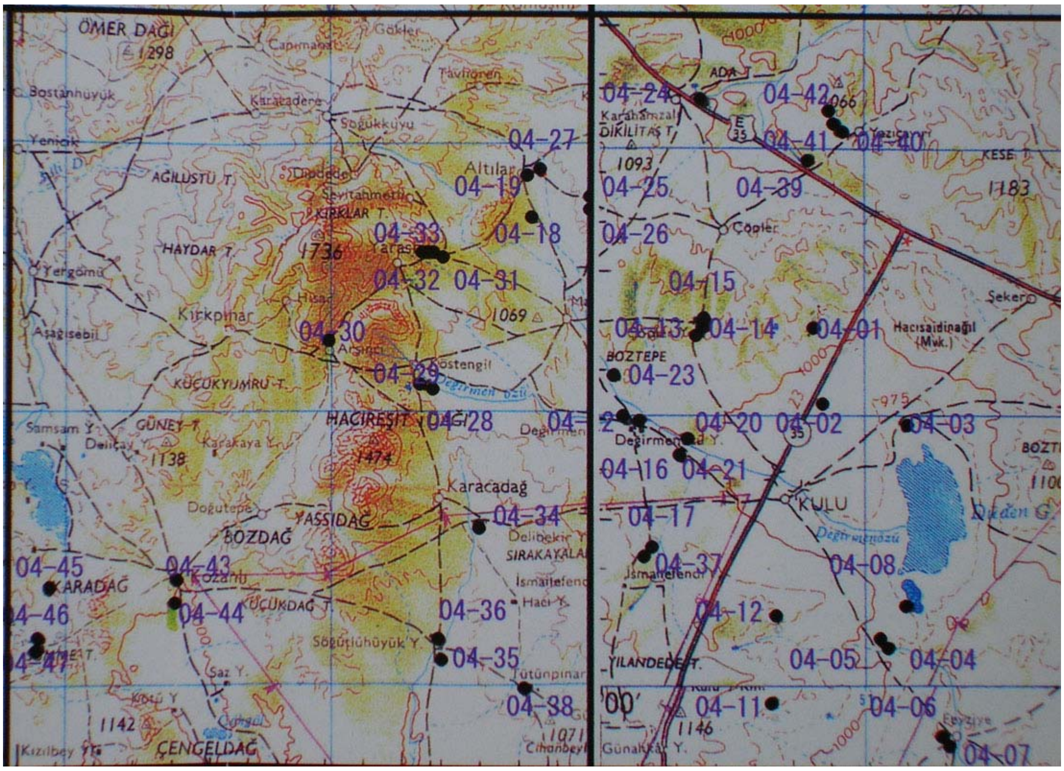

Figure 21: Sites surveyed in the vicinity of Yaraşlı by Kaman-Kale Höyük Central Anatolian Survey Team in 2005. Numbers 31, 32 and 33 are the three tumuli just outside of the Yaraşlı village. (Omura 2005)

22 Omura 2005, 59-60

CHAPTER 3

NEW PHASE OF THE STUDY

3.1 METHOD

Archaeological research in Anatolia is still largely dominated by the culture-historical approaches established in the early years of archaeological theory.[23] There are exceptionally few projects employing a variety of new scientific methods, particularly GIS and Remote Sensing, integrated into a broad theoretical approach. However, number of projects carried out on major Iron Age sites in Anatolia have shed much new light on our understanding of the period. Results of multidisciplinary studies from Iron Age sites have produced critical new data. These evidences are changing the widely accepted chronology and occupation history of the Iron Age: The change in the date of the "Gordion Destruction Level", a generally accepted reference point for Anatolian Iron Age, and the Luwian Hieroglyphic evidence studied by David Hawkins, are leading to re-evaluations of our understanding of the Anatolian Iron Age.[24] In addition to this new knowledge, developments over the last decade in the field of remote sensing and computing technology provide tools that enable archaeologists to visualize ancient landscapes within a wider framework as well as to combine and analyse different layers of data easily.

The available archaeological and historical evidence, combination of intensive on and off site survey and developments in remote sensing and computing fields is now offering new insights to the archaeologist who works on ancient landscapes. In this regard, the recent work carried out on the Iron Age fortress of Yaraşlı took advantage of the pioneering applications of this sort carried out on the

[23] Erciyas 2005, 179.
[24] Kealhofer ed. 2005, see also Hawkins 2000

Near Eastern and Mediterranean landscapes as well as the recently developed computing facilities which enable users to manipulate several layers of data.

The methods employed by the Yaraşlı Case Study fall within the discipline of landscape archaeology because the study will focus on the analysis of maps, remotely sensed imagery prior to fieldwork and evidence from previous studies. [25] However, this approach differs from the usual methodology in that recovery of new material could not be carried out during the course of new fieldwork since this study is focusing on remotely sensed imagery.

This author's research at Yaraşlı has the overall goal of broadening our understanding of a complex archaeological landscape by employing high altitude stereo pairs of aerial photographs to document the visible features of the site. This has been done by using a combination of GIS data layers. This project is the first of its kind to be conducted in order to place an Anatolian Iron Age site in its context.

[25] Wilkinson 2003, 33

3.2 REMOTE SENSING

At the initial stage of the Yaraşlı Case Study, the use of satellite imagery to document the outer wall was proposed. Satellite images are superior to aerial images in their capability of seeing in wide ranges of spectra (which the human eye cannot see) and they cover huge land areas in single images.[26] The images provided by LANDSAT and SPOT have pixel resolutions sufficient for geomorphological studies.[27] On the other hand, to locate and plot the outer wall at Çevre Kale, which is made of uncut andesite, is less than a meter high in most areas and only some 2 m wide, requires a satellite image with higher resolution. The images from the Quick Bird satellite were ruled out on grounds of cost. The final solution was to use recently declassified aerial images provided by the Turkish authorities.

Figure 22: Satellite imagery of the study area taken from Google Earth. The fortress and the outer wall are clearly visible.

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[26] Kouchoukos 2001,84
[27] Ur 2003, 102

3.2.1 Aerial Imagery

Aerial photography for archaeology is described as "an airborne method for archaeological survey for discovering new sites and monitoring the known sites and landscapes"[28] and this technique became a tool for surveying the ancient sites in Great Britain and later mainland Europe in the second half of the 20th century. Felix Tounachon probably took the earliest aerial photograph, over Paris in 1858.[29] At the start of the 20th century the Roman town of Ostia[30] and in 1906 Stonehenge were photographed from the air.[31]

On the other hand, there is no question that the development of aerial photography was related with the two World Wars. The use of airplanes and cameras during the World War I effected the development of aerial photography as well as the interpretations of the photographs.[32] In World War II, military intelligence units employed archaeologists.[33] In this sense it is not a coincidence that pioneering names in the applications of aerial photography for archaeological purposes were members of the military forces or trained by air forces. Of those names, Sir John Mayers later noted that when he was flying as an artillery observer for the fleet during the Gelibolu campaign in 1916' he was distracted by the unexpected view of the villas and gardens of Roman Branchidae (Didyma) and he would never willingly dig again without aerial reconnaissance[34], Oberleutnant Falke of the German Air Force took air photos of the archaeological sites in Negev Desert in 1917 while Dr. Theodore Wiegend was at the same time obtaining aerial photographs of ancient sites in Western Turkey[35], Beazeley became interested in the ancient sites and canals recorded by air photographs while he was flying with Royal Flying Corps[36], O.G.S.

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28 Bewley 2000, 3
29 Wilkinson 2003, 35
30 Renfrew and Bahn 1993, 69
31 Bewley 2000, 3. For brief history of aerial archaeology see Riley and Kennedy 1990, Deuel 1971 Wilson 1982, and Renfrew and Bahn 1991.
32 Bewley 2000, 3
33 Renfrew and Bahn 1993, 72
34 Riley and Kennedy 1990, 48
35 Kennedy 2002,34-35
36 Riley and Kennedy 1990, 48

Crawford, one of the first to realize importance of aerial photography in terms of mapping ancient sites was an observer in the Royal Flying Corps[37] and the Jesuit priest Père Antoine Poidebard who photographed ancient landscapes in Syria during 1920s and 1930s trained by Royal Air Force (later name for the Royal Flying Corps).[38]

3.2.2 Technique

A basic aerial photography process has three main steps: firstly, aerial reconnaissance which covers surveying from the air on a regular basis and taking oblique or vertical photos; secondly, cataloguing and maintaining libraries of negatives and prints; finally and most importantly is interpretation and mapping from the aerial photographs.[39] There are two types of aerial photographs; vertical and oblique. Vertical photographs are taken with the use of specific equipment and specially adapted aircraft.[40] These images are most suitable for mapping purposes.[41] They are generally taken in continuous overlapping rows to allow them to be viewed stereoscopically.[42] On the other hand, oblique aerial photographs are relatively easy to obtain since hand-held cameras are usually used while flying in a high-wing aircraft.[43] An aerial survey has several advantages such as extensive coverage and cost effectiveness. At the same time, aerial archaeology locates ancient sites within their landscapes. As in the case of the “Wings over Armenia project” where an airplane is not available aerial survey can be done with a paramotor, or by using tethered blimps, kites or similar sorts of flying equipment and a hand-held digital camera. The Wings Over Armenia Project began with the use of CORONA satellite imagery to identify and locate ancient sites. Afterwards, with very limited sources, an aerial survey was carried out by flying with a paramotor. As a result more than 1500

[37] Bewley 2000, 4
[38] Kennedy 1998, 553, see also Kennedy 2002,
[39] Bewley 2000, 5
[40] Bewley 2000, 6
[41] Renfrew and Bahn 1993, 72
[42] Bewley 2000, 6
[43] Bewley 2000, 6

oblique aerial photos were taken and this provided insights to the former know sites. It is also possible to use a paramotor or similar flying object.[44] The decision for the area to be excavated was decided by evaluating the aerial images of Kaman Kalehöyük in 1986.[45] The 1992 Aerial Survey of Yaraşlı was a one of its first example in Turkey, and further examples of the practice applied to ancient sites at Kerkenes and Göllüdağ in the last decade.[46] On the other hand, it would be fair to say that continuous aerial survey is not part of archaeological study in Turkey although almost fifty years ago Turkey was named as a country, of cardinal importance for aerial archaeology.[47]

As summarized above, aerial photography has been a tool for the archaeologist since the early years of the 20th century.[48] This technique has helped archaeologists "to discover new sites, provide an understanding of the ancient landscapes and establish a basis for conservation strategies".[49] In this sense, the Yaraşlı Case study includes almost all aspects of aerial archaeology. Recording the recently discovered features of the site for the first time easily fits into first aspect, "discovering new sites"; whereas visualizing the features of this complex archaeological landscape at one and the same time can provide an understanding of the development or evolution of ancient landscapes. While not an integral part of this study, a portion of this project should involve public administrators as well as archaeologists in order to integrate Cultural Heritage Management concerns.

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[44] Faustmann and Palmer 2005, 402. Wings Over Armenia Project has been established by the recall of Armenian archaeologists to AARG to establish an aerial survey in 2000.
[45] Mikami and Omura 1986, 87-88
[46] A summary for the blimp imagery at Kerkenes can be found at http://www.kerkenes.metu.edu.tr/kerk1/12propub/kerknews/1998/phase1en.htm. For the English summary of work at Göllüdağ See Gates 1995 and 1996.
[47] Bradford 1957, 5
[48] Renfrew and Bahn 1993, 69
[49] Bewley and Rączkowski 2002,1

3.2.3. Aerial Data Sets

In the Yaraşlı Case Study, two types of aerial images were employed: the blimp photographs from the 1991 Aerial Survey and high altitude stereo pairs of aerial photographs provided by the General Command of Mapping.

3.2.3.1. Blimp Images from the 1991 Survey

The blimp images were taken using helium filled tethered blimp with a capacity of 20 cubic meters and a net lift of 9.5 kg. The lift includes the weight of the tether rope as well as that of the photographic equipment and sling, and decreases through the morning as the temperature rises. When the survey was undertaken relatively inexpensive balloon gas was not available in Turkey. When the blimp was ca. 850 m above the ground, the entire fortress was photographed using a 35 mm camera with a 28 mm wide-angle lens. Most of the images were taken from lower altitudes, however. Black and white negatives, colour negatives and slides were taken to document the fortress itself, together with associated archaeological features, in impressive detail. The detail of the features of the fortress shows variety due to altitude at the time of photography. (**Figure 23**)

The intense wind at the site provided a challenge to control the blimp, even though the study was carried out during mid summer, the least windy period; this interference affected the distribution of the images on particular areas of the site. At the time of the study digital cameras, which enable users to take, more than one roll at once (36 images) and see images without time consuming processing was not available Eventually the blimp was torn from its moorings by the wind, bringing the survey to a slightly premature end. [50]

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[50] Summers 1993,13

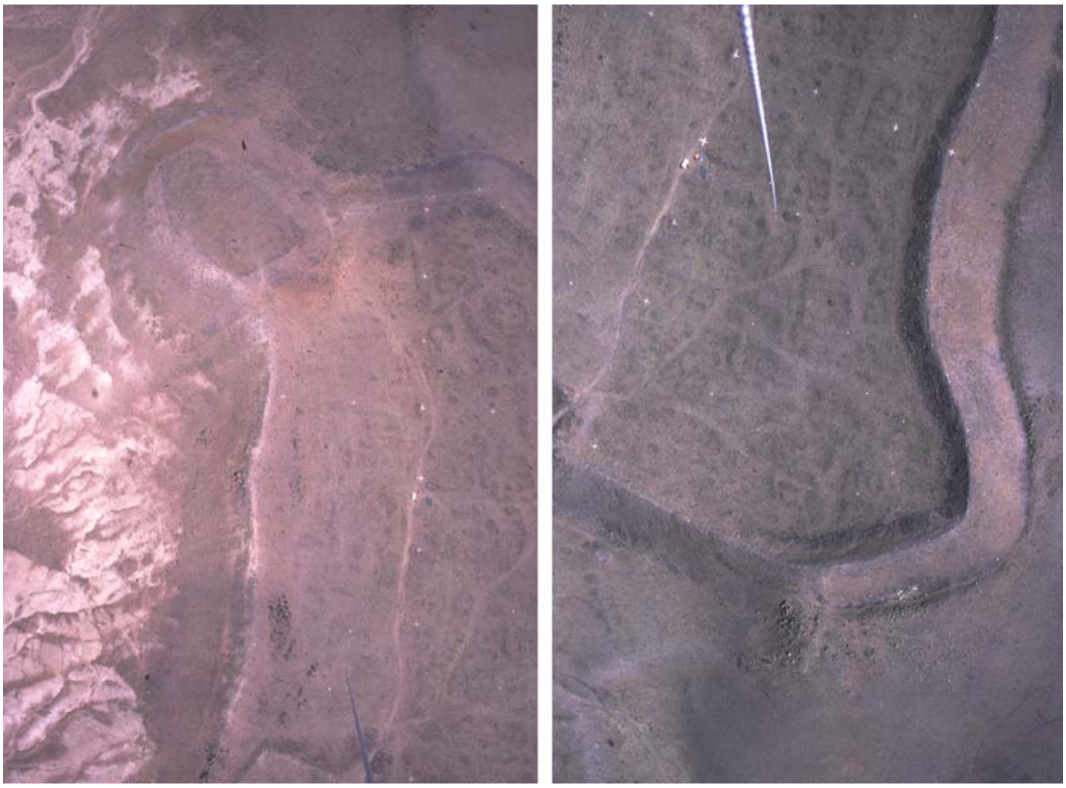

Figure 23: Blimp images documenting the northern enclosure, showing the northwest portion and the southeast corner of the fortress.

3.2.3.2 High Altitude Stereo Pairs of Aerial Photographs

High altitude stereo pairs of aerial photographs were taken by the General Command of Mapping from aeroplanes, probably for the purpose of mapping. As a result of official application through Middle East Technical University, hard copies of 23x23 cm declassified high altitude aerial images were provided by from the General Command of Mapping at Ankara. Each high altitude aerial images cost 7 YTL without tax, and 21 high altitude aerial photos (3 sets of shoots belonging to various years) were bought for around 173.45 YTL.[51]

[51] Kerkenes Project funded part of the aerial photo expenses and provided the software for processing aerial imagery.

These pictures were taken in three different years: 1954, 1980 and 1991; it must be noted that none of the images were taken for archaeological purposes, and they were not taken during a time of year most suitable for archaeological photography. The images of 1954 are at a scale of 1/35,000 and most of the study area is under heavy cloud cover. The scale of the 1980 and 1991 high altitude images is 1/25,000, a rather unsuitable scale for aerial archaeology, but the fortress and most of the outer wall is traceable. Although these images might seem to be outdated at first glance, older images have more potential to provide information on ancient landscapes because they preserve snapshots of a landscape before and during periods of rapid urban growth in the second half of the twentieth century. Most ancient landscapes in Turkey are under this threat of fast population increase and resulting uncontrolled urban growth.[52] This phenomenon is clearly visible in the aerial images from 1954 to 1991, which show the expansion of settlements on former agricultural areas. The change in the landscape through 1954 to 1991 is dramatic, especially around the Yaraşlı village, a relatively fast growing village that has a population working abroad and making investment in the village by building large villa type houses. The site and its features provide material for construction purposes and, unfortunately, evidence for severe destruction in parts of the outer wall, especially the retaining wall of the dam and the fortress gate, is noticeable at first glance in the images of 1954 and afterwards. Most of the stone robbing from the fortress occurred when the school was built. (Geoffrey Summer Pers. Comm.) The coverage of each image is extremely comprehensive when compared with a single blimp image. Each 1/25,000 scale high-altitude image covers an area of about 40 km^2 .The images include the fortress, Yaraşlı village, the possible fort in Dipdede Village, possible mound/tumuli to the SE of Yaraşlı village, and, most importantly, the outer wall, which had not been documented before. The geographical features such as the Karacadağ Mountain Range, andesite outcrops, river valleys, in addition a couple of seasonal lakes and other small villages are visible in those images. It is important to note that the high-altitude images are at a scale of 1/25,000, which is unfortunately

[52] Kennedy 1998, 555

too small to provide precise detail of the architectural features. Only rough geometric shapes in the features are traceable. (**Figure 24**)

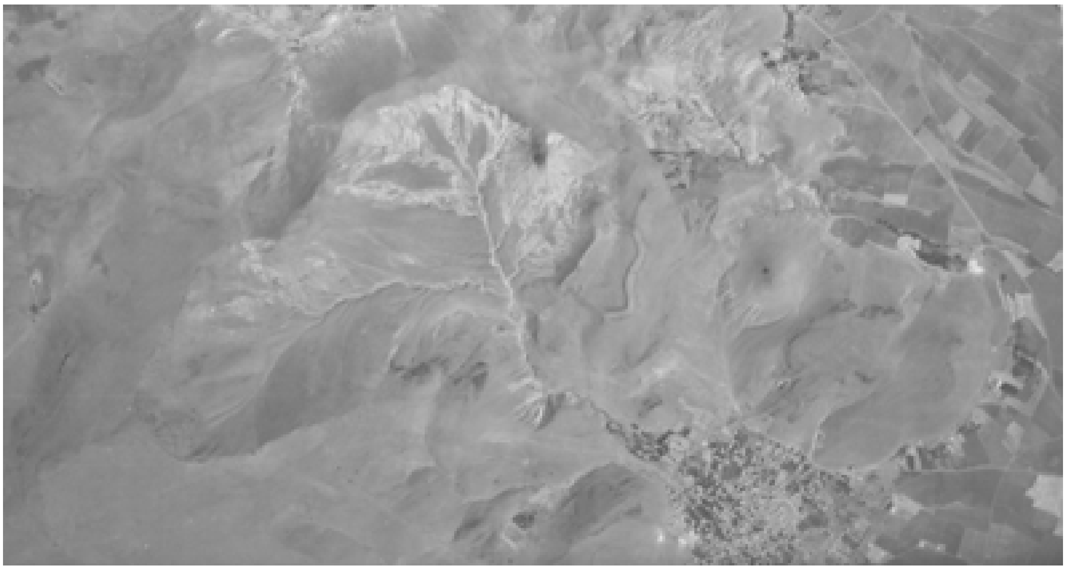

Figure 24: Study area from on a high altitude aerial image. (Photo Courtesy of General Command of Mapping)

As an initial step before processing the aerial images three overlapping images covering the study area examined by using a mirrored stereoscope. This examination clearly shows the strength of the declassified high altitude aerial images in terms of archaeological documentation purposes. Most of the outer wall, the fortress and part of the rampart and the ditch surrounding the fortress in addition to the several other possible archaeological features plotted. In addition 3D provided by the stereoimages enables user to see the topography and how features are associated with each other. (**Figure 25**)

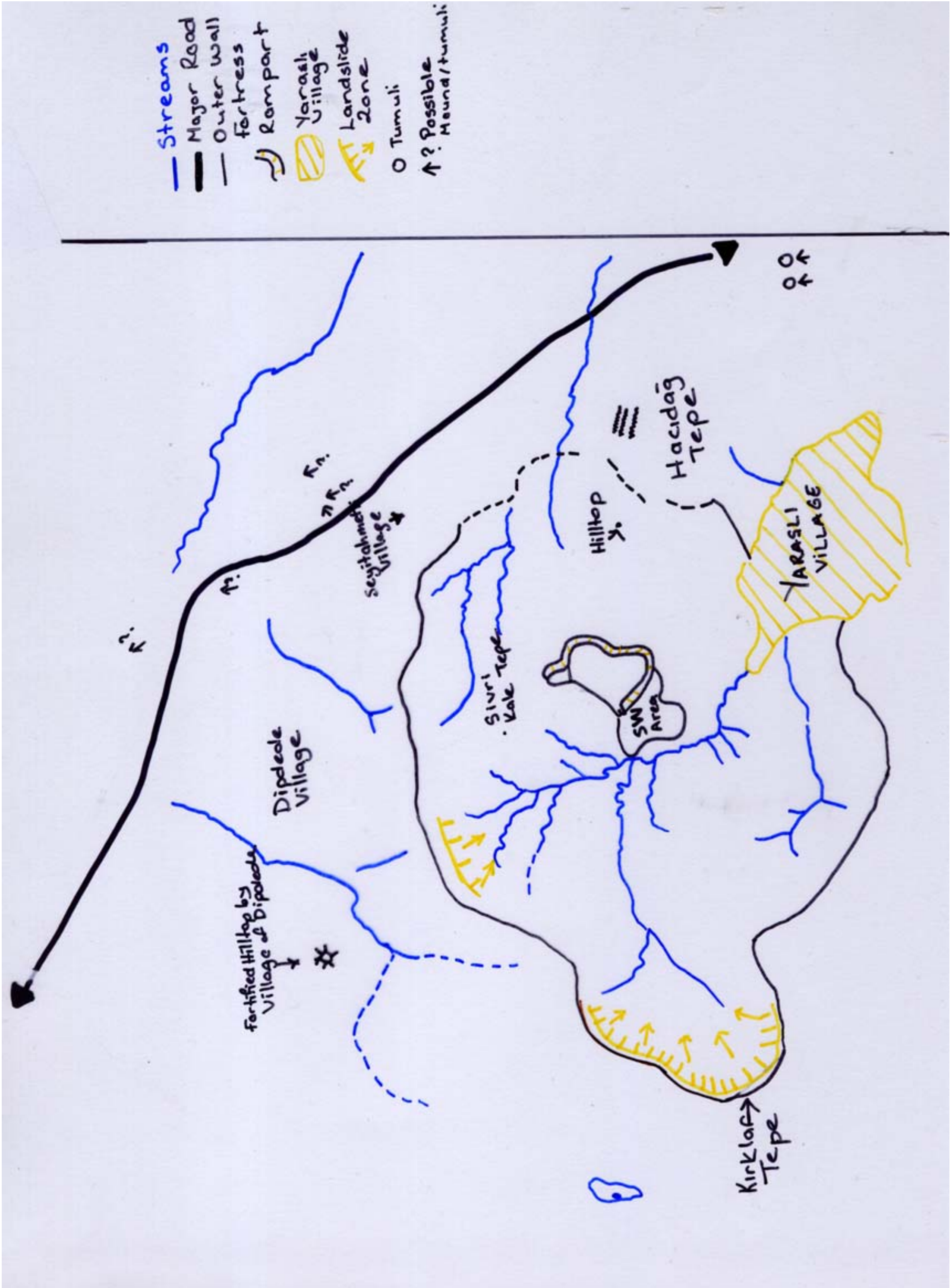

Figure 25: Air Photo Interpretation before processing the aerial images.

3.2.4 Image Processing

Vertical aerial images are helpful to visualization of features of the landscape since they are plan-like views of the real world. Aerial images can thus be used as photomaps; however, all aerial images contain distortions due to the camera distance from the object, the lens used, the changes in the observation point, and the relief of the earth.[53] In order to obtain a map-like geometry from an aerial image, these distortions have to be removed. The effects caused by the tilting of the camera axis can be corrected by the rectification process however; but rectified images still contain image displacements and scale variations due to topographic relief.[54] The distortions caused by the topographic relief can be removed in a process called differential rectification or orthorectification. [55] These distortions in aerial images can be corrected with special soft wares. While some of these software products, such as AERIAL, were specifically created for archaeological purposes, some others come with a toolbox of very sophisticated Geographical Information Systems technology. In this study distortions of the aerial images are corrected through the employment of two different software products. This is because each aerial image type and associated available data required a different approach. Low altitude photographs of the fortress covering a relatively flat area of some 10ha was rectified through simple georeferencing and a resampling process with small error values. On the other hand, high altitude aerial photos that cover an area with great variation in height and very steep slopes corrected by an orthorectification process.

Two special softwares were used in the Yaraşlı Case study for image processing purposes. In order to rectify low altitude blimp images, AERIAL V5.27 created by John G. Haigh was used. Orthorectification of high altitude stereo images was done in TNT Mips V6.0, a raster based GIS software produced by

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[53] Wolf and Dewitt, 2000, 198
[54] Wolf and Dewitt 2000, 217
[55] Wolf and Dewitt 2000, 217

MicroImages.[56] Mosaics were made of corrected images were if they did not already cover the entire study area.

3.2.4.1 Orthorectification Using TNT Mips V6.0

In the Yaraşlı Case Study the orthorectification process was applied to 1/25 000 scale, 23x23cm high altitude aerial photos from 1991. This set was selected both the stereo pairs coverage of the study area and high-level visibility of the archaeological features on that set. Orthorectification simply requires two overlapping stereo images. The percentage of the overlap is around 55-65 % in a stereo pair.[57] Since high altitude aerial images were obtained in hard copy format, images selected for orthorectification process were scanned with an A3 desktop scanner at a resolution of 600 dpi. Afterwards all images were imported to TNT Mips software special file format; rvc files. In TNT Mips the user can create an orthophoto from either two overlapping stereo pairs or from one high altitude aerial image and a Digital Elevation Model (DEM). In the first way, after extracting a digital elevation model from overlapping high altitude aerial images, an orthophoto can be extracted from using this DEM to establish a corrected image from the overlapping area. This method is probably less desirable one since it takes very much time and requires at least basic knowledge of the photogrammetry terminology just to be able to follow the instructions given in the "Getting Started: Making DEMs and Orthophotos booklet that come with TNT Mips. In the second way, if only one georeferenced aerial image is available with in addition to a digital terrain model (DEM), the user can discard processes necessary for creating a DEM and directly extract an orthophoto. In the Yaraşlı case study, the DTM extracted from a digitized topographic data was available but because of the image quality and detail/resolution of available the DTM as well as the lack of control points on the images, it was decided to try both ways of creating a map like photo. Although the application of

[56] Technical aspects of each process were presented at the Annual Conference of the Aerial Archaeology Research Group at Leuven, Belgium in 19-21 September 2005.
[57] Wolf and Dewitt 2000, 6

the second way seems easier at first, it should be noted that creating a digital terrain model (if it not readily available from a source) also is a time consuming process.

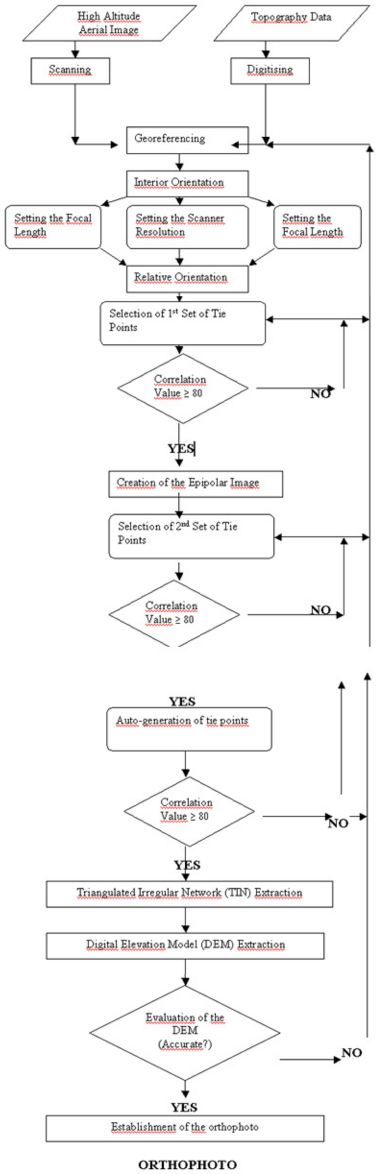

Figure 26: Algorithm for Image Processing

Orthorectification using two overlapping stereo images:

1) Georeferencing: In photogrammetry "georeferencing is a technique whereby a digital image is processed so that the columns and rows of the resulting project are aligned with north and east in a ground coordinate system"[58] A scanned aerial image is in raster format, which means the image consists of pixels of varying values. However, these pixel values are not associated with real world coordinates. In order to give real word coordinates to the pixels of the scanned aerial images, coordinates (x, y, z) of the known/reference objects are entered.
2) Interior Orientation: It is "the step which mathematically recreates the geometry that existed in the camera when a particular photograph was exposed"[59] After opening georeferenced right and left images for orthorectification, the focal length of the camera, scanner resolution and principal point values for the left and right images are entered. The focal length of the camera is given at the corner of each image. The principal point is the point where lines from the pinholes at the corners or edges of the high altitude aerial images intersect.[60] **(Figure 27)**
3) Relative Orientation: This is the most important and probably the most time consuming part of the orthorectification process done with the aid of software. In general terms relative orientation is "the process of determining the relative angular attitude and positional displacement between the photographs that existed when the photos were taken."[61] This process has two main steps; in the first step the user selects a number of points (tie points) from both left and right images so as to define the overlapping area and orientation of the photos.[62] **(Figure 28 and 29).** After selecting this first set of

[58] Wolf and Dewitt 2000, 189
[59] Wolf and Dewitt 2000, 246
[60] Getting Started, Making DEMs and Orthophotos, 6
[61] Wolf and Dewitt 2000, 247
[62] Getting Started, Making DEMs and Orthophotos, 7

tie points, the correlation value between points on both images should be checked and adjusted to obtain a better quality orthophoto. **(Figure 30)**

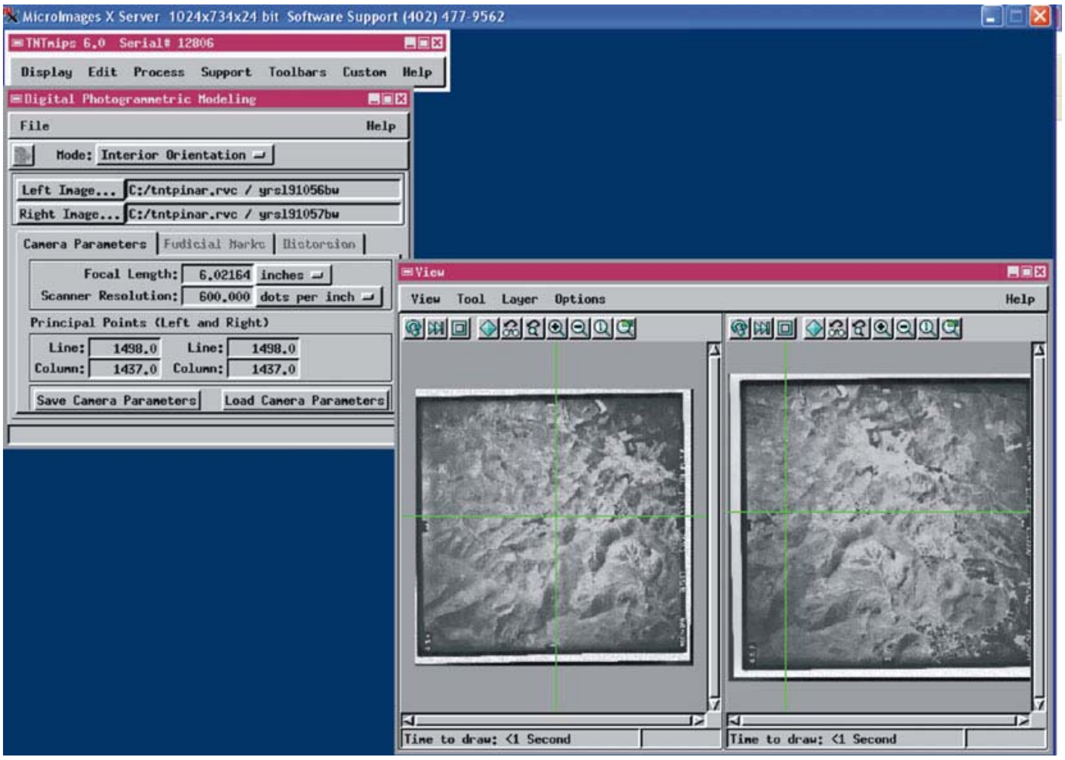

Figure 27: Interior Orientation. After georeferencing, numeric values for the focal length, scanner resolution and principal points entered to help the program to calculate the tilt of the camera.

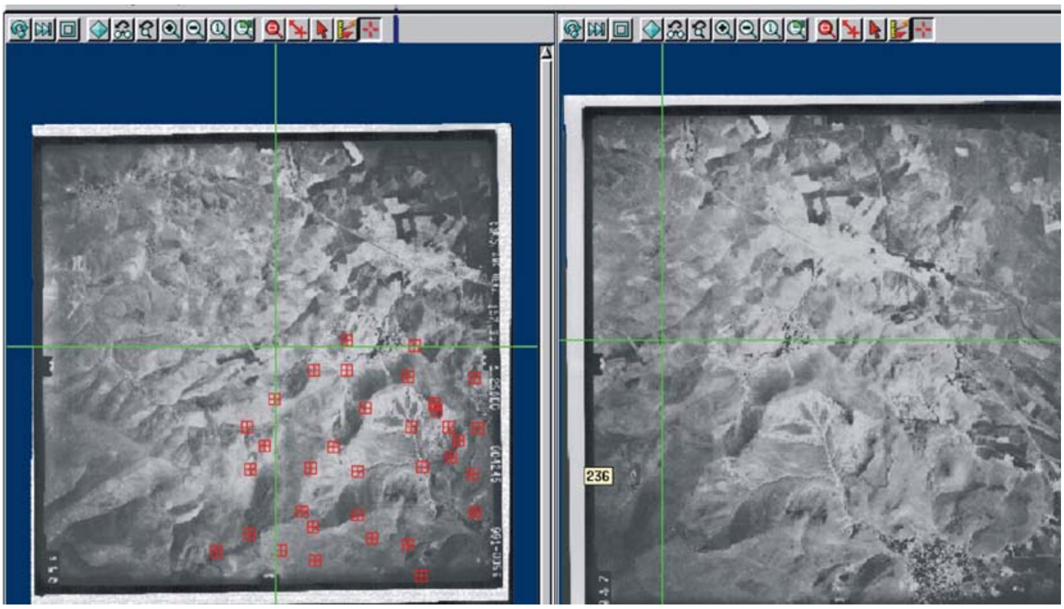

Figure 28: Relative Orientation. Georeferenced points appear with red symbols in the left pair. The user is now going to select first set of tie points by using the thin green crosshair.

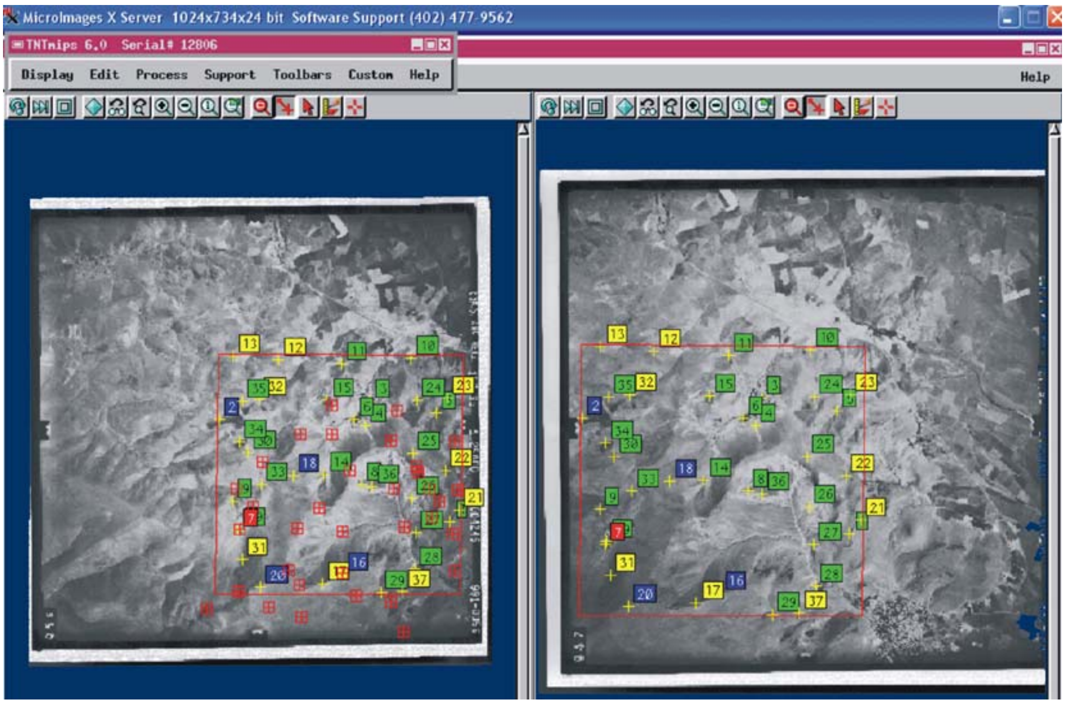

Figure 29: Relative Orientation. First set of tie points is selected to define the overlapping area in both images.

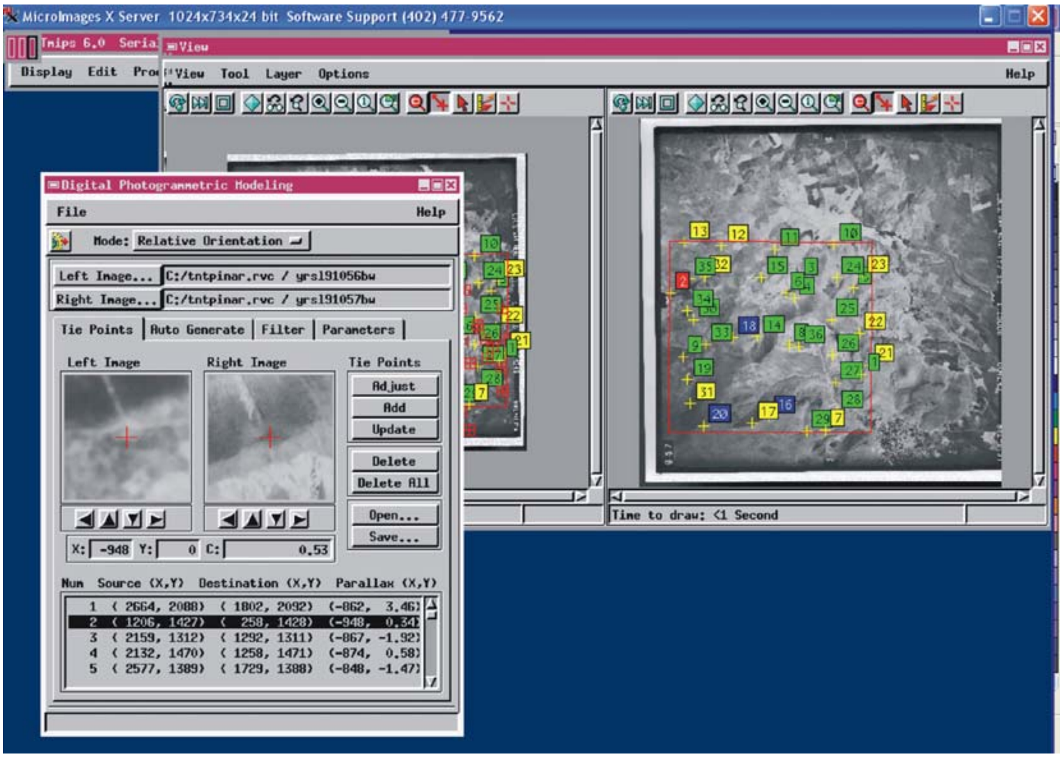

Figure 30:Relative Orientation. Tie points are checked to ensure that they have high correlation values.

After this step, the program resample left and right images, and creates an epipolar image pair in which both images have the same cell size and orientation.[63] **(Figure 31)** At this stage, cross-eyed stereo viewing is also possible. Following the establishment of epipolar images, first set of tie points which were used to define overlapping area in stereo pairs imposed on both epipolar image. The reason for this is that, this first set of tie points also define/establish a basis for the following set of tie points to be manually selected and then automatically generated. (**Figure 32**)

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63 Getting Started, Making DEMs and Orthophotos, 9

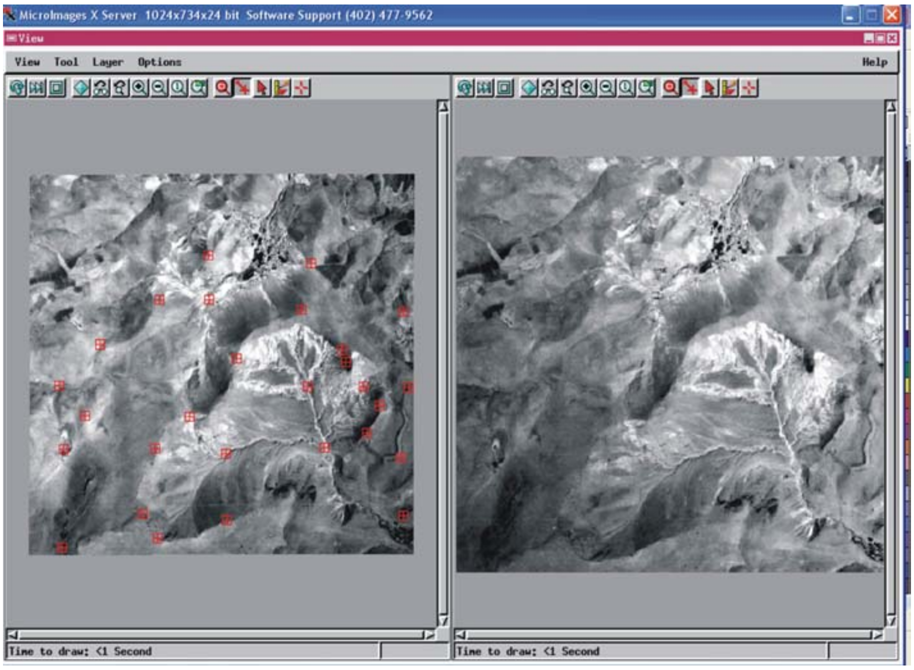

Figure 31: Relative Orientation and Epipolar Images. The Program automatically creates Epipolar Images.

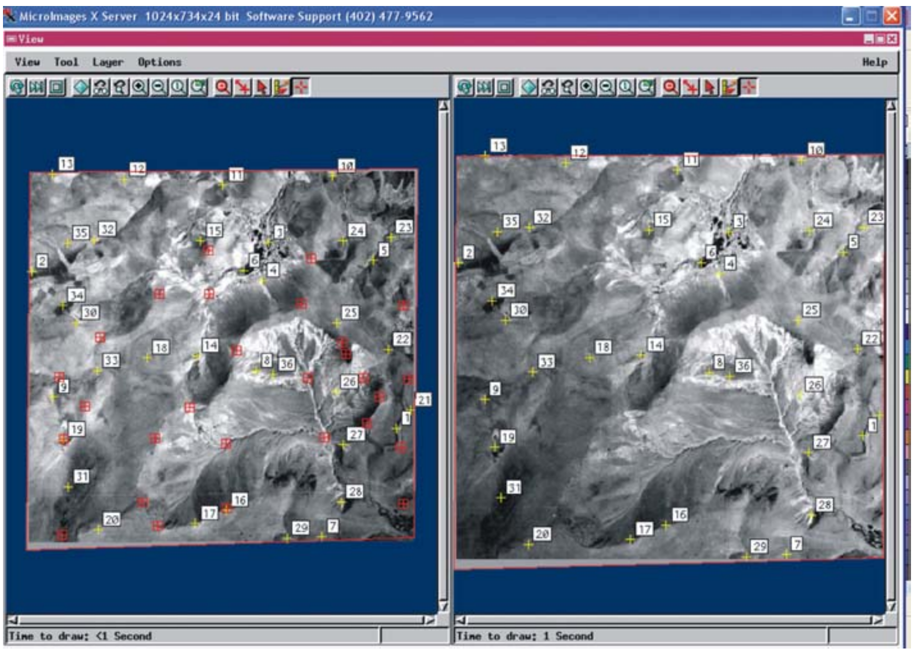

Figure 32: Relative Orientation. Epipolar image created after selection of orientation tie points.

The second step of relative orientation process begins after establishment of the epipolar images. In this step, the epipolar images are now opened in the window and second set of points (tie points) is manually selected in both images. Apart from the first set, this set includes more points in number. (**Figure 33**)

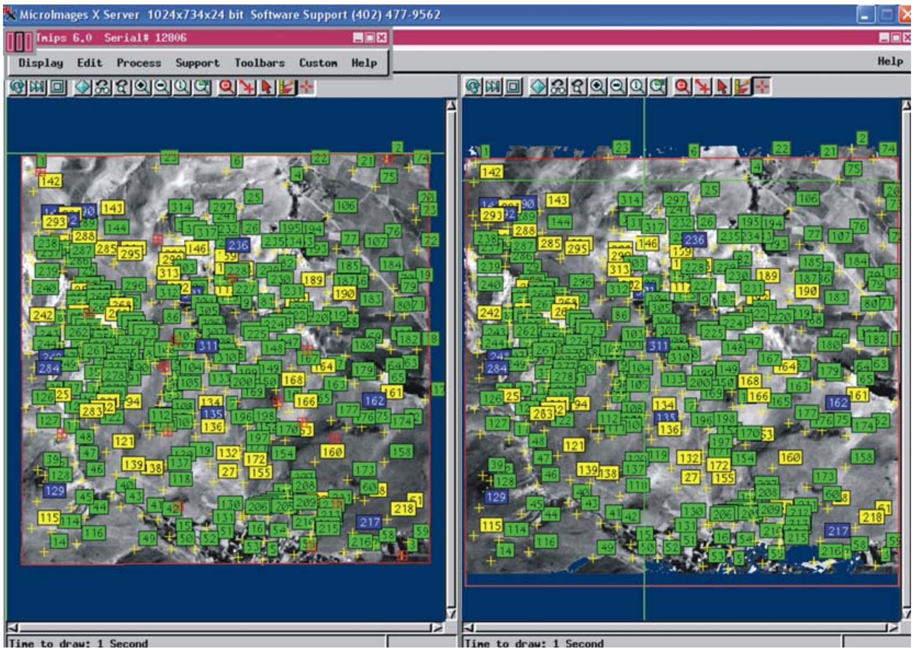

Figure 33: Relative Orientation. It is necessary to select several generations of tie points. Green symbolizes high correlation values whereas yellow indicates low and blue the lowest correlation values.

Locations of these points bears importance too; since DEM is going to be extracted from this set, these points must include the highest and the lowest features in the photos with high correlation values in tie points.[64]

[64] Getting Started, Making DEMs and Orthophotos, 10

After manually setting several hundred of points, and examining the accuracy of those selected ones, the program automatically generates another set of tie points. (**Figure 34**) After this regeneration the user has to check those tie point and attain more points if necessary since auto-generated tie points could focus on specific part of the image.

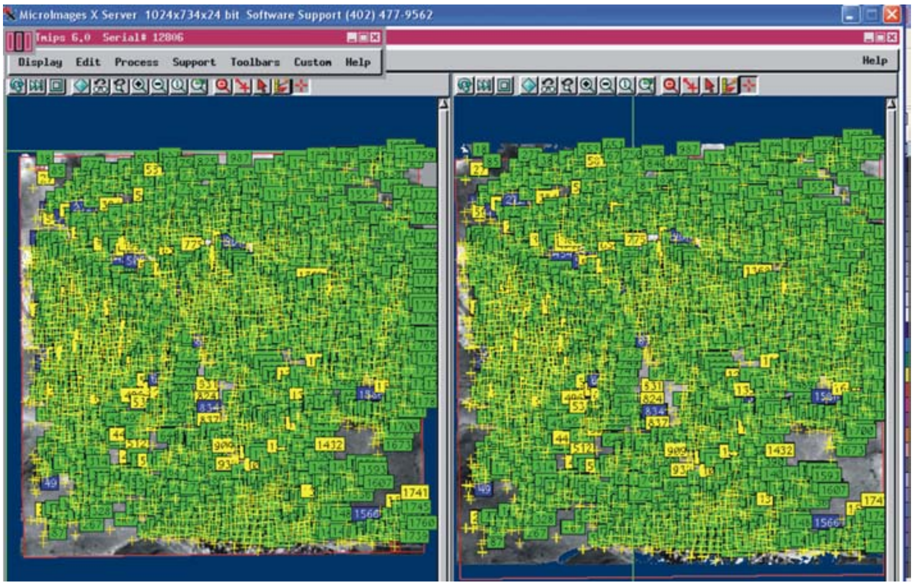

Figure 34: Relative orientation, automatic generation of the tie points. The program automatically regenerates several hundred-tie points after selecting the second set and adjusting them.

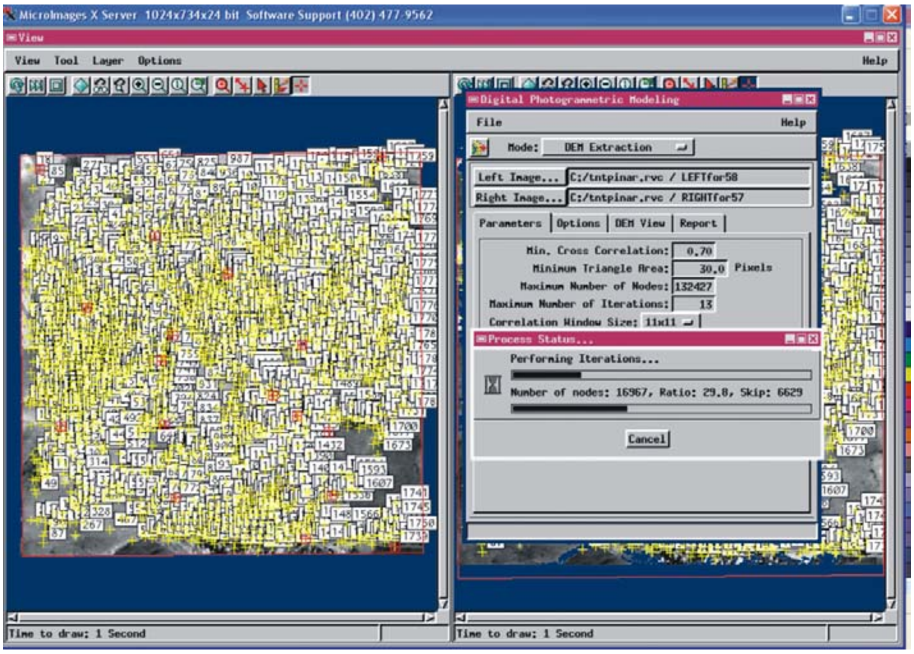

Figure 35: Establishment of the Triangulated Irregular Network (TIN). After selection of the second set of tie points, the program processes first manually entered and then automatically generated and adjusted tie points to create a tin.

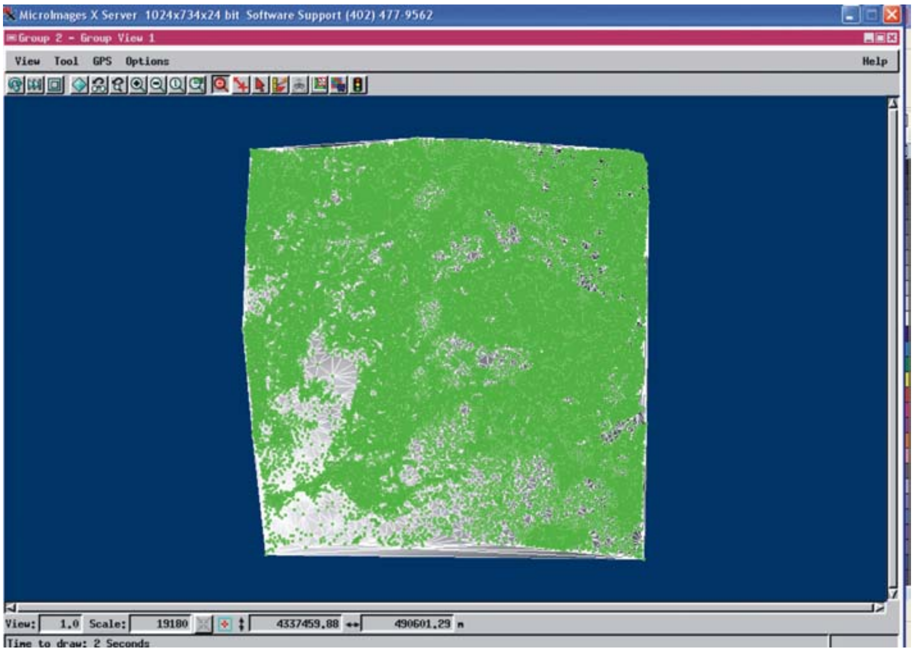

Figure 36: Triangulated Irregular Network. Program automatically creates the Triangulated Irregular Network from tie points.

4) DEM Extraction: After all steps of relative orientation process have been taken, the program creates a Digital Elevation Model. The precision of the DEM heavily depends on the previous operations. A problem with ground registration is that, quantity and quality of the tie points in terms of correlations definitely determines the sharpness and correctness of the DEMs. (**Figure 37 and 38)**

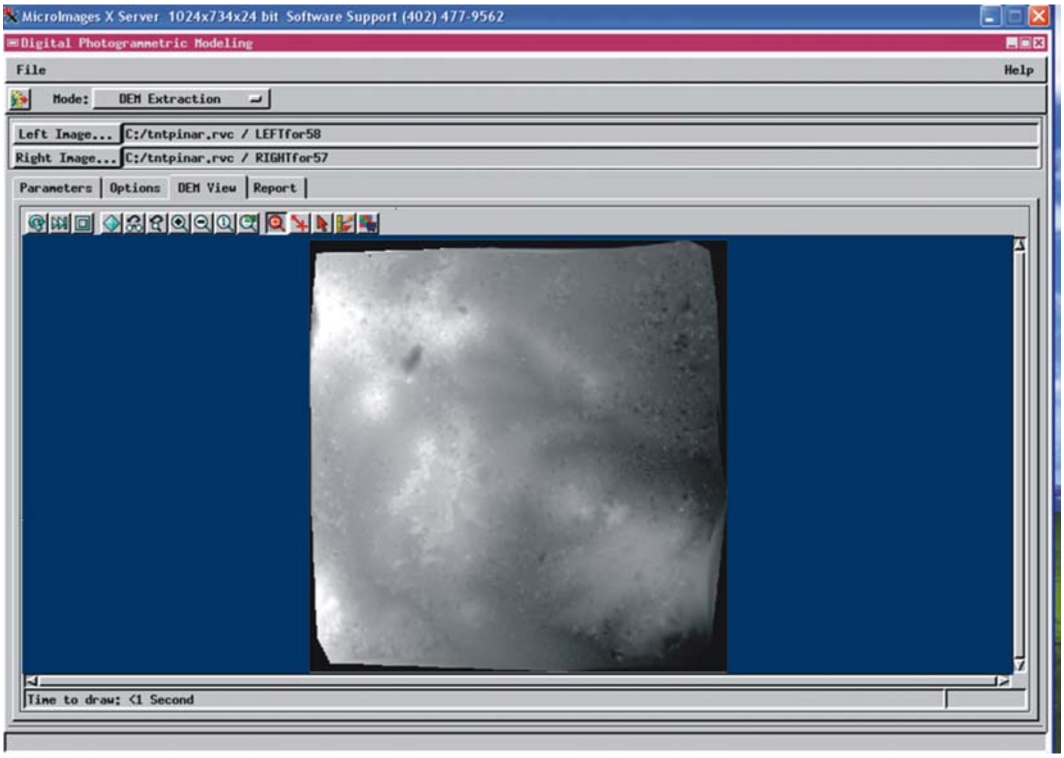

Figure 37: Creation of the Digital Elevation Model (DEM). DEM is created from TIN. The relief of the fortress and top of the rampart is visible as a white trace in this image.

5) Orthophoto: After generation of a DEM, an orthophoto derived from either the left or right image is created. Accuracy of the orthophoto can be checked if the real word distance between two specific locations is known or by simply overlaying an available base map on the orthophoto. (**Figure 39**)

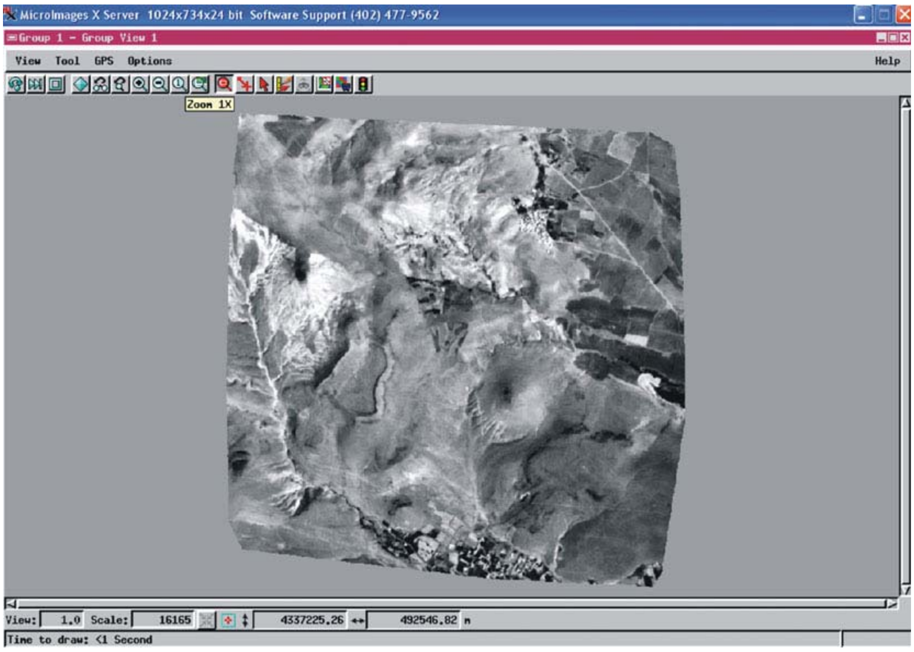

Figure 38: Orthophoto. The orthophoto is the final product.

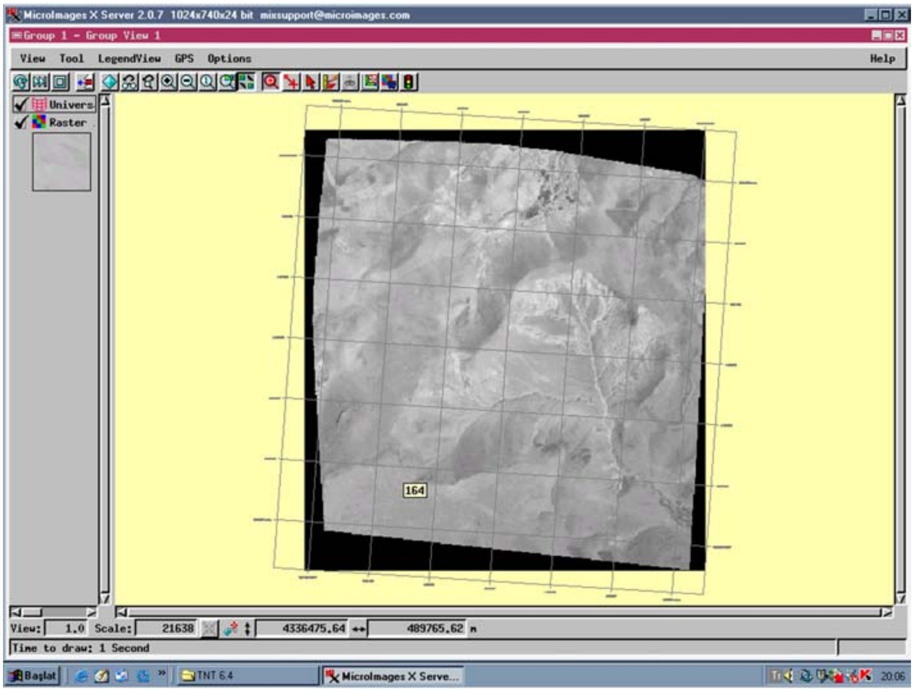

Figure 39:Orthophoto with the grid on it. Map grid can be imposed to orthorectified high altitude aerial image.

However, the orthorectification process is not as quick and easy as the foregoing summary might suggest. In practice, each step involves crucial time-consuming tasks and basic knowledge of the photogrammetry terminology. The manual prepared by MicroImages makes more sense/or at least a sense to the inexperienced user after getting help from a university level text book in photogrammetry.

The crucial steps in orthorectification are:

1. Georeferencing the highest and lowest features in the images to enable the software to create correct elevation relations in the later steps of the process.
2. Focal length, being aware of the scanner resolution and the correct principal point since this information is necessary in order to create the geometry that existed in the camera at the time of exposure.
3. Manually selecting tie points with high correlation values. (A correlation value more than %80 is suggested by TNT Mips Manual). It is also important to note that during the automatic tie regeneration process it is also possible that the program could generate tie points with high correlation values though those points could be misplaced.
4. Being aware of the fact that although there could be no concern about the location of the selected tie points, in practice some tie points can have very low correlation values. This low value could be result of sun flash or similar reasons.[65]
5. Before starting the DEM extraction process, examining the y parallax values of tie points and correcting them if necessary.
6. Evaluating elevation values of the extracted DEM before the running orthophoto process.
7. Checking values calculated for orientation angles. These values should approach 0, 0.
8. Evaluating the accuracy of orthophoto.

The quality of the work done in the first three steps of the process affects the precision of the DEM, and thus the sharpness of the orthophoto. As underlined in the

[65] Getting Started, Making DEMs and Orthophotos, 10

TNT Mips Manual, this sort of process is somewhat more complicated than either a simple digitising process or georeferencing planer data such as topographical maps. In order to understand the basic steps and the logic of the process, so as to obtain good results, knowledge of terms such as fiducial points, parallax, epipolar imagery, correlation values are essential but, as this study clearly demonstrates, an archaeologist who lacks a highly technical background in photogrammetry can still produce useful orthoimages. After this process the orthophoto is ready for mapping purposes.

3.2.4.2 Rectification with Aerial V5.27

Blimp images from the 1991 survey were corrected using a program specially created for archaeological aerial photography: Aerial Version 5.27. Processing in Aerial requires uncompressed TIFF (Tagged Image File) images. The basic rectifying process is plane to plane projection that requires only x and y coordinates. If the z (elevation values) is known, 3D projecting is also possible and the superiority of Aerial V5.27 to previous releases is that it also enables rectification of color images. The rectification process in Aerial V5.27 only requires three basic and relatively easy steps;

- Selecting the points to rectify
- Georeferencing the selected points
- Application of the resampling process

In order to rectify an image in Aerial Version 5.27 it is necessary to enter the known coordinates for each control point. A minimum of four control points is required for each image. The maximum number of control points allowed by the program is 12. The ideal number of control points for any one image is dependent on the relief. For a flat, level area four is sufficient, where there is more modulation of the ground surface a larger number of points is desirable. (**Figure 40**) For the 1991 Aerial Survey a total station was used to establish a local co-ordinate system. Fixed points, visible from the air, were set on ground at known intervals along the major axes and further random points were clearly marked with white lime. All points were located in the local coordinate system with a total station. Most of the rectification of the blimp images was achieved using only known 12 points. If one image is successfully rectified, Aerial V5.27 makes it possible to use this rectified image as a map with which to rectify other images without entering any coordinates. In some cases, where the blimp was close to the ground, at least 4 of the 12 fixed points were not observable in the images. In that case, it was possible to employ a previously rectified image that covered most of the same area and select features (stones, corners of the rampart etc) as control points instead of the fixed points on the ground. Rectification with Aerial V5.27 is thus quite a straightforward task; it is easy to use and rectification with very low error values can be done in a in a short period of time when compared with time-consuming orthorectification processes. However, it must be noted when compared with time-consuming orthorectification processes. However, it must be noted that rectification by this method does not always create corrected images. When there is undulating topography of vast areas, orthorectification is essential. (See **Figures 41, 42** and **43** for examples of rectified images of 1991 Aerial Survey)

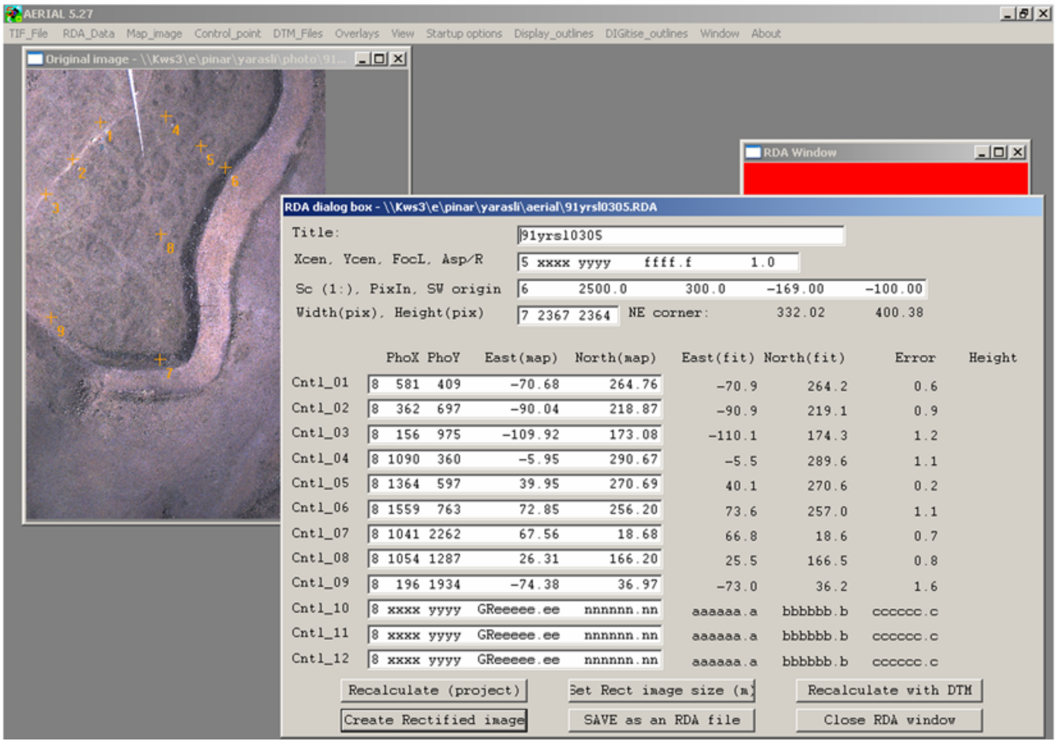

Figure 40: Rectification with Aerial V 5.27. The rectification process in aerial can be done in three steps. First points are selected (points which appear orange in the image) and afterwards coordinates for the selected points are entered. Then the program calculates the project and gives the errors on the table. If the user is content with the error margin, image is ready for use.

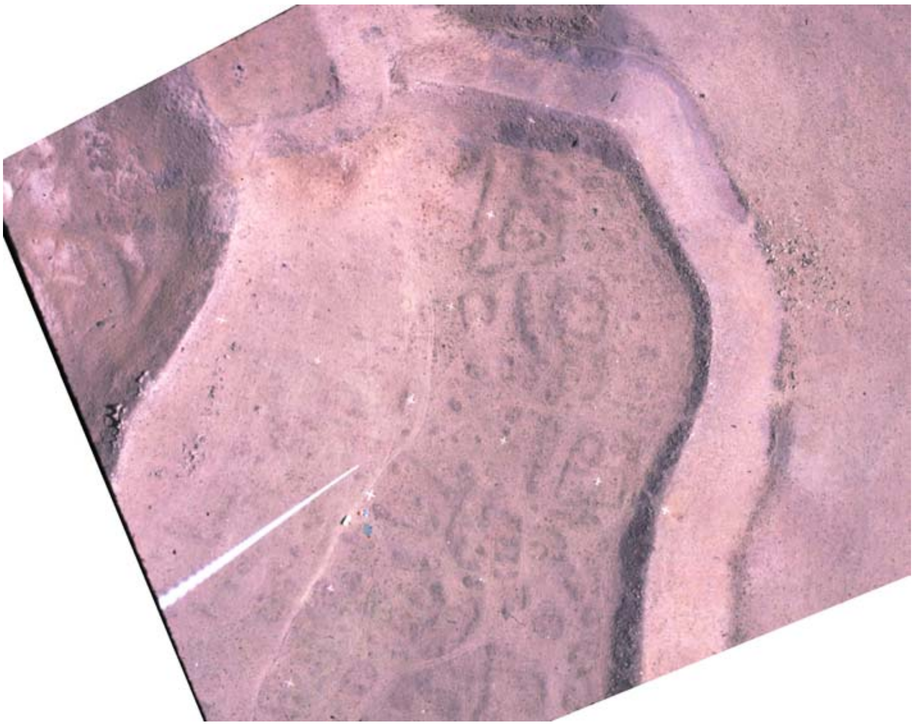

Figure 41: Rectified blimp image of the upper half of the fortress. (Photo ID: 91yrsl0319)

Figure 42: Rectified blimp image of the lower half of the fortress. Photo ID: 91yrsl0324

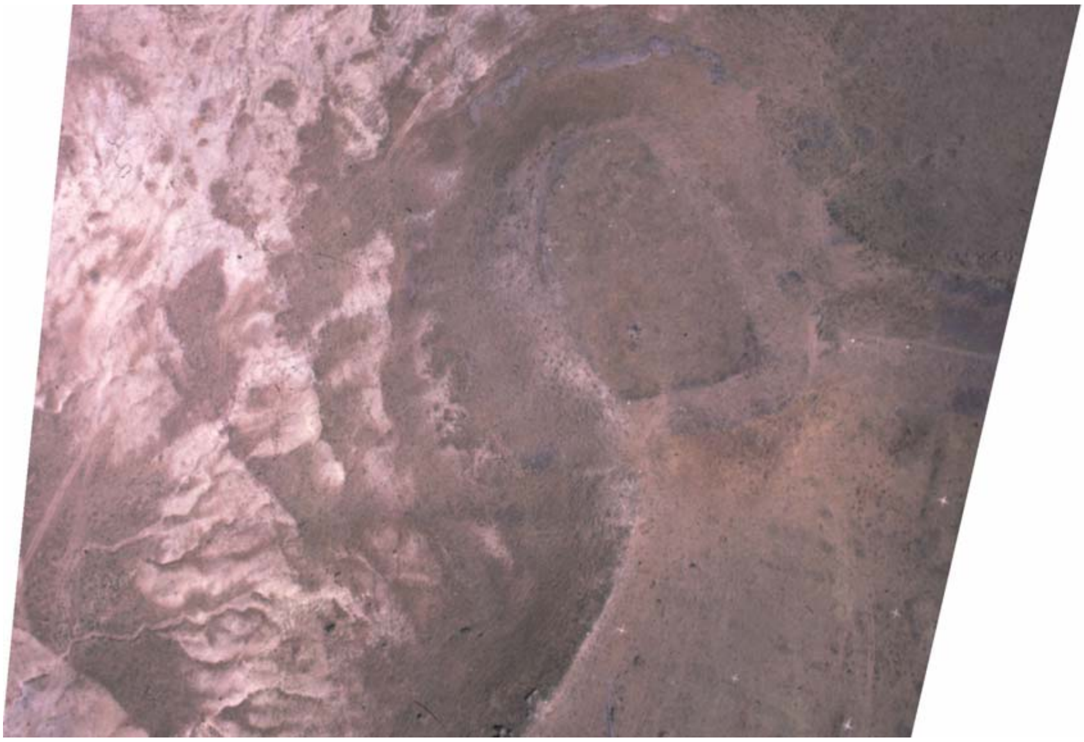

Figure 43: Rectified blimp image of the Northern Enclosure of the fortress. (Photo ID: 91yrsl0415)

3.2.4.3 Making a Mosaic

Since the entire study area is covered by at least three overlapping high altitude aerial images and the entire fortress is covered by at least two blimp images, it is necessary to create a uniform image from separate pieces. This process of creating a single image from several bits is called mosaicing. While it is also possible to use photo editing programs or a CAD program to align separate corrected images, TNT Mips software also provides an option to mosaic different images. Since color balancing can be done with the program, where necessary, TNT Mips was used to mosaic images.

3.2.5 Creating A Digital Terrain Model and Combining Different Layers of Data

One of the aims of this study is to document the outer wall by employing high altitude aerial imagery. To do this, producing or using a layer, which would act as a base map, was essential. 1/25 000 scale topographic data was scanned and imported into a digital environment. However, this format would only allow the plotting the features while manipulation of the data layers would be limited. In order to increase our understanding of the topography and how archaeological features are associated in a 3D environment, topography data was vectorised. In this process, the first step was to define the area to be studied. This was done by roughly plotting the line of the outer wall onto a base map during the first site visit in September 2004. The next stage was to digitise the topographic 1:25000 map of an area covering around 30km^2 with contours at 10m intervals. This was done in AutoCAD. This digital data was then imported into ARC/Scene 3.1, which made it possible to create a Digital Terrain Model. (See **Figure 8** for DTM and features of the study area located on it) Afterwards, georeferenced high altitude aerial photographs were draped over this Digital Terrain Model. (**Figure 44**) The program also enables users to view these manipulated data from different viewpoints. The digitised topographic map and corrected aerial images are combined together in order to see the relationship of the archaeological features as well as in relation to topography. After this process had been done the outer wall was accurately plotted for the first time on a map. The descriptions are primarily made according to the way they appear in the images.

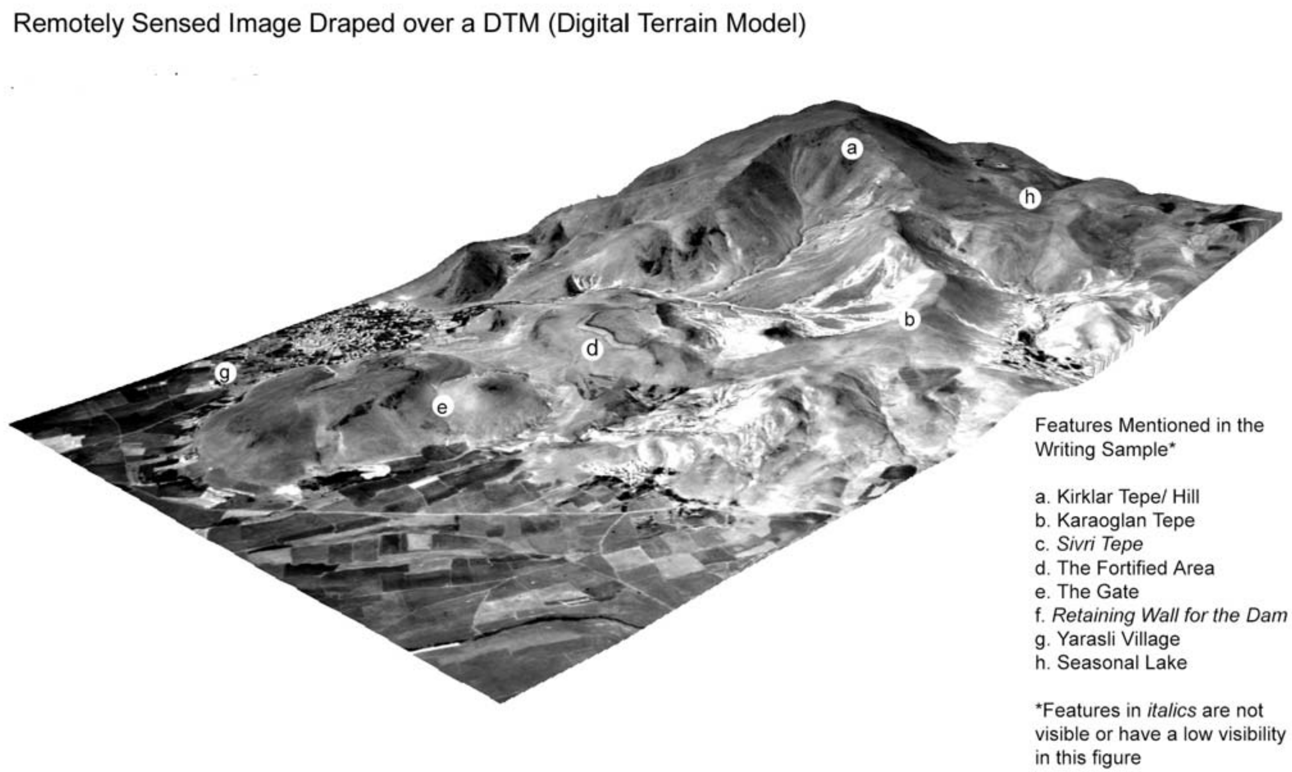

Figure 44: Remotely sensed image draped over DTM with features of the study areas plotted.

CHAPTER 4

DESCRIPTIONS OF THE ARCHAEOLOGICAL FEATURES

4.1 THE OUTER WALL, THE GATE AND THE DAM AREA

The outer wall is about 5 km long and it follows closely the ridges of the Karacadağ Mountain Range while the lowest, southern, section lies under the outskirts of Yaraşlı village. (**Figure 45**) The wall is made of uncut andesite blocks available in the area and, in some places; the natural andesite outcrop has been used as the footings of wall itself. Thus the wall has a dual nature, part man-made and part natural.

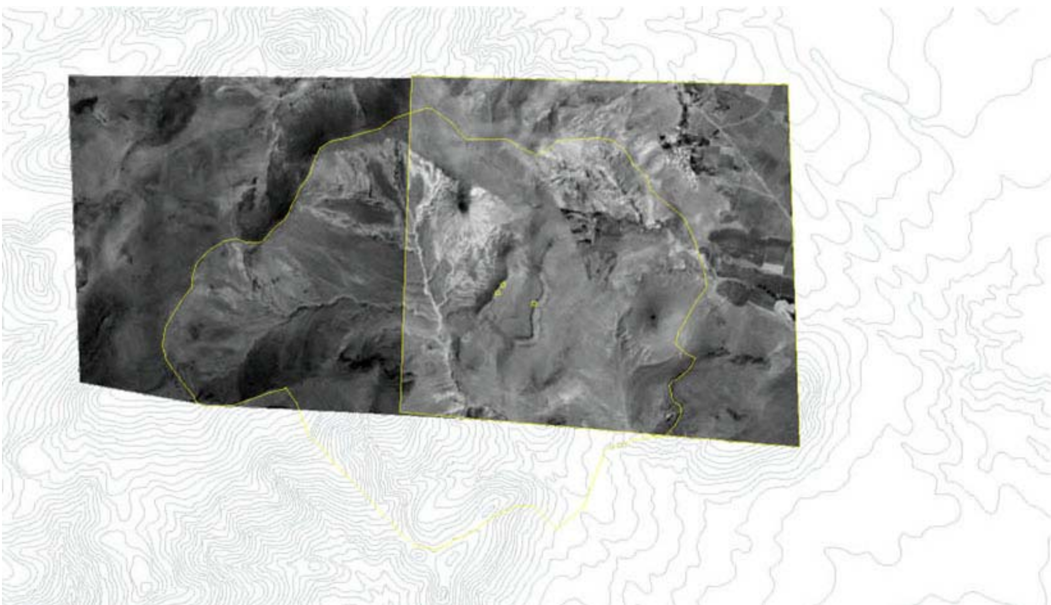

Figure 45: The outer wall plotted from orthorectified aerial images. The topographic data provides a base map for the study. The yellow line is the outer wall.

The preserved height of the outer wall is always less than 1m with an exceptional case on the east end of Yaraşlı village where part of the wall is also a retaining wall for a dam. The preserved width is consistent over most of its length, varying between 2- 2.5 m. A single gate has been identified, situated between Hacıdağ Tepe and an unnamed hill to north of Hacıdağ Tepe. No other original gate or entrance can be seen, although the principle entrance must surely have been in the section of the wall that is now largely obscured by the modern village. Detailed descriptions are provided below. Only a small part of the outer wall was accurately plotted, as a track rather than a wall, on a 1/25000 topographical map. On the 1/25000 map this track–begins at the west end of Yaraşlı village and climbs westwards along the ridge towards northwest until it reaches Kırklar Tepe, the highest point of the Karacadağ Mountain.-**(Figure 5)**

Figure 46: Part of the outer wall plotted as a track on the 1/25000 map. The outer wall can be seen as a linear feature following the ridge of Karacadağ, running from bottom left corner of the image towards top center where it makes a left turn over the cole before running along the skyline to the very peak. (Photo ID: 05yrsl0599)

Figure 47: Detail of the west-southwest ridge of Karacadağ looking west. (Photo ID: 05yrsl0218)

Figure 48: The Outer Wall. The outer wall can be seen in the middle of the image. Geoffrey Summers standing several meters in front of the northern face and Nicholas Cahill standing on top of the wall. The browner stonewalling is a shepherd's construction. (Photo ID: 05yrsl05105)

Figure 49: The Outer Wall. Only a single row of the outer wall is running from bottom right corner to the middle of the image where Nicholas D. Cahill stands. (Photo ID: 05yrsl05106)

Figure 50: A detail from a Shepard's' shelter on the western part of the outer wall. (Photo ID: 05yrsl05122)

Figure 51: The Outer Wall. This part of the outer wall plotted as a track on the 1/25000-scale map and it is the part seen most clearly on the aerial images (Photo ID: 05yrsl05138)

Figure 52: The Outer Wall. Remains of the outer face of the wall can be seen on the left of the image; the preserved height is not more than two courses. (Photo ID: 05yrsl05149)

Figure 53: The Outer Wall. Remains of the outer wall running along the ridge of the mountain. (Photo ID: 05yrsl05170)

Figure 54: The Outer Wall. This part of the outer wall is plotted as a track on the 1/25000 map. It is the part seen most clearly seen part on the aerial images. (Photo ID: 05yrsl05162)

Figure 55: The Outer Wall. The part of the outer wall shown as track in 1/25000 map. Shepard's enclosures are visible running from the middle of the image towards the bottom right hand corner. Yarasli Village can also be seen in the middle distance. The SW corner of the fortress, at extreme left, is arrowed. (Photo ID: 04yrsl0289)

At Kırklar Tepe it is also possible to see remains of plundered graves in addition to the outer wall. (**Figure 10**) The section of the outer wall from Kırklar Tepe to the end of Köyüstü Sırtı is one of the best-preserved parts. This section again shows duality in nature where an andesite outcrop on the ridge also formed part of the wall. In the artificial section large uncut andesite blocks were used and it is possible to see parts of both wall faces, which stand almost a meter high. (**Figure 56**) A track coming from Dipdede Village cuts the wall at the east end of Köyüstü Sırtı. (**Figure 57**)

Figure 56: The Outer Wall. 2-2.5m wide section of the outer wall is visible in the middle of the image whereas rest of the wall running parallel to the ridge is visible on the background of the image. At this location preserved height is no less than a meter. (Photo ID: 04yrsl02115)

Figure 57: The Outer Wall. Traces of the outer wall are visible up the middle of the image before it turns left along the steeper ridge. A later track runs across the centre. (Photo ID: 04yrsl0266)

Figure 58: The Outer Wall. The Outer wall running along the ridge from Karaoğlan Tepe to Köyüstü Sırtı. A Land Rover is parked inside the territory.

From the east end of the Köyüstü Sırtı to Karaoğlan Tepe, the wall follows the downward slope of the ridge. (**Figure 58**) The topography in this area is relatively flat when compared with previous parts of the mountain. In this section the preserved height of the wall is less than 0.5m, and it is very difficult to discern in the aerial images, on which it can be seen as a very thin white line following the ridge of Karaoğlan Tepe and passing through the highly eroded white colored outcrop south of Seyitahmetli village. This area is the last spot where an untrained eye can follow the outer wall. As seen in the general views of the wall, the fallen stones are extremely scattered. There are places where preserved height is less than 20cm and this might explain why this section of the outer wall is more visible on the ground (than on aerial images). (**Figure 59**) However, when the amount of the fallen stones is considered it would be logical to suggest that actual height of the wall was never very great. Although the scattered stones displaced from both faces of the outer wall do not suggest a (stone) wall rising several meters above the ground level, one might be aware of the fact that this might not be the actual case.

On the other hand, one should also consider the possibility of an imposed upper structure made of mudbrick or wood or some sort of material, which would limit the mobility between two sides of the wall. Unfortunately, none of these suggestions could be proven by the research possibilities provided by aerial imagery, but at least they enable us to define a further multidisciplinary work in the study area, which would also require environmental reconstructions and measurement of soil accumulations.

After passing the ridges of Karaoğlan Tepe and continuing to the SE of Seyitahmetli village, apart from very slight thin white lines there is no clear indication of the outer wall, even in the oldest of aerial images or very recent satellite images taken from Google Earth. In one of the images, which date to 1980, a slight line can be followed as a trace running more or less 50m east of the east bank of a stream. Between Karaoğlan Tepe and the northwest end of Pancarbaşın Çiftlik (a local farm next to a stream), no evidence of a wall can be made out on the aerial images. However, just a few hundred meters west of the farm, the wall is again clearly visible on the ground. Here again, the visibility of the outer wall is clearer from ground level.

Figure 59: The Outer Wall in the vicinity of Karaoğlan Tepe. Attendees of the site visit can be seen standing at several points on top of the remains of the outer wall. In this area, the preserved height is less than one course of stone, about 20cms. The enclosed area is on the left. (Photo ID: 05yrsl0116)

As one approaches the unnamed hill to the east of Hacıdağ Tepe west from the modern roadway on the east, remains of the outer wall can be traced from a considerable distance away. In this section the line of the outer wall runs over terrain of somewhat different aspect, running over a low saddle between two hills rather than following natural ridges. (**Figure 60**) The construction, stone sizes and width of the wall in this section are different from the rest of the wall. (**Figure 61**) Both faces of the wall are made from large andesite blocks, which abound in the vicinity, with the result that it stands out in the landscape. The preservation of the wall is also better when compared with the section around Karaoğlan Tepe.

Figure 60: The Outer Wall running between Hacıdağ Tepe on the left and another hill on the right h. This is the only section of the wall that runs over a saddle rather than following the ridge. (Photo ID: 05yrsl0226)

This exceptional orientation, the strategic location of the outer wall, and the difference in the architecture suggests that this section might be connected with a difference in function. A sudden almost 90-degree turn in the wall towards Hacıdağ Tepe, together with remains of what was perhaps a room-like feature at this spot, adds weight to this suggestion. (**Figure 64-65-66**) It is probable that the remains of a gate are to be found here, although the plan is very difficult to discern because of later shepherds constructions and recent disturbances. If it is so, it is the only gate discovered to date. (Although, as noted in the introduction to this section, there was surely a gate in the southern section which is now beneath the village. (See Chapter 8, Section 8. 2 for the discussion about the single gate of the fortress). Following the gate, where the outer wall makes a 90-degree turn while it goes all the way up to Hacıdağ Tepe/Hill, another bare andesite outcrop. (For -Panoromic Views of the Gate Area see **Figures 67-68**)

An additional factor to be considered here is the possible existence of a Roman road that might have passed just to east of this gate.[66] Unfortunately, no trace of any such road can be seen on the aerial images, nor are there obvious traces on the ground.

[66] Talbert 2000, Map 63

Figure 61:Close-up of the Outer Wall in the same location as Figure 58. The width of the wall is larger than elsewhere, and block sizes are also larger. Hacıdağ Tepe is on the left. Photo ID: 05yrsl0240

Figure 62: The outer wall and the gate area from the hill opposite Hacıdağ Tepe. The near 90 Degree turn of the wall is also visible. (Photo ID: 05yrsl0135)

Figure 63: Detail of the west face of the outer wall while running towards to the gate area The Trees mark the stream on the north side of Pancarbaşın Çiftlik. (Photo ID: 05yrsl0250)

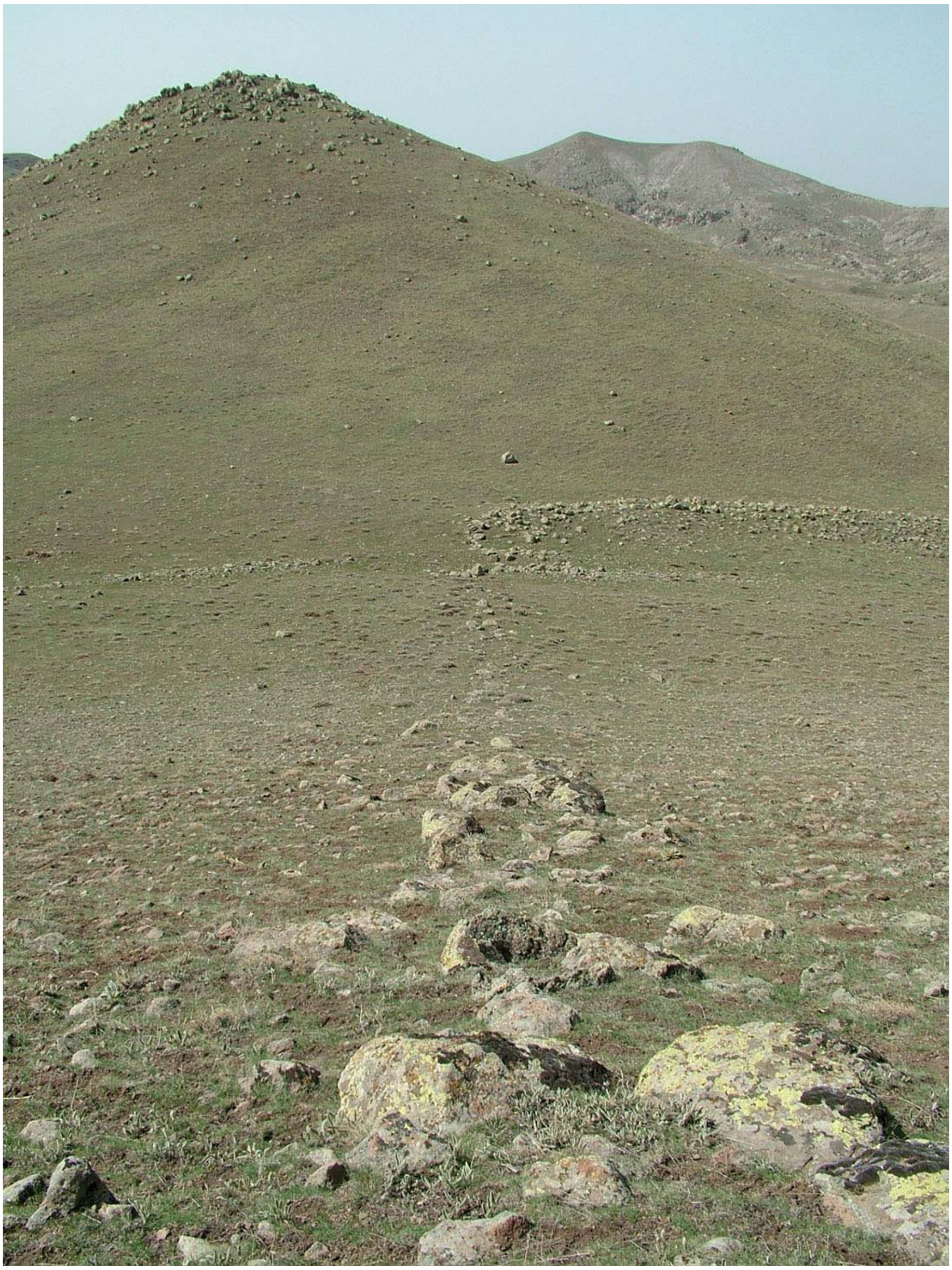

Figure 64: The Gate Area. The 90 degree turn of the outer wall from the slopes of Hacıdağ Tepe and remains of a track are also visible in the middle of the image, jutting out from the gate. It is clearly evident that this point could be relatively well controlled. (Photo ID: 05yrsl0253).

Figure 65: The Gate Area. Attendees of the site visit standing inside what now remains of the gate while the wall makes almost 90 degree turn towards Hacı Dağ Tepe. (Photo ID: 05yrsl0247)

Figure 66: Hacıdağ Tepe from the Fortress. Slight trace of the outer wall and where outcrop becomes part of the outer wall at Hacıdağ Tepe. (Photo ID: 05yrsl05027)

Figure 68: Panoramic View of the Gate Area from Hacıdağ Tepe. (Photo Courtesy of Arda Arcasoy)

Figure 67: Panoramic View of the Gate Area from the nameless hill north of Hacıdağ Tepe. (Photo Courtesy of Arda Arcasoy)

On Hacıdağ Tepe, the outer wall once again transforms to the natural outcrop and it is almost impossible to distinguish the wall itself from the natural formation both in aerial images and ground level. (**Figure 69**) However, several hundred meters east of Yaraşlı village, there is a significant anomaly in the aerial images. This anomaly is a E-W oriented line and this line is relatively higher than the close vicinity. In addition accumulated earth is evident on two sides of this line. Although there was no reason to doubt that this section was also part of the outer wall, several line of evidence suggested a different function for this part of the outer wall.

Analysis of topography maps showed that this section has the lowest elevation value in the area surrounded by the outer wall. In addition there is a stream to dam area. When these inputs are considered together with the battering north face of the wall and pile of earth behind, it would be logical to suggest that that this part of the outer wall is actually a retaining wall for a dam or water collection area.

Ground level observations proved that this line is retaining wall for a dam, which is also integral part of the outer wall. Possible bulldozing action to widen the modern track road running east of Yaraşlı village unfortunately divided this retaining wall for the dam and exposed west section of this retaining wall (**Figure 70 and 71)**. At this spot wall is made of at least 3 sometimes 4 courses of big sized stones. The area between the faces was filled with smaller stones. As seen on the rest of the wall there are no remains of mortar or any other joining element. North face of the wall is slightly battered and there is no actual south face exposed. The exposed west section suggests that after setting one course of stone the area was in filled with small sized stone and another course of facing stones were placed. Unfortunately there is no evidence for the possible top surface.

On the west side of the earth road the retaining wall for the dam continues in the same E-W direction for yet another 25-30 meters. Here it is easily distinguishable from the rest of the outer wall, not because of the great earth bank that it retains but because the wall is preserved to a height of around 2 meters. This dam wall is constructed of rough courses of large andesite blocks, its outer face being distinctly battered, with each course set back a little from the one beneath. (**Figure 72-73**)

In aerial images these difference between the dam and the rest of the outer wall is also quite distinctive.

To the west of the dam it is impossible to trace the outer wall, either in the aerial images or on the ground, because it runs directly under Yaraşlı village. The western end of the retaining wall is abutted by a modern field boundary wall oriented S-W, and mortared and large andesite blocks are scattered all around in this area. However, a virtual line drawn from the west end of the retaining wall for the dam and the outer wall, which has been plotted as a track in 1/25000 map, connects the two visible sections almost without any deviation. This would seem to confirm that that the dam and outer wall was once part of the same construction process. When all these lines are connected, the total area enclosed by the outer wall is around 600 ha.

Figure 69: The Retaining Wall for the Dam. Derya Ulusoy standing in front of the battered north face of the dam where cut by the modern road. At least four courses of large facing stones are visible, with further stones and part of the large earth bank. (Photo ID: 05yrsl0140)

Figure 70: The Retaining Wall for the Dam. General view of the east section through the retaining wall for the dam with the earth bank at right. (Photo ID: 05yrsl0144)

Figure 71: The north face of the retaining wall for a dam. Preserved height is around 2m. This retaining is also a part of the outer wall, In the right foreground a modern mortared wall meets the dam wall where it has been cut. (Photo ID: 05yrsl0275)

Figure 72: The retaining wall for the dam with the author as a scale. The earth bank is at left. The hill in the middle distance is Yaraşlı Kale. (Photo ID: 05yrsl0277)

Figure 73: A view towards north from the retaining wall for the dam which was presumably covered with water. This area is today used as a dump. The area behind the land rover is providing earth/sand, much of which might be silt that accumulated behind the dam. (Photo ID: 05yrsl0148)

4.2 THE FORTRESS

In all sets of aerial images the fortress with its distinctive rampart is one of the most significant features apart from the modern settlements. There are, in addition, two much smaller hilltop sites with defenses visible in the aerial images; one lays 1km west of Dipdede Village, and the other 0.5 km east of Hisar Village. Neither of these sites are as prominent or impressive as Çevre Kale. Çevre Kale is located 1km north of Yaraşlı village and its northern enclosure is about 0.3km southeast of Sivri Kale Tepe. Harlak Dere and its sub-branches form, more or less, the western boundary of the fortress and its associated features. (**See Figures 5 and 8**) The main architectural features related to Çevre Kale are;

1) The Rampart
2) The Ditch
3) The wall on top of the rampart
4) The Northern Enclosure
5) The Gate
6) The built up area inside the rampart. (**Figure 7**)

On the southwest of Çevre Kale, there are remains of buildings and considerable amounts Iron Age and earlier pottery on the surface. This was clearly a separate element since the ditch and the rampart do not surround.

Looking at a non-corrected aerial image gives the impression that the fortress has an almost perfect rectangular shape. (**Figure 19**) However, the rectification process reveals that the northern short side of the fortress is as not as wide as the south side, and southeast side has almost sinuous form due to the line of the rampart. (**Figure 7**) An approach to the site by the track from the village reveals the impressiveness of this fortress with the rampart, which rises 10-15 meters from ground level.

Although high altitude aerial images help ~~us~~ to define the study area within a broader framework as well as in relation to the other natural and man-made features, such as the modern villages, they fail to show details of the main elements of the fortress, e.g. the gate and the wall on top of the rampart, or the inner organization of the fortress. Neither do they show details of the buildings on the Southwest Area.

The description below mainly based on the way they appear in the high and low altitude aerial images, supported by observations made on the ground.

4.2.1 The Rampart and Wall on Top:

The rampart rises approximately 15 meters above ground level. Its width reaches up to 40m in width at the base. (**Figure 74**)

As seen in the slope analysis derived from the topographical data, the area corresponding with the rampart has a slope value more than 28^{o}, which demonstrates that the rampart must be difficult to approach from both inside and outside. (**See Figure 95**)

Although the surface of the rampart is not revealed, but it is almost covered with scattered rubble and earth coming from the higher levels of the rampart, the compactness and the paucity of erosion channels running downwards from the rampart strengthens the idea that rampart was made of stones. Further evidence supporting this idea is that four exposed walls parallel to each other on the eastern side of the northern enclosure. These parallel walls might act as a series of retaining walls for the rampart.

In a way similar to the outer wall, the rampart also takes–advantage of the natural topography on the western side. Topographical evidence suggests that the western side of the platform where the fortress is built has higher elevation values than the eastern side. In addition, on the Southwest corner a bare andesite outcrop is exposed and combined with the rampart. In this sense, the eastern side of the rampart gives a better idea about the time and effort spent to build this sort of massive artificial fill.

The inner face of the rampart is relatively exposed on the South-eastern corner of the fortress where the rampart curves round towards north. (**Figure 75**) In this area it is possible to see large stones built up in step-like tiers with the spaces between filled with rubble. (**Figure 76, 77 and 78**)

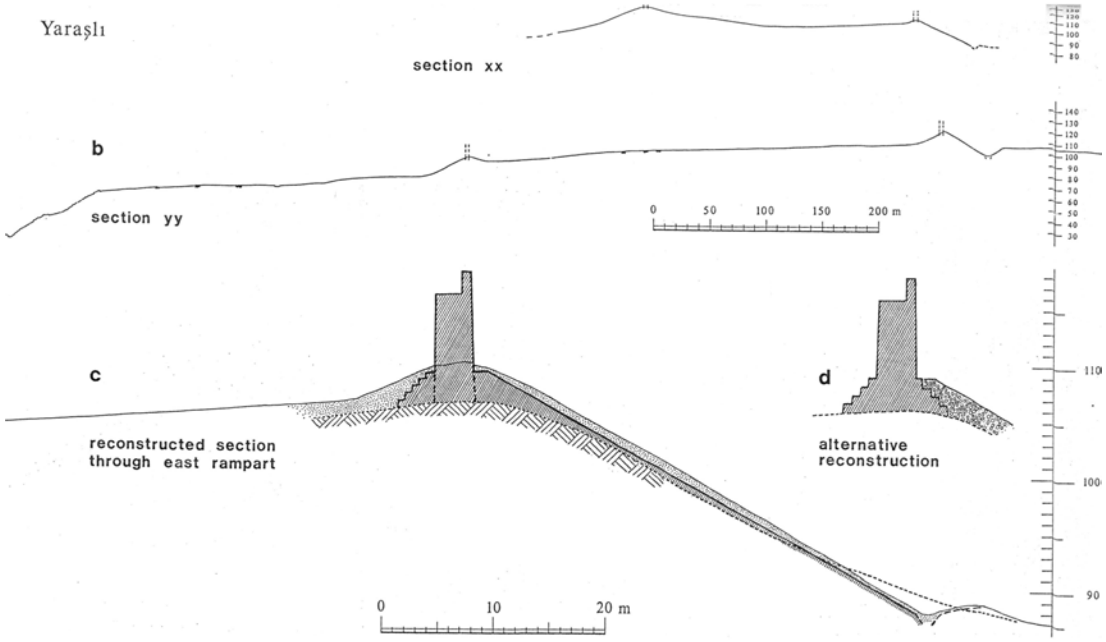

Figure 74: Section of the East side of the rampart. (Summers 1992)

Figure 75: The Fortress. Natalie Summers stands on the southeast corner of the fortress. The inner face of the wall is visible. Note the difference in level between the area of the fortress and the terrain to the east.

Figure 76:Detail from the east side of the rampart surrounding the fortress. Natalie Summers and Geoffrey Summers are following the very ruinous wall on top of the rampart. (Photo ID: 04yrsl0213)

However scattered rubble does not provide more insight about how the rampart was made or the wall on top of the rampart is embedded. The width of this wall varies between 3-3.50 m at certain points. Like the both the outer wall and the exposed inner face of the rampart, this wall is made of rough and somewhat irregular andesite blocks. (**Figure 77 and 78**) Yet another interesting point related with the design of the rampart is the height to which it rises above the interior of the fortress. This sort of elevation difference between the top of the rampart and the ground level where traces of the building are visible suggests an advanced isolation for the buildings inside the rampart. Unless they were built up quite high, it is possible to suggest that buildings inside the fortress cannot be seen from outside of the fortress. In addition, an elevation difference between the ground level of built up area and the wall on top of the rampart could provide a microclimatic condition for the occupants. The wall on top of the rampart is exposed to wind whereas built up area inside the fortress is less exposed. **(Figure 75 and 76)**

Figure 77: Section of the wall on top of the rampart on the eastern side. (Photo ID: 04yrsl0215)

Figure 78: Detail of the inner face of the fortress wall (Photo ID: 04yrsl0216)

Figure 79: Detail of the inner face of the rampart showing the battered construction.

Figure 80: Detail of the eastern side of the fortress wall (Photo ID: 04yrsl0214)

Figure 81: Detail from the wall on top of the rampart. A row of stone belonging to the wall on the rampart (Photo ID: 04yrsl0212)

Figure 82: Detail of the inner face of the fortress wall (Photo ID: 04yrsl0217)

4.2.2 The Ditch:

A wide and shallow ditch runs around the base of the rampart on the northern, eastern and southern sides. (**Figure 83**) There does not seem to be any appreciable accumulation within the ditch, suggesting that it was never appreciably deeper than it is today. This ditch is also visible in some of the high altitude aerial images as a dark grey shade at the bottom of the rampart. The ditch must have been dug intentionally when considered in relation with the rampart and the natural topography. The ditch though does not seem to act as the primary feature to increase the defensive capabilities of the entire system since it is quite shallow and narrow, it is possible to suggest that it was primarily a way of giving definition to the base of the rampart while also being a quarry for its construction.

Figure 83: The ditch and the rampart, looking east from northern enclosure (Photo ID: 04yrsl0228)

4.2.3 The Fortress Gate:

On the short south side of the fortress, there is a break close to the west end of the rampart which marks the position of the single gate into the fortress. Although the physical structure of the gate itself is not visible in the high altitude aerial images, low altitude aerial images reveal a break about 3 meters wide. However, it is hard to guess if this is the actual width of the original gate or consequence of later disturbance since high altitude aerial images reveal dramatic disturbance and increasing earth piles in the vicinity of the gate from 1954 onwards. While the precise plan of this gate is not recoverable without considerable clearance and excavation, sufficient survives to be certain that it is not of standard Hittite plan, dispelling any lingering doubts about an Iron Age, rather than a Late Bronze Age, date for the defences.

The closest parallel for the plan of this gate is, perhaps, the so-called Göz Baba Gate at Kerkenes where there is an impressive outwork. (Pers comm. Geoffrey Summers)

Figure 84: View towards south from west of the fortress gate. At least six stones in a row constituting the wall are visible. Yaraşlı village is the middle distance. (Photo ID: 04yrsl0247)

4.2.4 The Northern Enclosure:

The rampart and the wall had been cut and modified on the northern side of the fortress. Here is located the "Northern Enclosure", so named because of the dry ditch that separated from the elevated rampart which once was part of the original rampart. The northern enclosure is an area about 0.7 ha. (Figure 7) The aerial images clearly show the later wall running around all sides of the top of this feature

There is no evidence as to the date of this secondary reshaping process, nor is it clear from a cursory look at pottery on the surface whether or not this section of the fortress was occupied after abandonment of the main area of the fortress. It is just possibly Hellenistic in date. In any event, there is no water source within this Northern enclosure. In addition to the wall on top of the rampart there are several stretches of almost concentric walling on the slopes. **(Figure 86)** These appear as though they might have been retaining walls within the structure of the rampart, rather than freestanding defensive walls. The Northern Enclosure, which is higher than the rest of the fortress, affords a great overview from the northeast to the south. Some field terraces are visible to the naked eye on the skirts of the rampart of the northern enclosure.

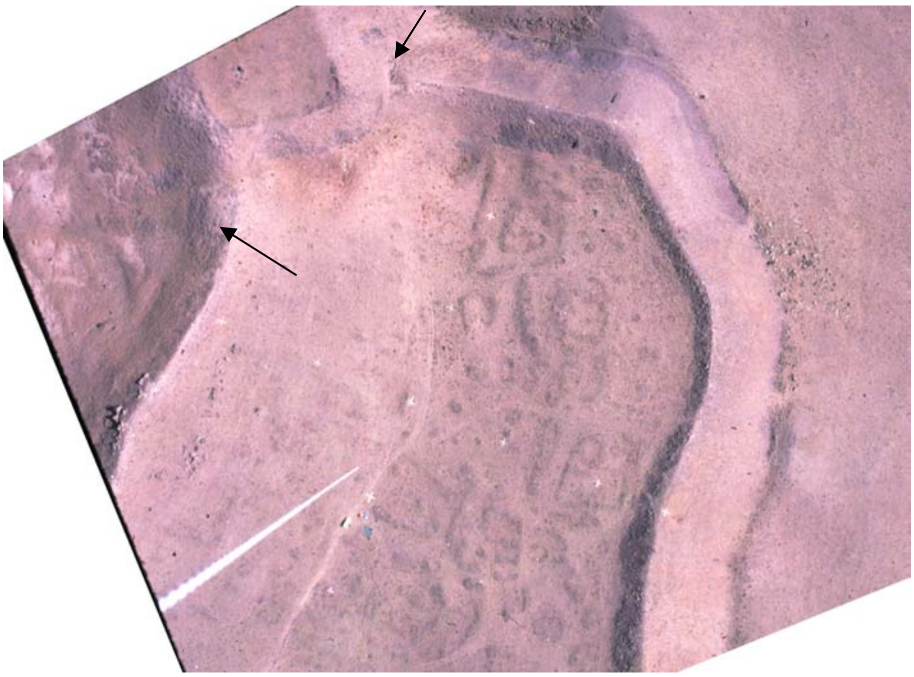

Figure 85: Rectified blimp image of the upper half of the fortress. Arrows indicate the original rampart where rampart of the northern enclosure was cut. (Photo ID: 91yrsl0319)

Figure 86: Possible retaining walls for northern enclosure (Photo ID: 04yrsl0221)

4.2.5 Built up Area inside the Fortress

This area is surrounded by the rampart covers around 8ha. In the low altitude aerial images a track–running N-S has divided it. This division though artificially created also corresponds with the actual visibility quality of the features inside the fortress.

Unfortunately, remains of the buildings on the western side of the track road have low visibility. During the last site visit, we were able to locate two unfinished large stone blocks with carvings of rough cylinders. Whether or not these can be associated with the column base plotted by Michael Balance is questionable though it is highly probable that they are the same features. **(Figure 87**)

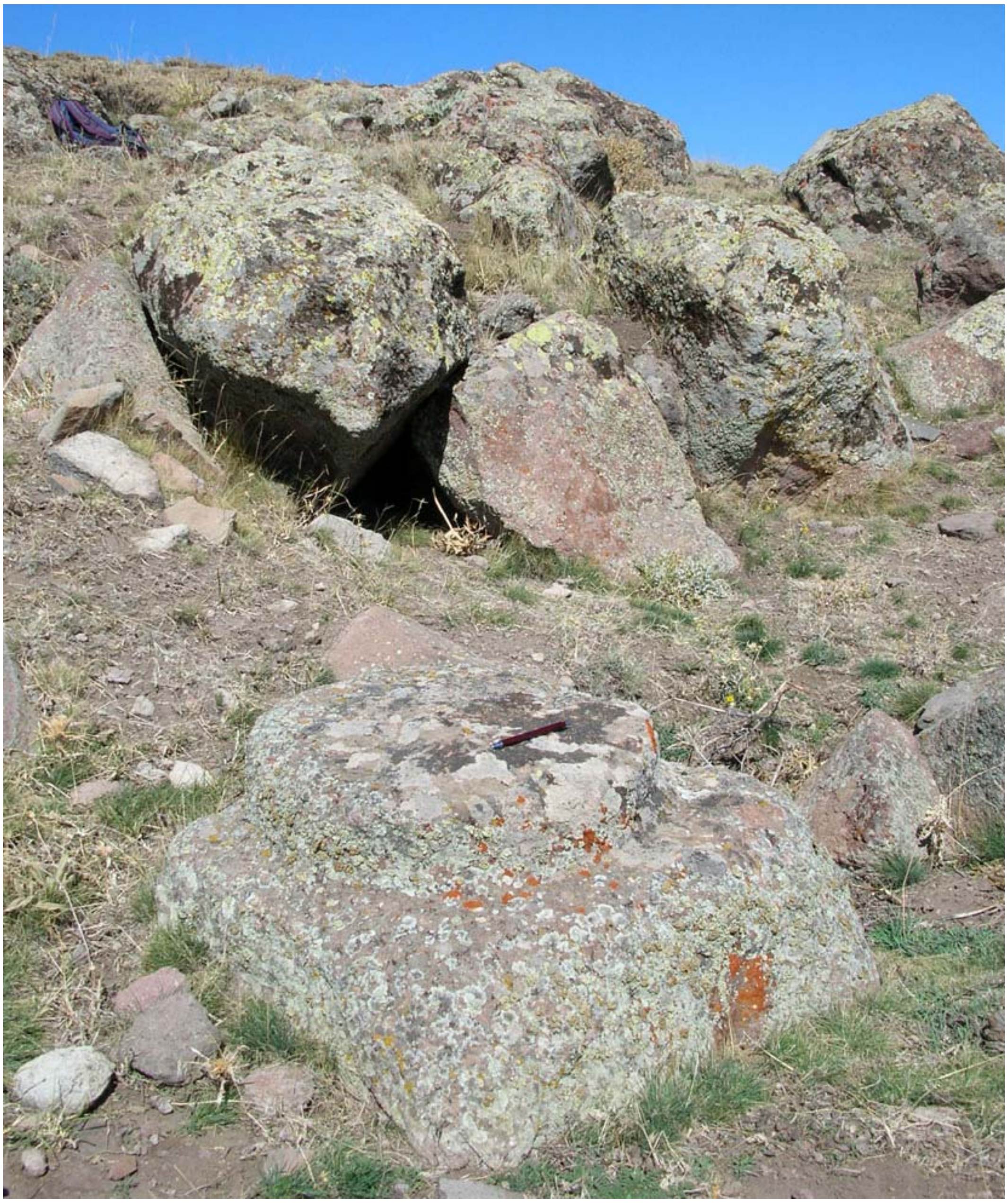

Figure 87: Unfinished block with a circular shape.

On the eastern side of the track visibility is better in low altitude blimp images. There are several buildings surrounded by compound walls, buildings with three or four rooms in a row (cell like structures) as well as buildings with semi-open rooms either in the front (or back?). Though these features can be associated with megaron-like structures and cell like buildings have parallels at Hattusha and Kerkenes, without proper geophysical survey and excavation it would be ambitious to date or interrelate these buildings.

4.3 THE SOUTHWEST AREA:

On the topographical map, at the junction of two modern roads, one leading up to Dipdede Village and other to an unknown destination in the west, a spot is located as Kız Fatma Harabeleri (Ruins of Kız Fatma). (Figure: 1/25000 topographical Map) This spot actually corresponds with approximately 4.5 ha. wide area just outside the fortress gate. (**Figure 88**)

Low altitude aerial images, and even some of the high altitude aerial images reveal traces of rectangular features that have N-S and E-W oriented walls southwest of the fortress, just outside the gate. These have been hugely modified by later activities, probably for gardens or orchards. In addition low altitude aerial images reveal traces of an enclosure wall surrounding this built up area. (**Figure 88**) Some of this enclosure wall is exposed while eastern part of this enclosure is the possible white trace that can be seen on the right hand side of Figure 88. It is also interesting to note that this possible trace of the enclosure wall intersects with the SW corner of the rampart where the bedrock juts out. (Circled on Figure 88). In addition to the Iron Age pottery, earlier pottery is abundant in this area. Under these circumstances it is possible to suggest during the Iron Age period this area formed some kind of annex to the fortress, but it was very probably be used in earlier periods as well. It is also possible that earlier buildings provided ready building material for some of the structures inside the fortress and its great rampart. It should also be noted that there is spring very close to west of this area, which also increases the attractiveness of this area for settlement purposes. However, inside the southwest area, stone piles at certain points indicate that this area was once subject of land clearance.

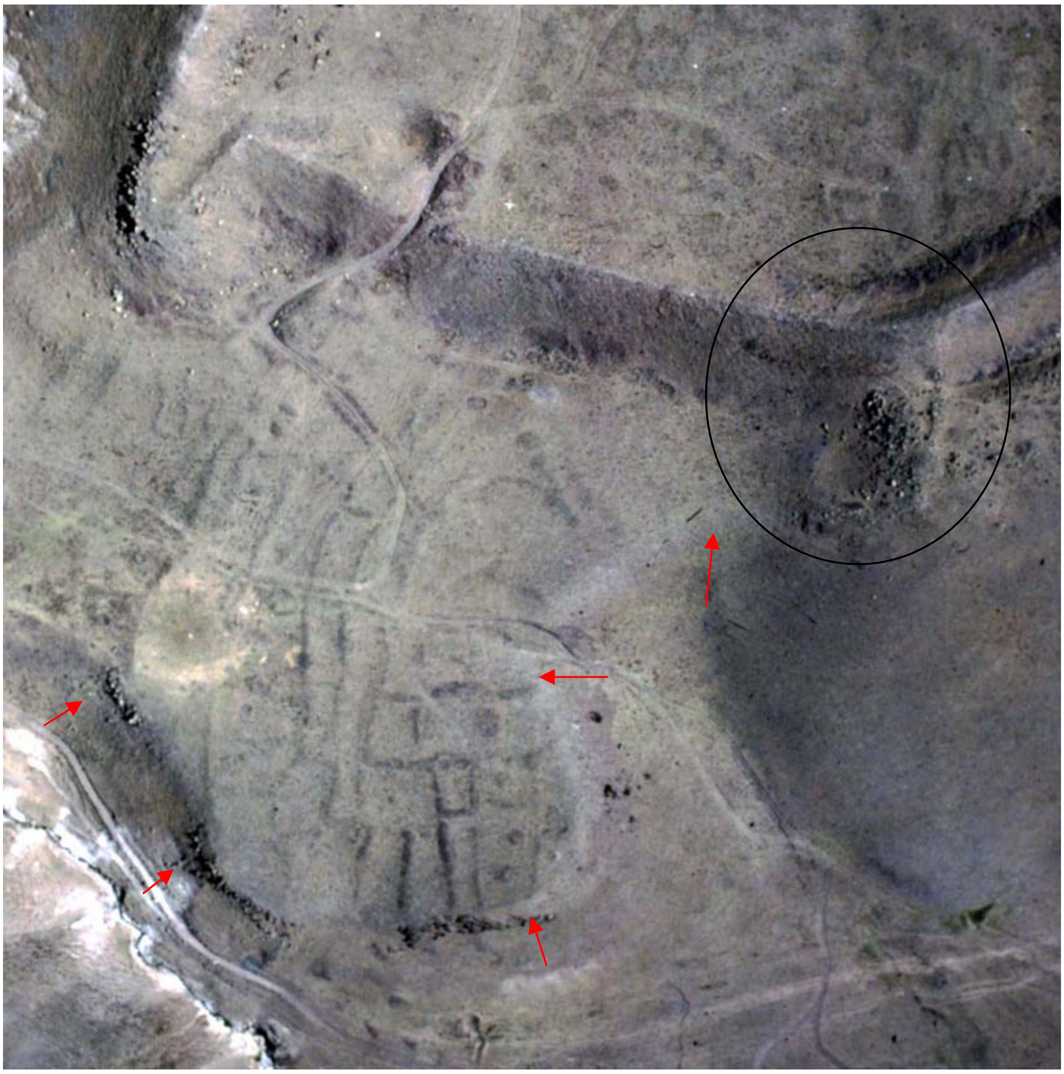

Figure 88: Southwest area of the fortress from the blimp. N-S oriented buildings are visible. It is also possible to identify stone piles on the southeast edge. Remains of a possible enclosure wall are visible at the left and bottom of the image. It is also possible to trace the enclosure wall are indicated by arrows. (Photo ID: 91yrsl0324)

Figure 89: Southwest area from the fortress. Remains of buildings can be seen as vertical and horizontal lines in the middle of the image. (Photo ID: 04yrsl0207)

CHAPTER 5

RELATION OF THE OUTER WALL WITH ÇEVRE KALE

One of the drawbacks of documentation archaeological features solely from aerial photographs, without ground reconnaissance is the problem of dating and understanding the relation between each of the several features visible on the landscape. In this section the evidence concerning the chronological relationship between the enclosure wall and the fortress will be set out and discussed. Some of this evidence is directly based on ground observation while other evidence is provided by Geographical Information Systems.

Firstly, the stone used in both the walling of the fortress defences and in the outer enclosure walls share the same basic characteristics. They are uncut fieldstones. However, these volcanic rocks have been regularly jointed which causes natural bricking of the rocks. (Arda Arcasoy Pers. Comm). (**Figure 90**). There is no cut of faced stone and no use of mortar, but much of the dry-stone facing appears to be chinked. The size and regularity of the wall stones varies from place to place around the circuit of the outer enclosure wall, reflecting very local changes in the geology and demonstrating that all of the stone was gathered very locally and not brought from any distance (**Figure 90**). Wall cores are of smaller stones with, in the case of the fortress, Hittite pithos sherds and other cultural debris as it was observed by Mellaart.

With regard to the dam, the stone facing on the inner, pool, side is coursed and battered, each course being set back a few centimetres from the one below.

A second piece of evidence concerns the design of the defences. It is striking that the both the walling on top of the fortress rampart and the enclosure wall are set back from the front of the bank or natural ridge, leaving a sort of flat berm in front. Additionally, both fortress defences and sections of the enclosure wall make distinctive use of natural rock outcrops.

At the fortress this utilization of outcropping rock is particularly obvious along the west side and at the re-entrant at the southwest corner, whilst on the enclosure wall it is a striking feature of section on the steep ridges either side of the Kırklar Tepe peak.

Figure 90: Detail from the outcrop at Sivri Kale Tepe.

The third evidence is the material used at the construction. Apart from andesite no other stone type is used in the construction of both the outer wall and the fortress. Although there are pithos sherds fitted into several spots at fortress, this is mostly likely to be associated with the availability of remains of an earlier period (discussed in Chapter 8, section 8.3) in the close vicinity of the fortress.

Turning now to spatial analysis, the topographic, view-shed (**Figures 91-92-93 and 94**) and slope (**Figure 95**) analyses show that there is limited visibility over the surrounding territory from the fortress. The enclosure wall, and particularly such towers or shelters as may have been constructed along its circuit, provides much better visibility. In other words, it is difficult to imagine how the fortress could have functioned without some additional system of surveillance that would have pre-empted surprise approach and attack. The outer enclosure wall would afforded such protection on three sides, although not from the eastern stretch below the summit of Hacidağ Tepe. Visibility to the west, as described earlier, seems to have been very restricted - an observation that defies easy explanation. In summary, then, the outer wall displays several features and characteristics that could clearly have extended the defensive capabilities of the strong fortress, but it is also clear that these defensive capabilities comprise only one of its several functions, and perhaps not the most important. There are thus two elements to the argument: on the one hand the fortress makes little sense withouth the enclosure wall and the enclosure wall makes little sense unless it was designed around the fortress which lies at the centre of the enclosed area, positioned in part by the advantages of the topography (flat area with sections of natural ramparts and presumably water sources).

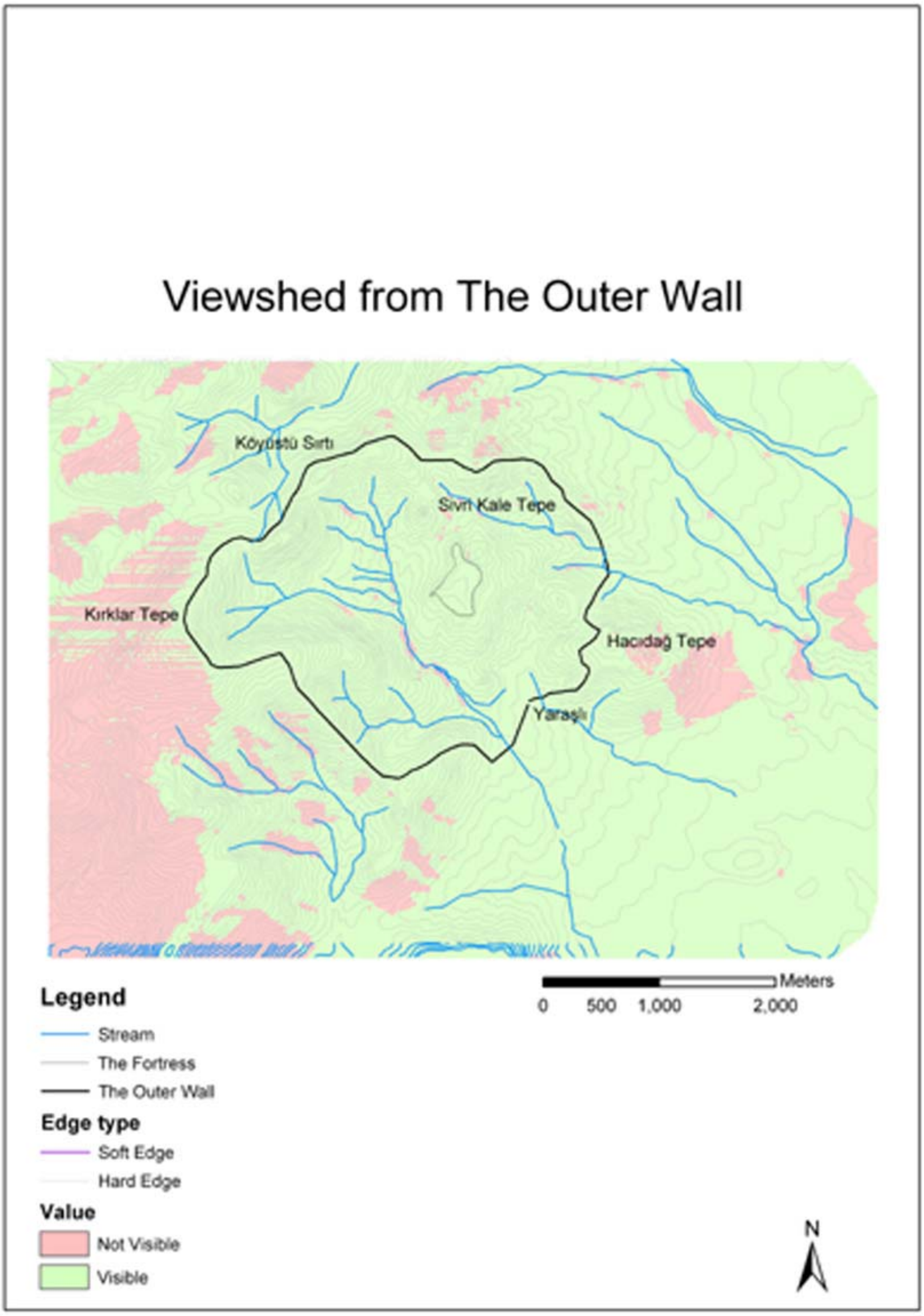

Figure 91: Viewshed analysis from the Outer Wall.

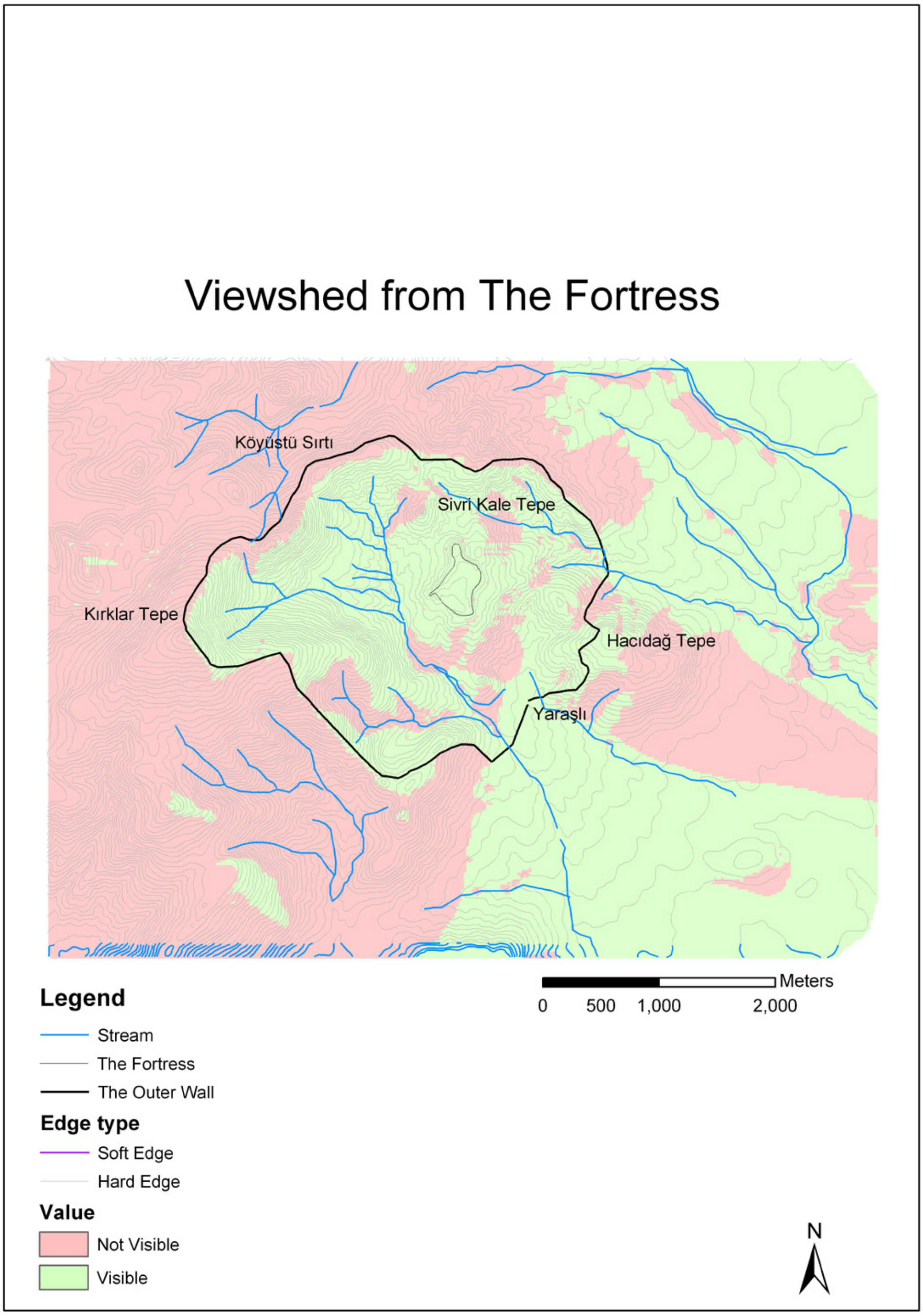

Figure 92: Viewshed analysis of the Fortress.

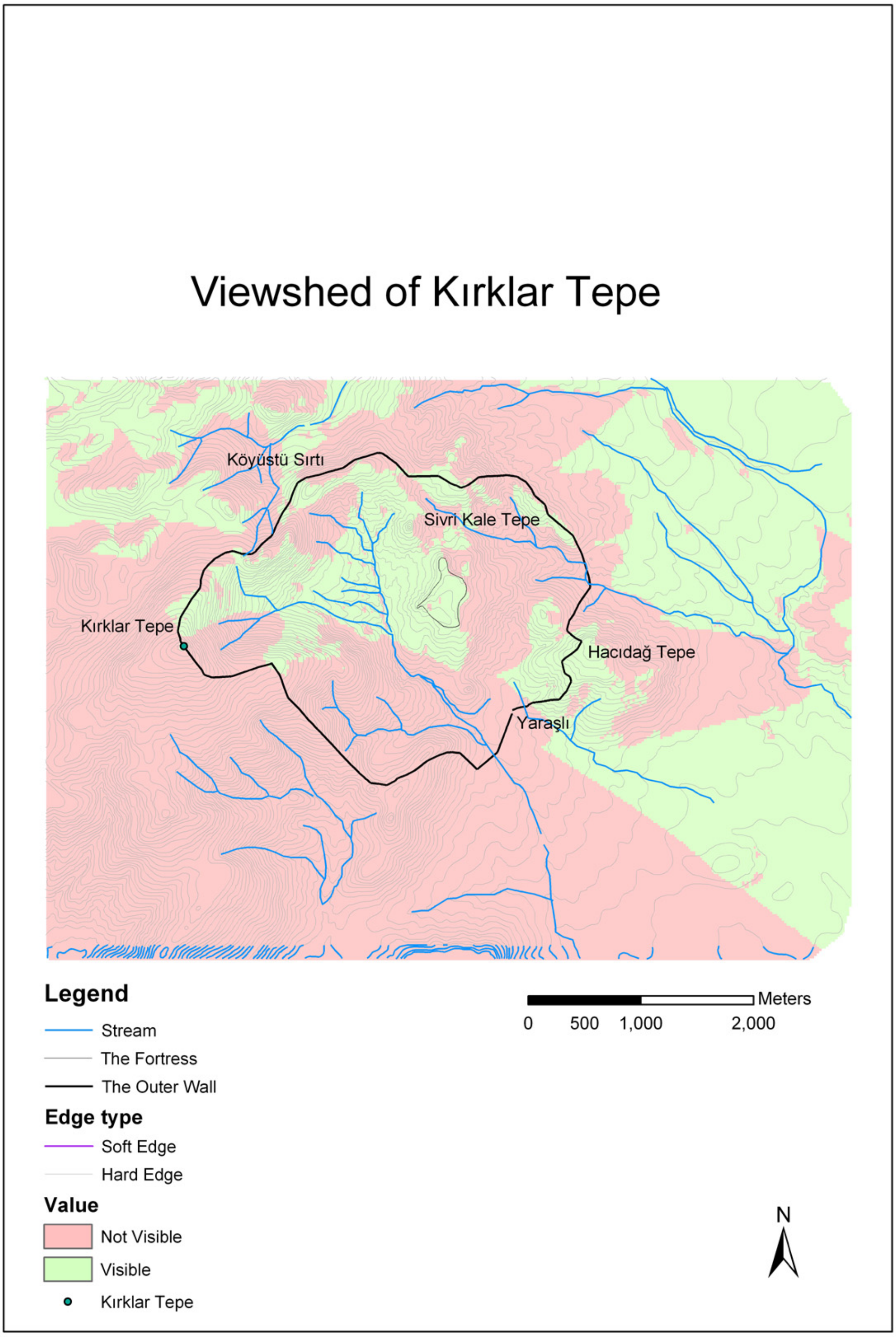

Figure 93: Viewshed of Kırklar Tepe.

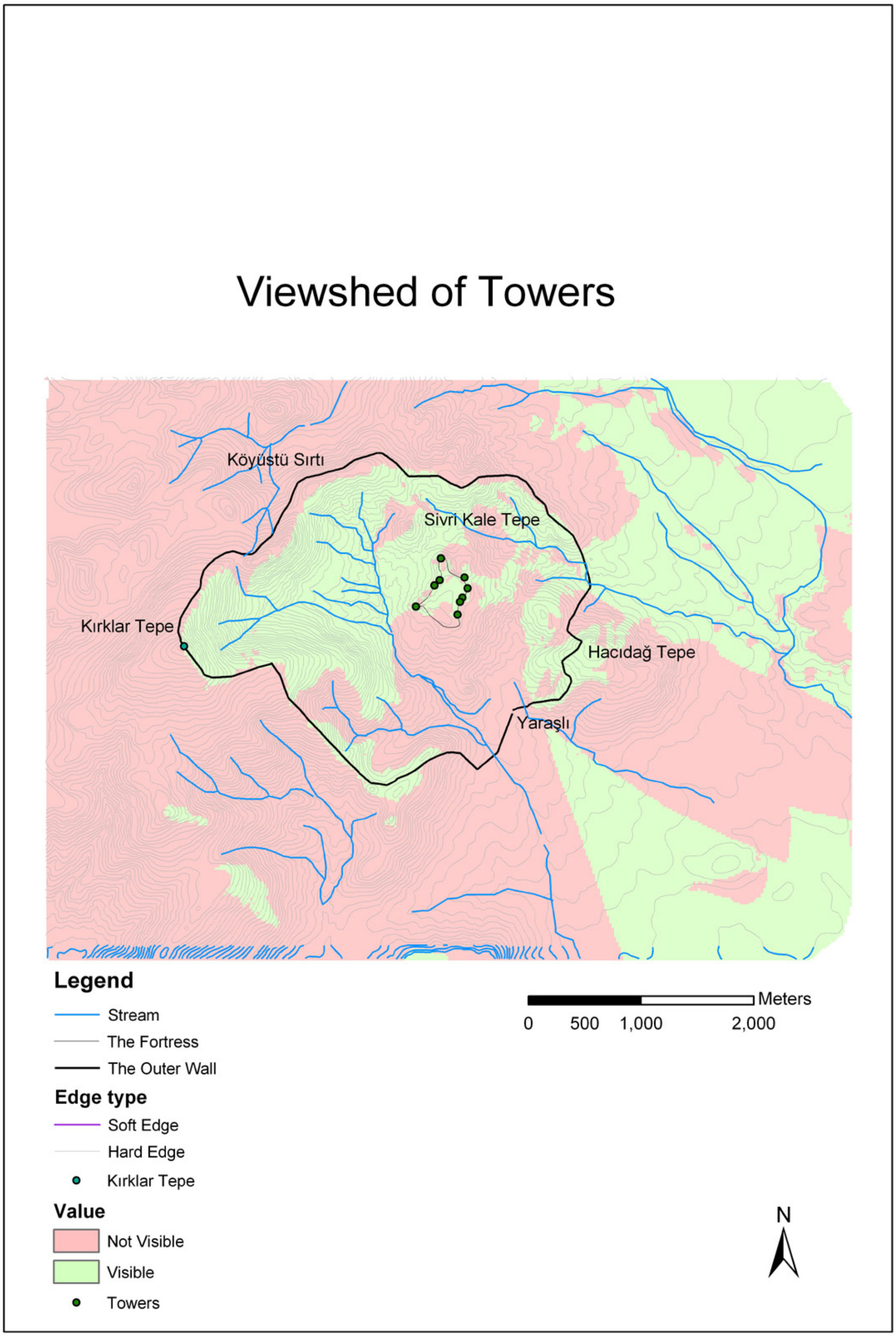

Figure 94: Viewshed of the towers of the fortress.

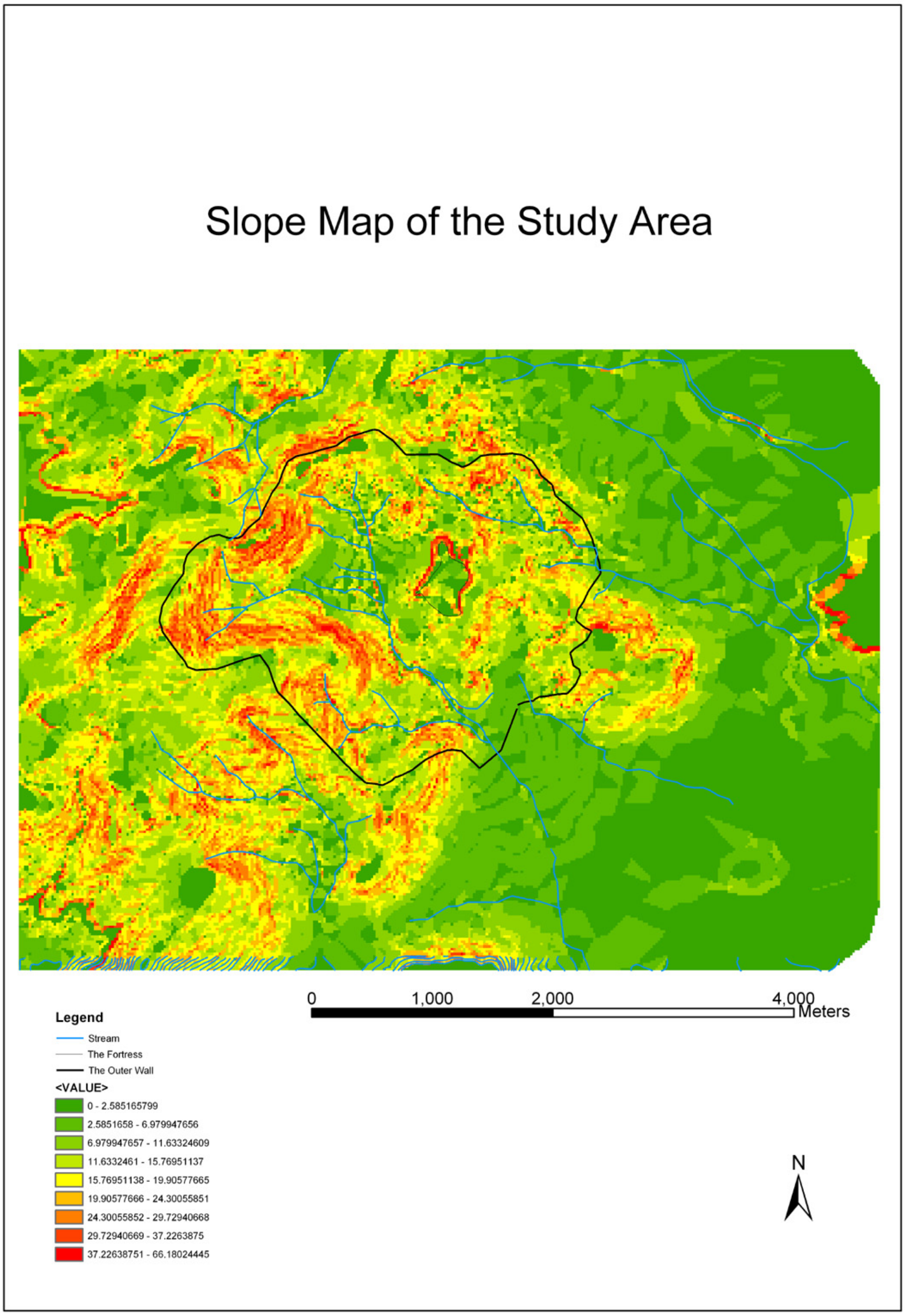

Figure 95: Slope Analysis of the Study Area. Slope Analysis shows that the rampart and the outer wall in addition to the east slope of Karacadağ Mountain are quite steep which limits certain functions, as decreasing accessibility to certain places.

These conclusions raise several questions; why was the fortress and surrounding enclosure wall constructed, how were they intended to function and under what circumstances, and why were they abandoned. As we shall see, the answer to some of these questions can be approached from the archaeological evidence while others rest on an understanding of the very shadowy and difficult historical background.

CHAPTER 6

THE CERAMIC EVIDENCE

The ceramic evidence discussed in this section is collected by Michael Balance and Alan Hall and stored in the collection of British Institute of Archaeology at Ankara. Detailed descriptions, drawings and dimensions of this material were given by Geoffrey Summers' article at Anatolian Studies 1992. Ceramic evidence from Yaraşlı, although not coming from stratigraphically excavated contexts and scanty in number establishes a reference point for a period of occupation of Çevre Kale.

However it is impossible to suggest that all of the Iron Age material, which had been previously collected from the site, is diagnostic in terms of chronology or center of production. Under these circumstances only the diagnostic pottery types were discussed again in this study to draw a historical framework for the fortress and associated Iron Age remains namely, the outer wall. Amongst those pottery groups, examples of Phrygian Grey Ware, Black on Red Ware, a Corinthian Aryballos and a very small sherd of Marbled Ware.

Although types such as Phrygian Grey Ware or BoRW is relatively hard to date when compared to Greek imports or other diagnostic material, their existence implies certain cultural connections and they are as useful as the latter types to draw a wider framework for the study area.

6.1 Phrygian Grey Ware:

Beginning from YHSS 6, Grey Ware is the dominating feature of the pottery repertoire found at Gordion until the end of YHSS 3 (330-150 BC).[67] In addition,

[67] Henrickson 2005, 124

when Summers plotted the grey ware from Ian Todd's' Central Anatolian survey, he also pointed out that distribution of the grey ware in the east may also approximate to the eastern limit of the Phrygian state with its capital at Gordion, perhaps in the 7th century BC.[68] In this sense existence of Phrygian Grey Ware and its association with other material could easily point out distinct period of occupation or cultural zones though the ware itself is not enough to set the precise chronology. The bowls and the silver wash as well as the shapes and fineness of the PGW in general suggest a date well after the start of the Middle Phrygian at Gordion. (Geoffrey Summers pers.comm.)

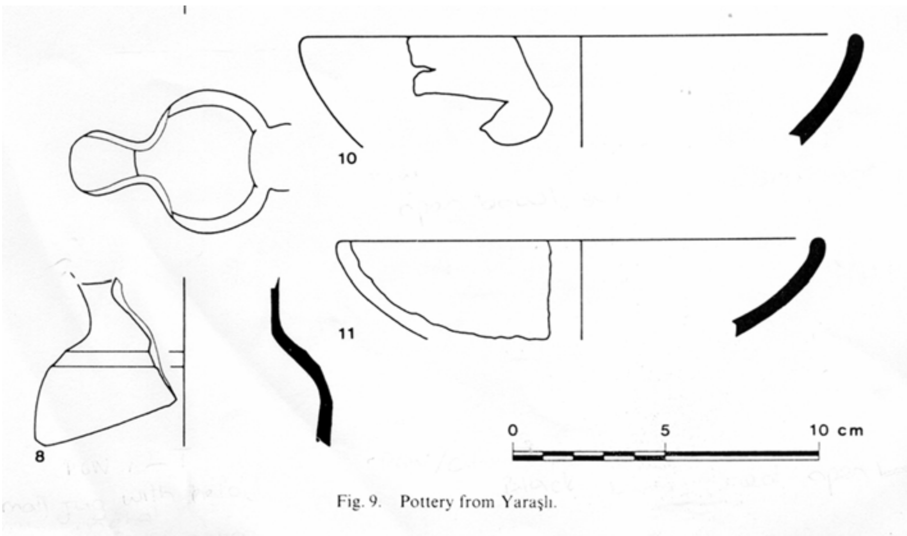

Figure 96: Profiles of Phrygian Grey Ware examples found at Çevre Kale. (Summers, 1992: 201

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68 Summers 1994, 241-52. Postgate (in a lecture given at Bilkent University, 2005, has accepted this equation).

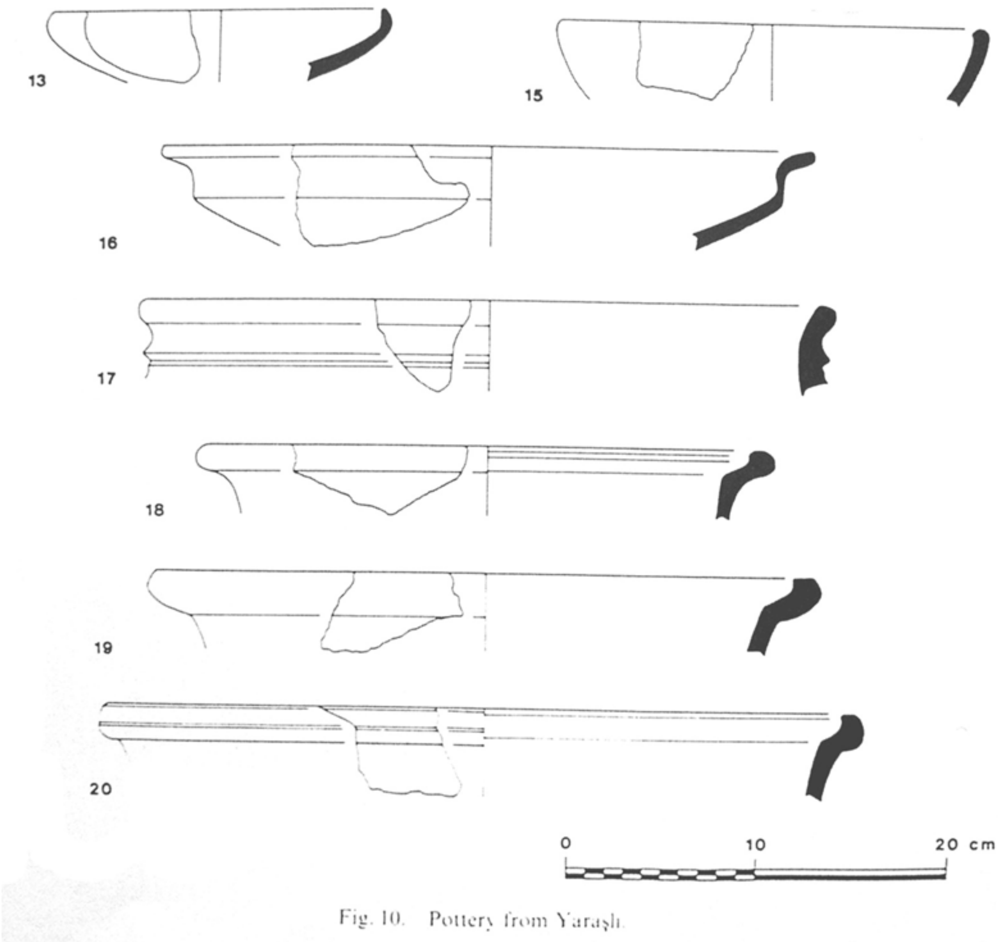

Figure 97: Profiles of Phrygian Grey Ware examples found at Çevre Kale. (Summers: 1992: 203)

6.2. Marbled Ware:

Marbled Ware is a distinctively Lydian technique and described as a "simple decorative technique in which diluted glaze paint was unevenly applied over lighter background surface to create abstract patterns of texture and coloristic effect".[69]

Examples of the ware was found in Sardis, Old Smyrna, Colophon, Pitane and Buruncuk-Larisa-, Daskyleion, Aphrodisias, Gordion, Emircik Höyük and

[69] Greenewalt 1966, 120

Alibey Höyük.[70] Varieties of the ware were found at Midas City and Düver Ada at Pisidia, late-provencial marbling is found at Gordion and Alişar Höyük.[71]

For the chronology of marbled ware, Greenewalt suggests "Lydian marbling was used to decorate pottery throughout the 6th century, commonly during the second and third quarters". There is no evidence it was made earlier than 600 BC and little to suggest that it continued later than c.450 BC and curled marbling technique occurs at the 2nd half of the 6th century BC.[72]

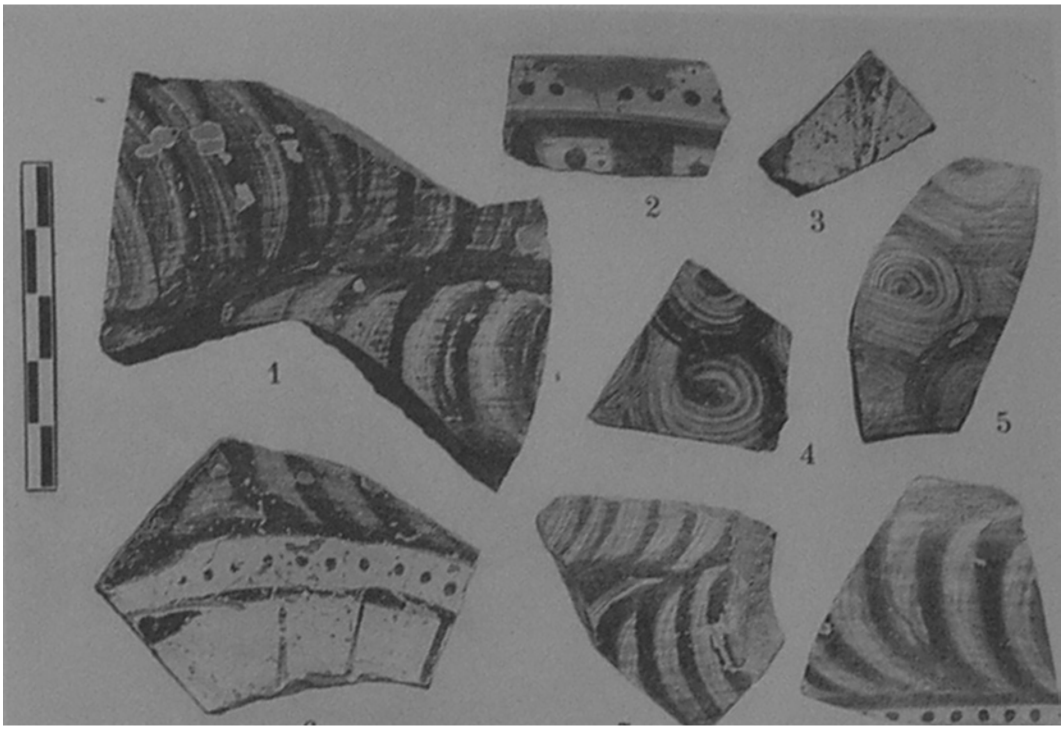

Figure 98: Examples of Marbled Ware from Midas City. (Haspels, 1951: Pl. 8b)

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[70] Greenewalt 1966, 152
[71] Greenewalt 1966,152
[72] Greenewalt 1966, 151

6.3. (Southwestern) Black on Red Ware:

Yet another significant group of pottey is Black on Red Ware found at Yaraşlı. The term Black on Red Ware is basically describing a type of decoration, which involves black painted geometric motifs on a red slip or red clay background.[73] However there are several types of Black on Red Ware and more than one center of production. Although the production place of the ware is not identified yet, Black on Red are is mainly found in and around Pisidia, and this strengthens the possibility that the ware is also produced at a specific site or sites at Pisidia.[74] Mellaart defined two types of the ware[75] and Sams underlines that occurring varieties are probably due to geographical and chronological factors.[76] Dating of the ware is also problematic. The beginning of BoRW I from Mellaarts' survey area date back to 800 BC though most of the material found in his Survey area is BoRW II and dated to 6th century BC. [77] Under these circumstances, BoRW from Yaraşlı is difficult to evaluate in terms of chronology and origin and this is merely an attempt to point out examples of similar BoRW examples from Gordion, Midas City and James Mellaart's central Anatolian Survey.

There are basically three groups of BoRW at Gordion; first group is locally made and mostly occurred in pre-destruction and destruction levels, second group is Lydian manufacture and last group is produced in SW Anatolia. The examples of BoRW at Gordion, Burdur, Afyon, Boğazköy, Midas City and East Greece come from 6th century contexts.[78] It is also possible to find sherd with similar

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[73] Schaus 1992, 53

[74] Sams 1979, 13 and Schaus 1992,151

[75] Two types of BoRW observed during James Mellaarts' Central Anatolia Survey and he described Black on Red Ware as a characteristic of the Southwest Anatolian pottery both in shape and lavish geometric design. Black on Red I, This group has a light red polished, slipped or unslipped surface bearing geometric patterns, matt black paint is used for the motifs. Black on Red II, Often unslipped and only smoothed, with a gray-black washy decoration, motifs are usually geometric but they sometimes contain naturalistic motifs. Ground color is red or brownish.

[76] Sams 1979, 13

[77] Mellaart 1955, 122-3

[78] Schaus 1992, 154. It must be boldly noted that Schaus mentions earlier in the article that the Gordion material discussed in the article comes from thick clay layer

patterns found at vilaage of Kıcıkışla 25 km NW of Karapınar district of Konya.[79] Arslan points out that the Black on Red pottery from Kıcıkışla dated to end of 7th century- beginning of 6th century BC and made by the potters near the West Anatolian center.[80] **(Figure 99**)

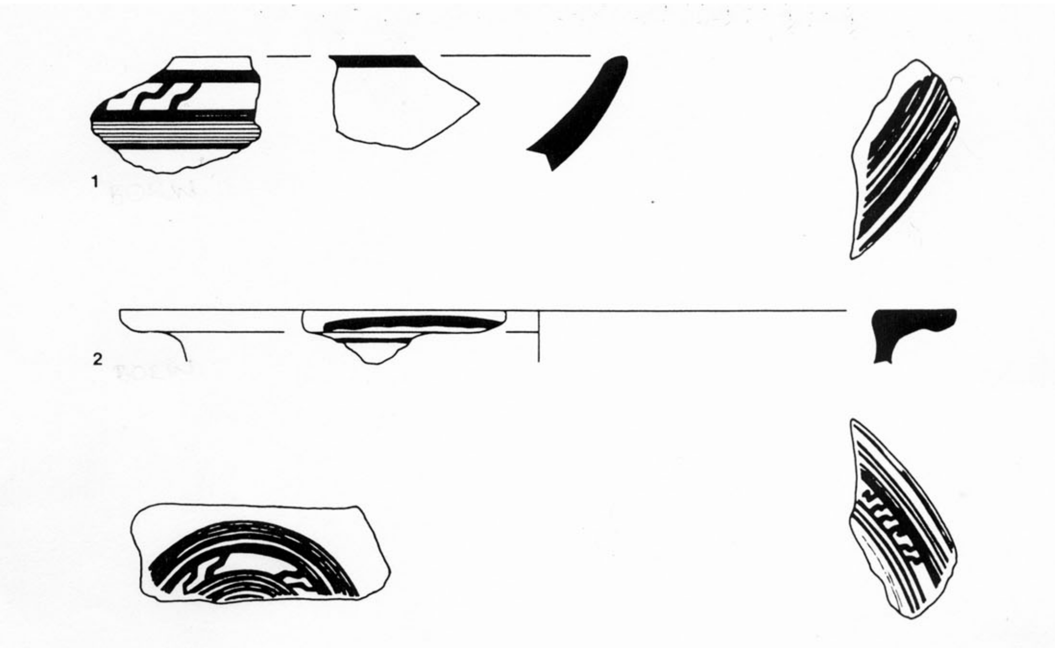

Figure 99: Ink drawings of Black on Red Ware from Yaraşlı (Summers, 1992: 197)

separating the Early Phrygian Layers to the Middle Phrygian and suggest 6th century date based on that. However, this 6th century date for Gordion is not valid at the moment due to change of "Destruction Level of Gordion". See Appendix II.

[79] Bahar 1999, Pl. XXIV 2.

[80] Arslan 2001, 176

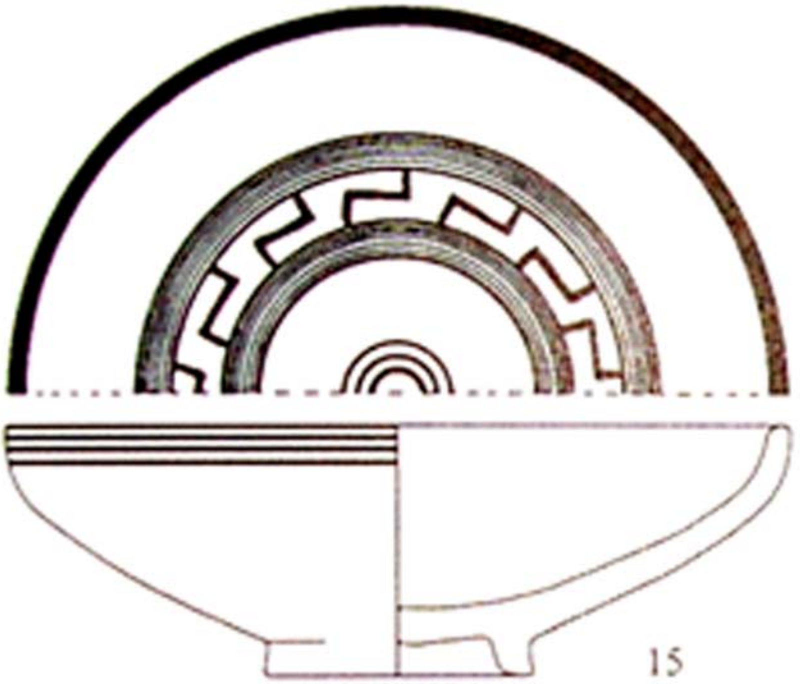

Figure 100: Example of BoRW from Kıcıkışla near Karapınar, Konya.(Arslan, 2001: 175)

At Gordion most common types of southwestern BoRW are jars and feeders. They have monotonous series of bars, cursory meandroids and groups of thin lines, sometimes enclosed by heavier lines. They are usually found at simple graves, which is similar context as the excavated examples of the SW.[81] At Ephesus some varieties occur contexts of the first half of the 6th century and at Gordion there are examples coming from late 5th century, however the latter do not come from a secure contexts.[82] Emilie Haspels dated the examples of BoRW from Midas City to 5th and 4th centuries, however Machteld Mellink suggests an earlier context based on the imported Cilician material.[83] The parallels of Black on Ware from Midas city were found in Gordion, Boğazköy, Pazarlı, Alaettin Tepe. At IIa Levels of Kaman-Kale Höyük examples of BoRW was also found, too.

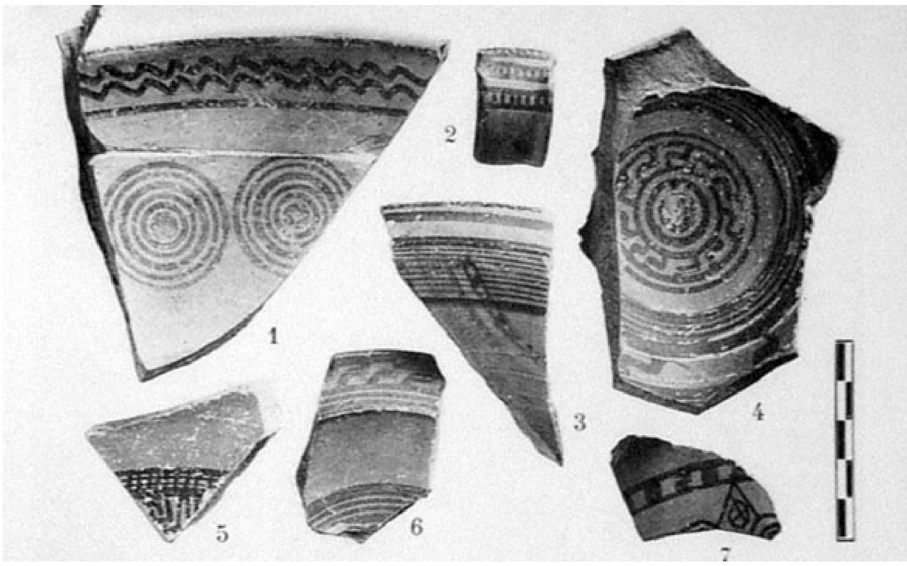

Figure 101: Samples of Black on Red Ware from Midas City. (Haspels, 1951: Pl. 9b)

[81] Sams 1979,13
[82] Sams 1979, 13
[83] Mellink 1954, 168

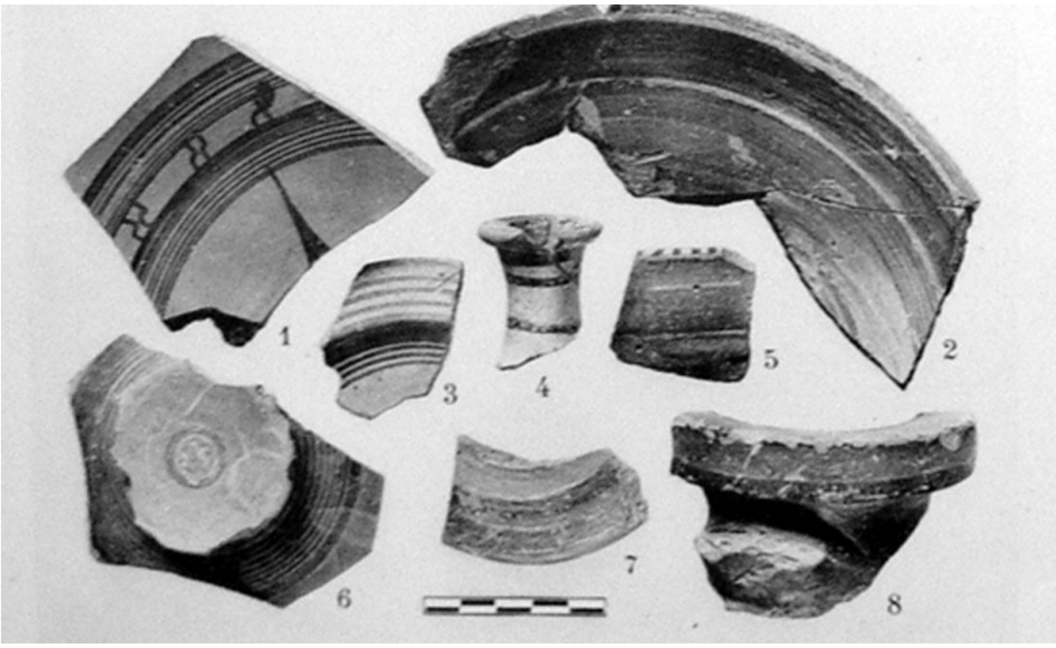

Figure 102: Samples of Black on Red Ware from Midas City. (Haspels, 1951: Pl. 9c)

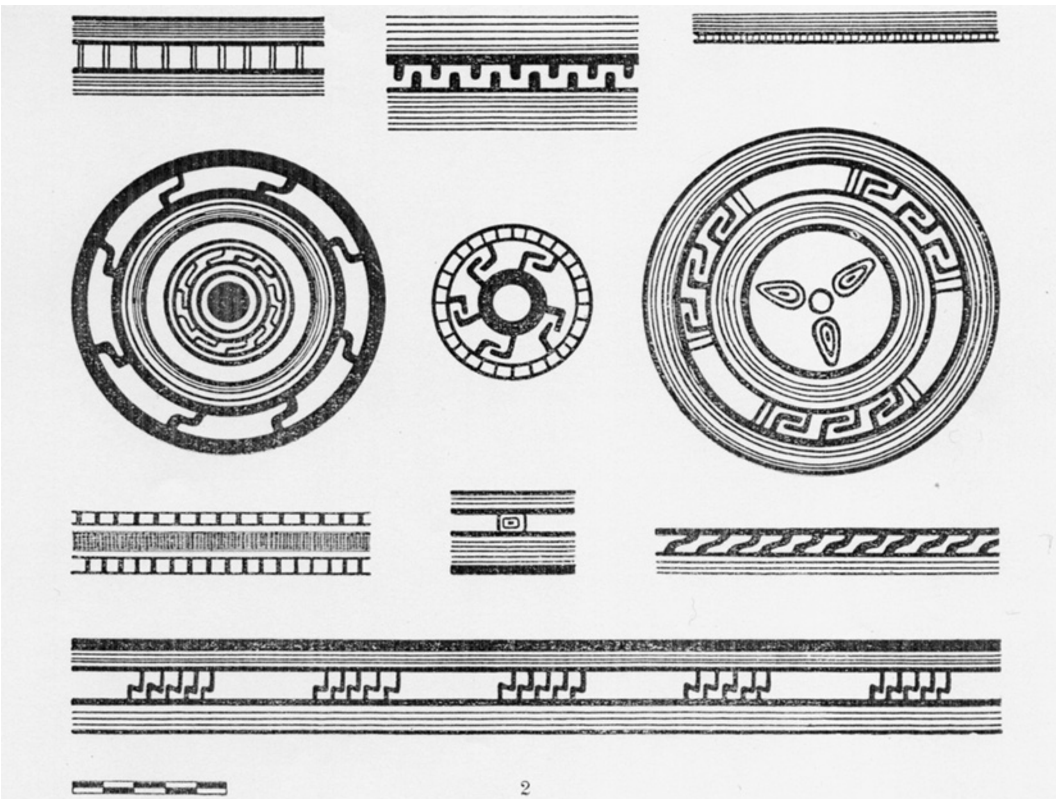

Figure 103: Patterns observed on Black on Red Wares from Midas City. (Haspels, 1951: Pl. 39/2)

6.4 Corinthian Aryballos:

There is a rim sherd and a body sherd of a Corinthian Aryballos found at Yaraşlı. Although dating of this type of import is easier than some the aforementioned types, the condition of the single Corinthian piece from Yaraşlı is not suitable for precise dating. From the HoB (House of the Bronzes) context of Sardis two similarly decorated samples were notified.[84] First one is coded as COR11 and is dated to Middle Proto-Corinthian (MPC) period (690-670/ 670-650) Second one is coded as COR43 and is dated to Late Proto-Corinthian (LPC) (650-630)

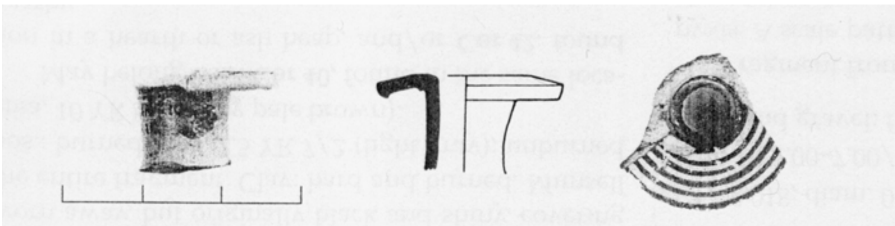

Figure 104: Corinth 11 (Schaeffer et al., 1997: Pl 6)

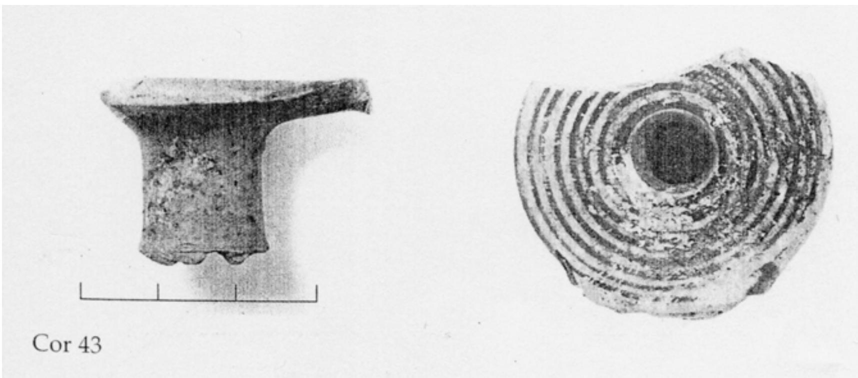

Figure 105: Corinth 43 (Schaeffer et al, 1997: Pl. 9)

[84] Schaeffer et al 1997: 23 and 31.

However, none of those samples are the perfect match of the sherd find in Yaraşlı although at least they provide a basis for possible dating options.

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CHAPTER 7

HISTORICAL SETTING

The decision to focus on the Iron Age occupation at the site was based the obvious over-riding importance of the Iron Age fortress and associated remains within the study area together with the availability of archaeological data from an earlier study of the fortress itself. In addition, there was an abundance of Iron Age pottery and the paucity of earlier material inside the fortress, together with the obscurity of evidence related with earlier construction of the fortress (no traces of the aforementioned postern or tunnels, a common feature found in Hittite cities such as Hattusas and Alacahöyük).[85] More important is the critical position of the fortress in terms of Iron Age power equilibrium and territories.

The collapse of the Hittite central authority caused changes in social and economic conditions following the end of the Late Bronze Age. As Hawkins points out, political centres in the Iron Age were different from their Late Bronze Age predecessors.[86] Culturally and regionally defined groups such as Phrygians and Lydians emerged as new political powers, while the Hittite population survived and expanded in the south of Anatolia and North Syria as far as the Euphrates.

7.1 HISTORICAL GEOGRAPHY

The political geography of Central Anatolia changed, sometimes radically, throughout the Iron Age. When this historical framework is combined with the limited archaeological evidence, it becomes obvious that in terms of the historical geography of the Iron Age, Çevre Kale lies close to and is in some way associated with the border of a territory between the 8th and the mid 6th century. This region was

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[85] Mellaart 1983, 345
[86] Hawkins 1990, 372

subject to different political powers starting with Phrygia and ending with the Persian conquest.

According to Muscarella, based on the initiation of massive building program at Gordion, around late 9th century BC (late 7A-beginning of 6B) kingship established in Phrygia.[87] During the reign of Midas (738-696/695), the territory of Phrygia covered most of the western Central Anatolia as far as Lydia to the southwest, and the Neo-Hittite city-states of Tabal, with Tuwanuwa in particular, to the east and southeast.[88]

According to Assyrian annals Mita of Mushki, who is widely accepted as the Midas of Phrygia, had conflicts with Assyria because of both sides' desires over these city-states. Both sides tried to persuade these city-states to act as allies against the other and, according to Bryce, "It was clearly impossible to remain neutral" [89] However, these conflictions ended up with the increasing Cimmerian threat and towards the end of the 8th century, a threat which is often associated as one of the reasons caused the demise of Neo-Hittite and Phrygian (and Urartian for that matter) power.

[87] Muscarella 1995, 96. It must be noted that Muscarella is against the change of destruction level of Gordion. If the change in this date is accepted, establishment of kingship goes well beyond late 9th century. According to the recently revised Yassihöyük Stratigraphical Sequence (YHSS), Phase 6B is around 950-900 BC which will put the establishment of Phrygian Kingdom around late 10th century BC. As a result of this, either the change of destruction level is accepted or not, one can talk about organized Phrygian power in the late 9th century. In this sense, Muscarella is setting a *terminus post quem* for the establishment of Phrygian kingship.

[88] Sams 1995, 1157

[89] Bryce 2003, 99

Figure 106: Neo-Hittite City States. The arrow on the up left corner indicating where Yaraşlı is located. (Hawkins, 1991)

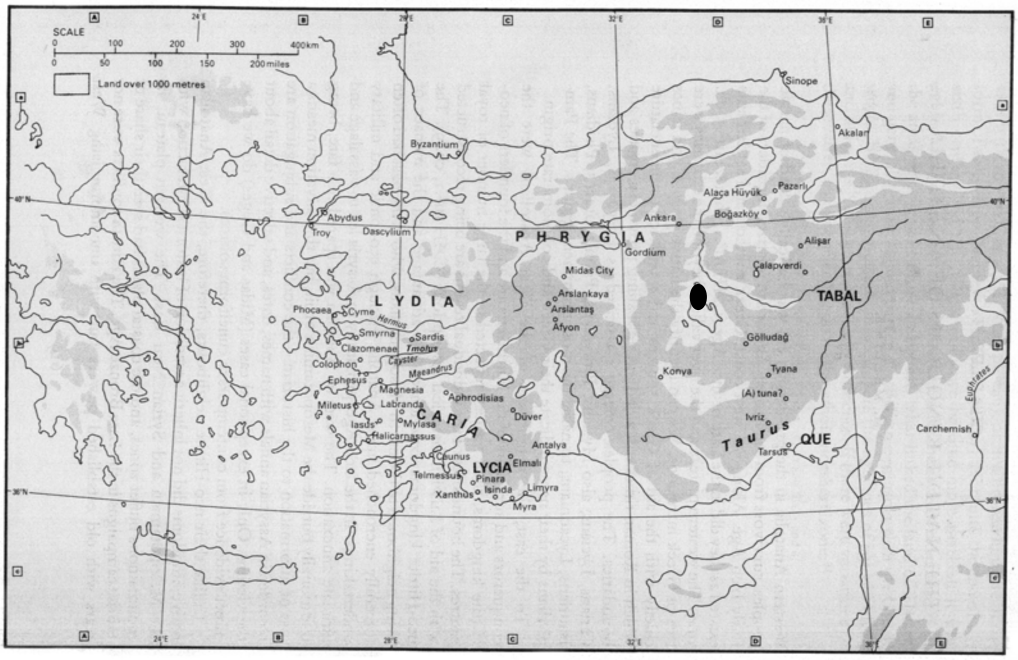

Figure 107: Phrygia and some major Iron Age sites. Black dot is indicating Yaraşlı. (Mellink, 1991: 620)

Although Yaraşlı lay within the Phrygian territory of the 8th century the ceramic evidence does not suggest a date as early as this period for the fortress and associated features.

In addition to the death of Midas as a symbol of Phrygian rule (at least from a 20th century point of view), growing Lydian power in the west and Cilicia to the south must have affected the re-establishment of power equilibriums towards the following the 8th century. The last time Assyrian records mention Tabal is in 640 BC after which it vanishes until it re-emerges as Cappadocia centuries later.[90] Assyria falls around 610 BC. These vanishing powers, as far as the historical evidence suggests, were replaced by at least in the central part of Anatolia by Lydians and Syrians (Cappadocians). Herodotus talks about a five- year was between the Medes

[90] Hawkins 2000, 428

and the Lydians, although the validity of his account is debated, some time between middle 7th and early 6th century BC.[91] The recent discovery of Phrygian inscriptions and graffiti at Kerkenes, an Iron Age capital that is probably to be identified with Pteria and which seems to have been destroyed in the mid 6th century, has added a new and unexpected player into these complex and shadowy events.[92]

Gradually growing Lydian power appears to have extended over Phrygia and its capital at Gordion by the early sixth century.[93] This was most evident at the Küçük Höyük Fortress, a mud brick fortress to the south of the main settlement mound, which is widely accepted as a Lydian project.[94] The occupants of the fortress were probably Lydian soldiers due to abundance of Lydian pottery over Phrygian. The Lydian Kingdom covered part of the modern provinces of Manisa, İzmir, Aydın, Denizli, Uşak, Kütahya and Balıkesir around the 7th and first half of the 6th century when it seems to have established itself as a distinct cultural and linguistic entity.[95] According to the Assyrian texts Cimmerians were still a threat on the Anatolian plateau during the reign of Gyges and he sent messengers to the Assyrian ruler to request help.[96] Unfortunately Gyges shared a similar destiny to his Phrygian counterpart around 645 BC. According to the Assyrian sources, he was killed during the Cimmerian capture of Sardis.[97] His successor Alyattes drove the Cimmerians from Anatolia[98] and Mellink underlines that after Midas, Alyattes seems to have been the first Lydian king to aim towards a similarly firm expansion to towards the Halys River in Central Anatolia [99]

91 See Tuplin 2004 for a detailed summary of the debate over Median Empire.
92 Summers (forthcoming 2006 b); and Brixhe,. (Forthcoming) for inscriptions.
93 Voigt 1997, 430
94 Sams 1995, 1158, see also Mellink 1991, 653
95 Roosevelt 2003, 25
96 Mellink 1991, 644
97 Greenewalt 1995, 1176
98 Greenewalt 1995, 1176
99 Mellink 1991, 649

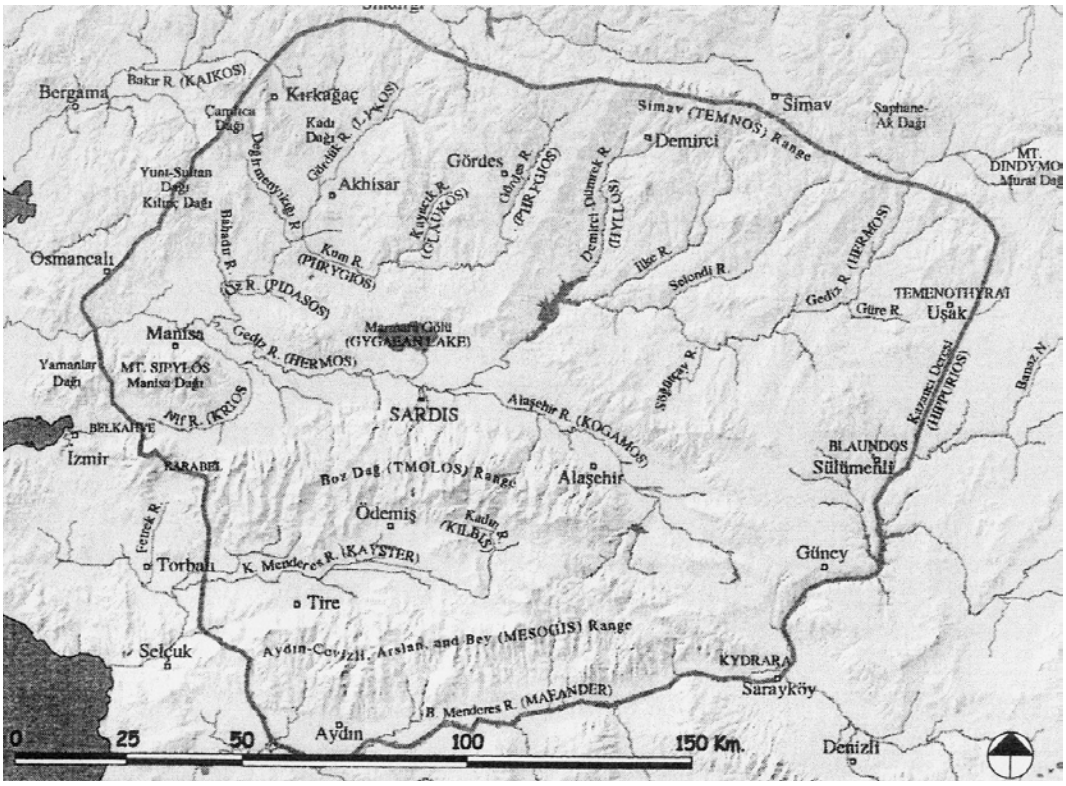

Figure 108: Borders of Lydia in the 6th century BC. (Roosevelt 2003: 26)

Although the coreland of Lydia was further west, by time, Phrygian territory falls under some degree of Lydian rule. (See Figure101) According to the accounts of Herodotus, Lydians and Medes had a battle on the other side of the Halys; the river, which has been accepted as the boundary between the Medes and Lydians. This account is important since it places Yaraşlı inside the Lydian territory although it is close to the eastern border. This war, according to Herodotus, ended because of a solar eclipse. Cilician and Babylonian kings are said to have acted as the arbiters in the ensuing peace treaty between the two sides.[100] Although Herodotus does not mention the date of the war, according to an astronomical calculation the eclipse

[100] Herodotus I.74, see also Mellink 1991, 649

must had taken place on 29 May 585 BC. However, Herodotus' association of end of the war with eclipse is open to discussion.

In addition to the Herodotus' testimony of the Cilician King Syennesis I and Neo-Babylonian King being arbiters of the peace between Medes and Lydians, he describes the Lydian territory ruled by Croesus (I.47), as including all peoples on the other side of River Halys with the exception of Cilicians and Lycians.

Thus some way to the south of Yaraşlı should be Pirindu, which was most probably within or overlapped with the area of Rough Cilicia. According to a Neo-Babylonian chronicle, the Neo-Babylonian Neriglissar chased after a rebel and set fires as far as the border between Lydia and Cilicia. This border probably lay well west of Pirindu.[101] (See Figure: 99) In any case, Pirindu appears as one of the resistant and strong entities of the early sixth century.

However, the political geography of the early sixth century changed with the march of Cyrus the Great to Lydia. The destruction of the Küçük Höyük Fortress is dated to 540s and this date is based on imported Attic pottery, an evidence placing Persians as the destroyers of the site.[102] Sardis fell around 547 BC. Thus by the second half of the sixth century Persian rule extended over the entire Anatolian Plateau and their system of Satrapies, while sometimes recognizing older divisions, removed the reasons for state conflict between Lydia and its neighbors. In other words, Çevre Kale and its outer wall lost its raison d'étre, which would probably be responsible for its construction. With the Persian conquest, Cilicia became a vassal state between 542 and 401 BC and afterwards it was put under rule of Persian Satrap between 401 and 333 BC.[103]

[101] Grayson 1975, 104, see also Wiseman 1974, 40.
[102] Voigt 1997, 431
[103] Ten Cate 1961, 31

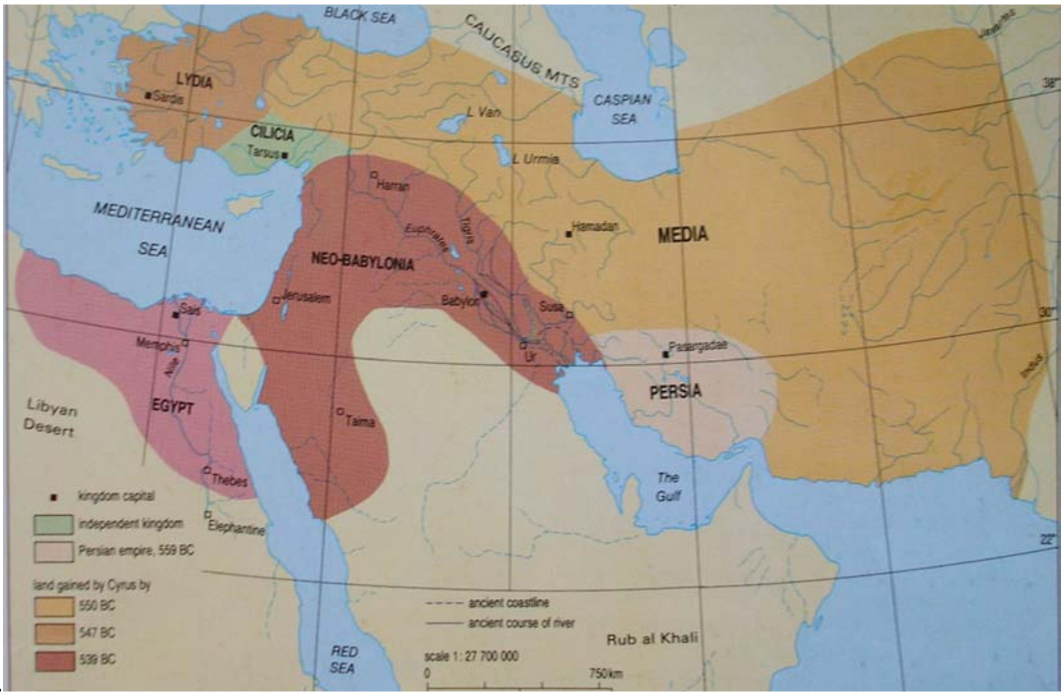

Figure 109: The map of land invaded by Cyrus. gives an idea about the borders of political powers or cultural entities just before 547 BC: (Roaf, 1990: 203)

CHAPTER 8

CONCLUSION

From the very beginning, the major aim of this study was to test the validity of Remote Sensing and applications of Geographical Information Systems (GIS) in the context of Anatolian Archaeology. As the focus of study, Çevre Kale and associated Iron Age features provided a solid reference point for the applications of this method in terms documentation, understanding of the site and evaluation of the process. Like almost in every aspect of life, the method succeeded in some ways and at some points failed to satisfy the expectations. However, without a doubt, where we stand right now is further beyond the initial phase of this study in terms of application of the method, interpretation and future prospection as well as the historical background/setting although the progress in the latter is relatively less than the rest.

Most of the architectural features in the study area reveal a dual nature construction technique: a combination of the artificial and the natural. A different sort of duality is evident also in the major aims of the Yaraşlı Case Study: to test a method while trying to contribute to the archaeological knowledge. As a result, the initial process of the study must be evaluated under several subheadings: evaluation of the method, the historical setting, the nature and the context of the site and future prospection as well.

8.1 EVALUATION OF THE METHOD

In general, Yaraşlı Case Study proved the strength of Remote Sensing and GIS as useful tools for understanding complex Anatolian landscapes in many ways.

The major results which could be concluded as the final assessment of the study are:

1. For the archaeological features at Yaraşlı, it would be fair to say that most of the features of the study area are visible from ground level and, hence, could easily be plotted by means of a total station survey. However, the data derived from available aerial imagery provide reliable and useful information on the context of the site in a case where combined intensive ground survey was impossible to conduct. In addition comprehensive aerial images provide information on topography, modern land use, possible water sources and vegetation at some cases as well as the archaeological remains. In this sense, the approach to the archaeological landscape becomes more comprehensive and from a wider perspective. This is certainly showing the importance of high altitude aerial images provided by General Command of Mapping. In addition, analysis of modern soil quality and geology maps provided further evidence for the suggested possible function of the site.
2. In terms of budget, this sort of study has advantages over a ground survey when the low cost of general aerial survey or obtaining high altitude aerial images is considered. Although it was decided to buy all overlapping high altitude aerial images of entire study area, employment of two overlapping high altitude stereo pairs of aerial images was sufficient for documentation of the study area. The General Command of Mapping provides declassified high altitude aerial photos for a cost less than 10 YTL, or about 7$. Two pairs of overlapping stereo pairs, i.e. four photographs, were enough to create a map like image of an area around 200-300 ha. As discussed earlier on, satellite images with higher resolution was grounded out of their high cost.
3. In a study which combines several layers of data such as high and low altitude aerial images, geology, soil quality and topography

data, use of Geographical Information Systems (GIS) becomes essential because geographical Information System software's' facilities enable us to manipulate, analyse and store data. One of the most important contributions of this study came from variety of view shed analysis made by using GIS software. These view-shed analyses demonstrated the association between the fortress and the outer wall, in terms of overlapping and completing visibility quality.

4. On the other hand, most of those data layers come in different - either digital or hardcopy- formats. Importing several layers of data and establishing a uniform coordinate system could be more time consuming than it was expected.

5. It should also be noted that each software product comes with its own advantages and disadvantages. While a raster-based software such as TNT Mips would be this authors primary choice for orthorectification or making a controlled mosaic in any future study, it takes some time to adapt to working simultaneously in three windows during those processes, especially when working on one a single small screen. On the other hand, ARC/GIS produces better results in vector-based analysis or representation; in addition to that, my personal view is that ARC/GIS creates better imagery when visual quality and representation quality are considered. If there were not a dramatic change at the topography of the photographed area, it would be very logical to use Aerial Version 5.27 for rectification. This software is quite user-friendly and does not involve very complicated steps or procedures when compared with the orthorectification process.

   Rectification in Aerial Version 5.27 did not take more than 2 hours, while the orthorectification process occupied more than two weeks when the time and effort spend to learn basic photogrammetry terms and processes is taken into consideration.

6. When all mapping and analysis procedures are done, the data is ready for presentation. It is important to note that this sort of study relies on visual data as well as archaeological and historical information, so that representation of the data in a reader-friendly format should be sought. In most cases black and white photos or drawings in grey-scale would create plain but more understandable data for presentation purposes.
7. The availability and the detail of the data are significant in setting the questions and research design for this kind of study. While sole use of high altitude aerial imagery would only enable us to plot the general features of the study area, such as the outer wall or the rampart, it would be impossible to plot precise locations of tower like features on top of the rampart from high altitude aerial photographs if detailed blimp images were not available.
8. A ground survey before and following the analysis and processing of aerial images in essential for several reasons. If solely aerial images were used to document the features of the study area, it would be impossible to plot east section of the outer wall. Even though, at this section, the outer wall has a quite solid structure and ground visibility is 100 percent, aerial images fail to provide even a smallest clue about the wall at this section. In addition, although aerial images provide potential areas for ground truthing such as the retaining wall for the dam, it would be impossible to suggest that this area was functioning as a dam to an inexperienced person without ground truthing.
9. Yet another aspect to be remembered that, aerial images provide a planar view of the features, which belong to different periods. In a single image, possible EBA, Iron Age and Byzantine features could appear together. So defining the relationship between several features and dating is almost impossible from aerial images unless very specific architectural forms are known etc.

In this sense, the aspect of dating is one of the weaknesses of this sort of study, although it is possible to document several features and monitor these features, setting the historical context is quite difficult without a systematic ground survey or excavation.

10. Although rapidly developing satellite imagery has several advantages, such as having high resolution, covering large areas in single images, being easy to obtain through Internet, and their ability to record over a wide spectral range, it would be untrue to say they are taking the place of the aerial images. At least in Anatolian landscapes, there is still great potential for applications of aerial archaeology. As seen in the 1954 high altitude aerial images, some of the declassified aerial images belong to an earlier time period than some of the earliest satellite images. In this sense, declassified aerial images provide snapshots of the forgotten, lost or destroyed ancient landscapes of the past decades. Also, declassified aerial images can easily be used to trace settlement patterns/systems when they are combined with other ways of archaeological survey and excavation.

In the Yaraşlı Case Study, high altitude aerial images enabled the plotting of at least three other small-scale fortresses/sites in the vicinity of Çevre Kale in addition to the outer wall. Although Kaman- Kalehöyük Regional Survey Team surveyed some of those sites in 2004, description and analysis of these small-scale sites around Yaraşlı requires more precise dating evidence and intensive ground survey. However, even this limited new information raises research questions concerning landscape archaeology and settlement patterning that could be investigated in a further study. Besides discovering new sites, periodic aerial survey of the known landscapes enables archaeologists to monitor those sites and their vicinity for protection of the cultural heritage. Yet another future study would focus on developing policies for protection of the cultural heritage. As Bewley, Palmer and several others have noted, aerial photography for archaeological purposes would be most efficient when the local archaeologists who are familiar with the landscape apply it to the study of material remains. In this sense, I hope that the Yaraşlı Case Study will be influential on the next generation of archaeologists, not only to present the archaeological heritage to the large audiences but also to search, document and monitor ancient landscapes by means of aerial photography.

8.2 ON THE HISTORICAL SETTING

Who are the builders of Çevre Kale and its circuit wall? Who were the first users of it? A precise answer to these questions above would be an ambitious one if the answer were only sought under the framework of this study. At this stage, limited archaeological and textual evidence when combined with information derived from other major Iron Age sites and previous study would enables us to suggest auspices for the possible construction of Çevre Kale and its circuit wall. In this stage than the question becomes which political power of the Iron Age might be responsible of the production of the complex archaeological landscape at Yaraşlı? Phrygian, Tabalian or Lydian?

Although none of the material at Yaraşlı comes from stratigraphically excavated contexts, existence of each piece completes the archaeological record when combined with information coming from other major Iron Age sites of Anatolian Plateau. Most notable of them are obviously Gordion, and Sardis. Iron Age levels of Kaman-Kalehöyük and the central Anatolian survey conducted by the same time also produced valuable evidence.

When Summers plotted the gray ware from Ian Todds' Central Anatolian survey, he also pointed out that distribution of the grey ware to the east may also approximate to the eastern limit of the Phrygian state with its capital at Gordion, perhaps in the 7th century BC.[104] In this sense, the existence of Phrygian ware and its association with other material could easily point towards a distinct period of occupation or cultural zones although the ware itself does not provide sufficient

[104] Postgate in a lecture given at Bilkent University, 2005, has accepted this equation).

evidence on which to base a precise chronology. Phrygian Grey ware at Yaraşlı certainly indicates Middle Phrygian period occupation. This phase very recently dated between 800-540 BC.[105] However, as noted in previous sections, it is impossible to talk about pure Phrygian political power at Gordion until very end of this phase and a subdivision between the heydays of Phrygian political power and Lydian dominance is necessary. It is possible that Yaraşlı might very well be associated with the period of Lydian domination of Phrygia.

Voigt underlines that "archaeologically, increased political control and centralization is often indicated by construction projects that required significant inputs of labor".[106]As mentioned before, Phrygia became a political power at least in the late 9th century and it is also obvious from the rebuilding of the citadel program at Gordion that in the 8th century they had enough power to organize labor and resources. In addition to that Assyrian texts testify Midas' interactions with Neo-Hittite City States and conflicts with Assyria during fourth quarter of the 8th century.[107] In a much later text written by Pausanias attests the foundation of Ankyra (modern Ankara) to Midas.[108] When ancient testimony for Midas' interactions towards the east, and the founding of Ankyra considered together with archaeological record coming from Gordion, one might associate construction of this complex archaeological landscape at Yaraşlı with the heydays (particularly during the reign of Midas) of Phrygian kingdom. However, it must very boldly be noted that none of the datable material evidence from Yaraşlı suggets a date can be associated with this era. In addition the material evidence is suggesting a data much later than the heydays of Phrygian kingdom.

The examples of Phrygian Grey Ware from Yaraşlı is testifying a date towards the end of Middle Phrygian Period rather than being associated from the

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[105] Voigt 2005, 27

[106] Voigt 2005, 29

[107] Assyrian texts testify for the actions of Mita of Mushki who is widely accepted as King Midas. For further discussion for the subject see Mellink 1965 and Muscarella 1998.

[108] Sams 1995, 1158. This attestation can be found at Description of Greece, section 1.4.5 by Pausanias.

early years of it. The bowls and the silver wash as well as the shapes and fineness of the PGW in general suggest a date well after the start of the Middle Phrygian at Gordion. (Geoffrey Summers pers.comm.)

Greek imports are yet another reference point, which would, suggests a later date for the occupation at Yaraşlı. In the 8th and early 7th centuries the number of Greek vases reached Gordion is 8 and most of them came form Corinth and after early 7th century there is an interruption of Greek material. Though there is a modest recommencement at the third quarter of 7th century the number of vases recovered at Gordion from excavated contexts at 1997 was 3. There was then gradual increase over the next generations.[109] The flow of Greek material to Gordion coincidences well with the gradual Lydian domination of Phrygia beginning from the reign of Alyattes (610-560 BC) and continuing with Croesus. In the first half of the 6th century (during reign of Alyattes and Croesus) the volume of Greek vases is in considerable proportions at Gordion while East Greek pottery was limited in quantity at 7th century.[110] The material coming from Corinth is mostly Middle and Late Corinthian Aryballoi and alabastra, probably containing perfume.[111] Although the Corinthian sherd of alabastron from Yaraşlı is hard to date because of its poor condition, its existence is clearly demonstrating some sort of interaction, either Phrygian or Lydian but close to the latter in nature, with East Greece. It is equally interesting that sherd belongs to specific type of pottery that was most common material imported from East Greece. The possible earliest date for Corinthian Aryballos is towards the end of 7th century BC and it is quite possible that the piece arrived Yaraşlı some years after it was produced. So this piece is also suggesting a date around late 7th and early 6th century BC.

Existence of BoRW though hard to date is significant since it is part of the pottery assemblage of YHSS 5 phase of Gordion. This pottery also found IIA levels dated between 7th to 4th centuries, of Kaman-Kalehöyük mingling together with

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[109] DeVries 1997, 20
[110] Sams 1979, and see also DeVries 1997,20 for more detailed information on the issue.
[111] Sams 1979, 8

Phrygian Grey Ware. Examples of BoRW from Kıcıkışla also dated around late 7th – early 6th century.

Yet another evidence supporting the Lydian influence is the existence of marbled ware, which securely begins in the 6th century BC. The ware is most commonly found at west Anatolian sites, however though sites like Alibey Höyük near Çumra and Emircik Höyük 10 km east of Çivril (which has number of tumuli in the vicinity) provided examples of it.[112]

On the other hand, Phrygian capital demonstrates Lydian dominance beginning from the reign of Alyattes; a hoard of 45 electrum coins were found from one of the storage buildings at Gordion, Lydian pottery makes its appearance in burials at Gordion of the early 6th century BC in both simple graves and tumuli, and finally in the houses of the walled suburb of the Küçük Höyük at Gordion, East Greek, and Lydian pottery exist together with Phrygian monochrome dark pottery.[113] At Yaraşlı, it is obvious that the pottery repertoire shows a similar combination. However there are missing pieces of the Lydian impact on Gordion, namely architectural terracottas.

Appearance of architectural terracottas at Gordion almost contemporary to their appearance at Sardis is yet another chronological evidence related with the Lydian domination over Gordion. The birthplace of roof tiles is probably Corinth and dated to the early 7th century BC.[114] They appear sites such as Sardis, Düver Ada, and Gordion in Anatolia.[115] Tiles were one of the more abundant finds in Gordion after pottery in Middle Phrygian levels.[116]

The arrival of tiles to Gordion is thought to have occurred in the late 7th and early 6th century BC.[117] Parallels for the Gordion tiles have been found at Sardis; in contexts that predate the Persian Destruction, which is (generally) dated to around

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[112] Mellaart 1955,121 and Greenewalt 1966, 152
[113] Mellink 1991, 649
[114] Glendinning 2005, 82
[115] Summers (forthcoming 2006 a)
[116] Glendinning 2005, 82
[117] Glendinning 2005, 82

550 BC.[118] Glendinnig suggested that terracottas' conservatism in terms of design, style, size or decoration, might be interpreted as the result of the importation of an already fully developed tradition from Lydia.[119]

This is yet another interesting spot of the Lydian dominance in Gordion. While pottery production shows almost strong resistance to the foreign influence which Henrickson interprets as the evidence demonstrating the strength of the local YHSS 6-5 craft tradition and its resistance to change.[120] It was not until the Achaeamenid period in Gordion that the local ceramic repertoire revealed traces of cultural impact. [121]

However, neither BIAA collection nor site visits provided even a single piece of architectural terracotta, which was found in western and central Phrygian sites as well as the Lydian ones.[122] Though existence of tiles would probably clarify the early sixth century occupation as well as the Lydian auspices, its paucity could take us to a two options. Architectural terracottas can either be underneath the ground cover or they actually had never been used at Yaraşlı.

If Winters' suggestion about tiles introduction to Lydia ascribed to Croesus, though architectural terracottas are yet lacking in Yaraşlı, this might mean that Yaraşlı was probably built before Croesus. However, it is also possible to suggest another option about the lack of architectural terracottas at Yaraşlı. Though architectural terracottas are amongst the abundant finds of Gordion after pottery, Glendinning mentions that tiles come from very specific buildings at Gordion; Building A, Mosaic Building and Painted House which the latter two have unusual architectural plans and have wall mosaics of clay pegs.[123] One can easily suggest that if existence of terracotta is also related with a specific function, than the fortress of Yaraşlı did not contain this sort of specific building at Gordion.

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[118] Glendinning 2005, 94 and Summers (forthcoming 2006 a)
[119] Glendinning 2005, 97
[120] Henrickson 2005, 135
[121] Henrickson 1997, 16
[122] Summers (forthcoming 2006 a)
[123] Glendinning 2005, 98

Finally, the similarity of the observed material with another Iron Age Settlement mound on the eastern side of the Kızılırmak River Basin, namely Kaman-Kalehöyük, provides at least a reference for dating and understanding this possible cultural sphere. The IIA occupation levels of Kaman-Kalehöyük include a pottery repertoire consisting of typical Phrygian gray ware, marbled ware, and examples of Black on Red Ware and this phase dates to the 7th-4th centuries.[124] However, the suggested initial date for the marbled ware begins in the 6th century and continues until the mid-fifth century.[125] This evidence at least reveals that the study area, i.e. Yaraşlı, was under the same cultural sphere Kaman-Kalehöyük on the other side of the Salt Lake.

Last but not least there are no characteristically Persian shapes, e.g. Achaeamenid Cups, at Yaraşlı, (Geoffrey Summers pers. comm.) which makes it possible that the site was abandoned about the time of, and very possibly in connection with, the Persian Conquest around 547 BC. Apart from lack of Achaeamenid material, probably the most important reason behind the abandonment could very well be the change of Iron Age borders once again which would probably caused Çevre Kale to lost its strategic importance

8.3. ON THE NATURE AND CONTEXT OF THE STUDY AREA

One of the aspects of this study was to understand function of the long outer wall surrounding the fortress through evaluation of possible reasons as to why it might have been built. Although the outer wall at first glance suggests a function related with fortifications, there are several lines of evidence, which suggest that fortification may not have been its primary purpose.

The first group of evidence comes from the structure of the outer wall itself. Although it is possible that the outer wall has towers or buttresses to enhance its control, there is no evidence of strong towers supporting the enclosure wall as might be seen at defended Iron Age sites such as Kerkenes or Gordion (the Küçük Höyük and perhaps Kuş Tepe). The second piece of evidence comes from the remains of the

[124] Omura 1997,293 , Matsumora 2001,101-110 and see also Hongo 1998, 239-278
[125] Greenewalt 1966, 120-123

dam in the vicinity of Yaraşlı village. The preserved height of the outer wall is less than a meter except for the retaining wall for the dam. Although the dam is on the very edge of a fast growing village, and thereby more threatened by destruction more than other archaeological features, it is still the best-preserved part of the outer wall within the study area. So it might be logical to suggest that the outer wall was never intended to build monumental in size like the sites mentioned above. Thus it is also possible to talk about the function of the outer wall as defining and enclosing a territory rather than being defensive.

Than the question is what would be the function of this place enclosed by the outer wall? Low soil quality in the modern soil data suggests that the area enclosed by the outer wall does not have good soil quality, but it still affords good grazing - particularly in spring.

In addition, the territory enclosed by the outer wall is of substantial extent including the water catchments of the Harlak Dere. The main source of this stream is a spring situated southwest of the fortress, but the narrow valleys on the outskirts of Karacadağ Mountain also collect rainwater and melted snow in spring. The outer wall also enclosed the source of another water catchment system close to the east gate. In this sense the outer wall not only enclosing an area suitable for animal pasture but also got the control of several water sources and streams that could provide water in this relatively dry region of Anatolia.

Understanding the purpose of constructing the dam is another aspect of the study. There are a number of water resources in the close vicinity of the fortress; the fortress is located higher than the dam, which would have made transporting water uphill to the fortress challenging. Modern soil quality maps reveal that the area inside the outer wall is a pasture area. At this stage it would not be proper to suggest similar conditions for the last two thousand years without any environmental reconstruction background, since landscapes are subject to gradual and immediate changes due to human interaction as well as natural processes.

However, when this hypothesis is accepted and all these inputs are evaluated together, it is logical to suggest a non-domestic use for the dam.

It is possible that dam was collecting the water necessary for animal fostering and it might well be provide for water for good quality agricultural land southeast of it.

The visibility quality suggests that the outer wall is in a way acting to guard and protect inhabitants of the fortress and, perhaps more importantly, the well-watered pasture surrounding the fortress and demarcated by the enclosure wall. This theory might also be supported by the presence of a later (Byzantine) beacon located somewhere on the top of Kırklar Tepe. When all the evidences listed above considered, this territory must have included a function related with the economic or military strength of the fortress.

Other major feature of the study area; the fortress, with its elevation above the previous ground level, and having features such as the surrounding ditch and strong rampart, suggests a space intentionally designed to distinguish itself from the rest of the area with a commanding view over the margins of the Tuz Gölü Basin. The location of the fortress as it is seen in the overall design was not a random choice; topography suggests there are two suitable areas to build this sort of structure: one on the ridge where the structure is located; another on Hacıdağ Tepe/Hill, towards the southeast—a prominent hill with a flat top.

The abundance of Old Hittite pottery in the vicinity of the fortress suggests Hittite architectural features provided construction material for the fortress project and attests to the longevity of the site. Material provided from an Old Hittite settlement could easily be used on construction of the rampart. In addition there is at least one water source in the close vicinity of the fortress just outside the fortress gate and there is also another one inside the fortress, close to the SW corner. In this sense, the fortress has its own water source, which would be extremely useful when it has to isolate itself from the rest in terms of hostile actions. However, Northern Enclosure does not have any water sources.

It is also interesting to note that the fortress has a single entrance from south. It is also impossible to talk about monumentality of the gate though this might be deceptive due to scattered construction material there is no evidence of monumental reliefs, multiple gates for specific functions etc.

It should also be noted that “single south gate” is not a result of restricted topography since the fortress was not built inside a quite narrow valley like today’s modern Artvin. However, the topography again is important fact, which affects possible routes or tracks. Modern topography reveals that most logical path to reach the fortress more or less follows/runs parallel to the Harlak Dere which goes all the way up to the south gate of the fortress.

When the single south gate is considered together with the abutting tower-like features on the eastern side of the rampart, a desire to being able to look over the east-southeast is suggested. This theory is also confirmed by the existence of secondary Roman Road coming from Ankara, running west of the Salt Lake and passing only a few km east of Yaraşlı village and ancient Çevre Kale. It would be logical for a later road system to correspond to an earlier one since the modern Ankara-İzmir highway still follows the path of the ancient Sardis-Susa Royal Road; even the modern road one takes from Ankara to reach Çevre Kale was once part of the Pilgrims’ Road. In this sense the origins of this later Roman Road may have drawn on Iron Age and possibly earlier templates.

The construction technique of the rampart and the wall on top of it is not clear. The buildings inside the fortress are at an elevation lower than the top of the rampart. It is also impossible to define an exact height for the wall on the rampart. Either mud brick or wood might have been used on top of the stone footings of the wall on top of the rampart, although the traditions at Early Phrygian Gordion, Late-Hittite Göllü Dağ and the 6th century defences at Kerkenes demonstrate that defenses built entirely o stone are perfectly plausible.[126]

It would be logical to suggest that the fortress was built with defensive considerations and its design could prevent access of hostile elements. With the enhanced visibility capacity by the outer wall, which is enclosing an area suitable for pasture, and with water sources, Çevre Kale might be of a site with significant military importance at least in the first half of the 6th century. 120km south of Yaraşlı

[126] See www.kerkenes.metu.edu.tr, (ed) Kealhofer 2005 and Gates 1995 and 1996 for detailed information.

is Royal Road and it is several days walk but less time consuming to pass with horses. So it can very well provide a military power and support when necessary. The site could very well be the best place to act as a supporting force during time of war or crises when the leading force was marching south and of course during days of peace it can very well sustain itself with its available resources. I must say that I owe the origins of these ideas presented in here to Geoffrey Summers. Significance of Yaraşlı is also associated with its uniqueness in Anatolian Iron Age landscapes up to date.

Although a date of first half of the 6th century is marked with the Lydian dominance in the former Phrgyian territory, at least in terms of archaeological evidence west of Salt Lake and Konya Plain can hardly be called someonelses land. While it would be possible to suggest such a big construction project requires benevolents and political situation of the late 7 early 6th century would definetly provide this source from the further west, namely Lydia who was in threat of the Persian Army, at this stage it is impossible to call Çevre Kale purely Lydian. However, Lydian Kingdom is so far the best candidate who is responsible for the construction unless this area had its own entities strong enough to do this sort of landscape manipulation. If the Lydian benevolence is accepted on Yaraşlı, it would also be yet another positive evidence of Herodotus' accounts on borders of Lydia at least during time of Croesus.

Further investigation might reveal a better explanation for the builders and the occupants of this fortress. This archaeological complex was either the result of early 6th century Lydian protection of the border looking towards Persia or not, it is the physical appearance of a group of people that has ability to control labor and resources to dig a ditch, built a 10m high rampart, enclose a territory with a 5km long outer wall, seek and success to control water.

The dual nature of the outer wall and the fortress signifies another perspective of the builders. Whoever they were, they had the ability to reshape the landscape as it is seen on the great rampart of the fortress, but also had the sense to take advantage of the natural landscape as in the case of integration of the manmade part of the outer wall with natural andesite outcrops.

8.4 FUTURE PROSPECTS

The work done on Yaraşlı is only the initial methodological step towards broadening our understanding of the interrelationship of settlement systems over time and ancient landscapes. The data obtained so far by just analyzing the topography and the aerial imagery have given us insights about the nature and the function of this archaeological landscape despite the lack of systematic archaeological excavations. When this sort of method can be combined with other aspects of remote sensing such as geophysics, or branches of environmental archaeology such as archaeobotany and archaezoology and intensive on and off site survey, the results will undoubtedly be tremendous.

Despite the fundamental lack of any sort of environmental reconstruction in terms of climate and vegetation cover as well as how this landscape was perceived in the ancient times, the process of studying the landscape as an integral part of settlement planning has, so far, produced information that corroborates the available archaeological and historical context of the proposed period of its occupation. In a broader sense, then, the site has been located in its historical and environmental context to some degree.

However, the extremely optimistic attitude held at the beginning of the study has given way to a desire to find out more answers about this complex archaeological landscape. The research done on Yaraşlı has only highlighted a major site of its own as well as revealing a number of minor ones located around it together with possible routes connecting them. In other words, the elements studied are but single visible features of a broader network, a network related to other settlements of varying levels of importance.

Overall, this study is basically opening a door for more comprehensive and developed methods to improve our knowledge about ancient people, landscapes and systems. Further, this study clearly demonstrates that these ancient sites and their features are not simply white spots or intersecting lines on white paper, but that they take on new meaning and importance when set in proper context.

Finally, I should mention that while I was walking on the way up to the summit of Karacadağ along the remains of the outer wall, I realized that once upon a time ago some people had thought, planned and designed the wall while others had worked, some harder some a bit lazier than the rest, to select, drag and lift the stones into position. This wall or indeed any other architectural structure or artifact from the past, in scholarly terms “material evidence”, is nothing if we archaeologists do not consider the humans and human thought behind it. Dismissing the human dimension in the pretense that we are being more scientific will make us no more than a pseudo-archaeologist.

APPENDICES

APPENDIX A

PHOTOGRAMMETRY TERMINOLOGY[127]

Absolute orientation: The process where stereomodel coordinates of control points are related to their 3 dimensional coordinates in a ground based system.
Binocular vision: The capability of seeing with both eyes, and thus in 3D.
Digital Elevation Model (DEM): Discrete representation of a topographic surface where elevation values of the topography are digitally represented. DEMs can be in the form of regular grid or a Triangulated Irregular Network (TIN).
Epipolar Image: Resampled image pairs in which the rows of pixels in both images lie along epipolar lines.
Fiducial marks: Usually four or eight pinhole-like points on the aerial images. They are two dimensional control points whose (x, y) coordinates are precisely and accurately determined as part of camera calibration.
Georeferencing (Ground registration): A technique whereby a digital image is processed so that the columns and rows of the resulting product are aligned with north and east in a ground coordinate system.

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[127] In compiling the "Appendix for the Photogrammetry Terminology", the major references depend on Wolf and Dewitt (2000), the Getting Started: Making DEMs and Orthophotos with TNTMips manual compiled by MicroImages and Archaeological Method and Theory, an Encyclopedia (2000)

Interior orientation: The step, which, mathematically recreates the geometry that existed in the camera when a particular photograph was exposed. This requires camera calibration information as well as quantification of the effects of atmospheric refraction.

Oblique Photograph: Photographs exposed with the camera axis intentionally tilted away from vertical. A high oblique photographs includes the horizon, a low oblique does not.

Orthophoto: A photograph showing images of objects in their true orthographic positions. Orthophotos are geometrically equivalent to conventional line and symbol planimetric maps.

Orthorectification (Differential Rectification): A process of removing image displacements and scale variations resulting from topographic relief.

Principal Point (Indicated): The point where opposite fiducial points intersects in an aerial image.

Rectification: The process of removing effects of tilt from an aerial photograph.

Relative orientation: The process of determining the relative angular attitude and positional displacement between individual photographs when they were taken.

Relief discplacement: The shift or displacement in the photographic position of an image caused by the relief of the object.

Stereopair: Overlapping pair of photographs that can be viewed in 3D using a stereoscope.

Stereoscopic viewing: Perception of depth through binocular vision.

Triangulated Irregular Network (TIN): Representation of a surface by a mosaic of triangles with known elevation points located at the vertices.

Vertical photograph: Photographs taken from aircraft with the optical axis of the camera vertical or as nearly vertical as possible

X parallax: The change in position of an image caused by the aircraft's motion. Parallax exists for all images appearing on successive overlapping photographs.

APPENDIX B

YASSI HÖYÜK STRATIGRAPHICAL SEQUENCE

The new dates combined with the Yassi Höyük Stratigraphic Sequence (YHSS) are summarized in the table below. The Yarişli fortress is thought to fall in the latter part of the middle Phrygian period.

Table 1: Yassı Höyük Stratigraphical Sequence. (After Voigt, 2005: 27)

Phrygian Citadel	Period Names	Approximate Absolute Dates	YHSS Phases
	Early Bronze Age	c. 2500-2000 BC	-
	Middle Bronze Age	c. 2000-1500 BC	10
	Late Bronze Age	c.1500-12th century BC	8-9
	Early Iron Age	c. 12th century-c. 950 BC	7
Old Citadel	Initial Early Phrygian	c.950-900 BC	6B
	Early Phrygian	c.900-800 BC	6A
	Early Phrygian Destruction	800 BC	
New Citadel	Middle Phrygian	c.800-540 BC	5
	Late Phrygian	c.540-330 BC	4
	Early Hellenistic	c.330-mid 3rd century BC	3B
	Later Hellenistic	Mid 3rd –mid 2nd century BC	3A
	Roman	Early 1st-5th century AD	2
	Medieval	13-14th century AD	1

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[128] For the Bibliography; format and abbreviations provided by American Journal of Archaeology were used.

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