SOTHO/TSWANA STONE-WALL SETTLEMENTS

Investigating the Nature of Aggregation and Variability in Late Iron Age Settlements in the Vredefort Dome - A Geographic Information Systems Application.

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A dissertation submitted in fulfilment of the requirements For the Master of Science degree in the Department of Archaeology, University of Cape Town

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Declaration:

I, `MAMAKOMORENG EXINIA NKHASI, hereby declare that this dissertation is my own work, unless otherwise acknowledged. And it has not been submitted for any degree at any other University.

Signed by candidate

MAMAKOMORENG EXINIA NKHASI

Dedication to my Parents-
Lekhetho Francis (Late) and `Matumo Aria Nkhasi

"The past is dead and gone, but it is also powerful...
the question of 'us', of our identity- *who are we?*"

-Johnson M. 1999

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ABSTRACT

The Vredefort Dome is a meteorite impact site (S26°51'36", E27°15'36") approximately 120km south-west of Johannesburg and about 300km north-east of Bloemfontein. It is one of South Africa's eight World Heritage Sites and straddles both North West and Free State provinces. Apart from its remarkable geology, the Vredefort Dome also has great faunal and floral biodiversity, as well as a wealth of cultural heritage. The Late Iron Age stone-walled settlements built by Sotho/Tswana speakers form part of this rich cultural heritage, and it is these that are under investigation in this study.

Previous archaeological survey and research has shown that Sotho/Tswana speaking peoples densely populated this area during Late Iron Age (from 1400 – 1800 AD). While settlement survey has identified three stone-wall settlement types (Group I, Group II and Group III) in the Vredefort Dome, this previous survey had been limited in extent. This research used aerial photographs to survey the whole Vredefort Dome and thereby expanded the sample. This research has focused mainly on the two dominant settlement types, namely Group I and Group II. This work has allowed a more detailed description of settlement preferences and an understanding of site location in relation to biophysical factors such as geology, topography and veld types.

Additionally, it has been possible to identify relatively discrete clusters of settlements and through the use of Geographic Information Systems (GIS), homesteads and cattle enclosures have been mapped and measured. The extent of homestead aggregation has also been measured and with this data, comparisons between settlements within clusters have been assessed in relation to possible political and social hierarchies. It is concluded that among Group I settlements and using some appropriate ethnography, there is no obvious settlement hierarchy. In the case of Group II settlement, larger aggregations represent the defensive response to the conditions of the early 19th century *difaqane.* While these must be underpinned by more centralised political control, on the basis of cattle enclosure and homestead sizes, central authority is not obvious. In contrast, these aggregations are briefly compared with the large Western Tswana towns, where political centralisation can be more easily identified.

This research is organized in five chapters: Chapter one introduces the background literature review which has influenced my research interest, and outlines the methodology followed in obtaining relevant data. The outline and discussions of the results are represented in chapter two, exploring is the distribution of different stone-walled sites within the ecological and biophysical context. Chapters three and four closely examine the distribution and locality of

specific stone-wall settlement patterns, Group I and Group II respectively. And lastly chapter five represents the concluding discussion.

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1. INTRODUCTION

The Vredefort Dome straddles both North West and Free State provinces. Running through the Vredefort Dome, the Vaal River forms a boundary between these provinces. The Vredefort Dome is not only declared a National Heritage Site by the South African Heritage Resource Agency (SAHRA) but was also recently declared the World Heritage site by United Nations Educational, Scientific and Cultural Organisation (UNESCO) (Reimold and Gibson, 2005). As the site of the oldest and largest meteorite impact in the world, Vredefort Dome has drawn interests from many disciplines, especially geology. This site is mostly renowned for its magnificent geology which in turn has influenced the flora and fauna in the area (Reimold and Gibson, 2005). Archaeological research has also shown that this geology may have had influence on how Late Iron Age Sotho/Tswana speakers selected their settlement sites (Taylor, 1979). It is the density, distribution, and localities of these settlements in this area that made the Vredefort Dome a suitable and appropriate choice for a study area.

The Vaal River is a significant land mark which can easily be used as a boundary to separate groups of people as they settle on the landscape. In South Africa Iron Age occupation immediately south and north of the Vaal appears to be much later than the south-eastern part of the country (Huffman TN 2002; Maggs 1994/95). Evidence from oral traditions has shown that Kwena crossed the Vaal at about 1550 – 1650 AD from the north west, heading south east, where they met with the Fokeng at Ntsuanatsatsi. The merged group crossed the Vaal northwards 1650/80 AD. The settlement of farming communities south of the Vaal is said to have taken place only from about 15th and 16th centuries. Though their migratory expansion was southeast wards, they occupied area further east earlier. Archaeological evidence of these movements has been traced through ceramic analysis and distribution of Iron Age stone-walls settlement types (Huffman TN 2002). The systematic mapping of the stone-wall settlements from aerial photographs (Mason 1968; Maggs 1976; Taylor 1979) has enabled to wider distribution of these sites and a higher concentration appeared to have being in the southern Highveld, mostly in the Free State Province.

The Highveld, dominated by grassland plains and very few trees, is an environment which is seemingly suitable for cattle and crop farming. Despite these environmental conditions, Early Iron Age farmers seemed to have avoided open grasslands. They located their settlements in the valley bottoms close to perennial water bodies, in contrast to Late Iron Age agro-pastoralists who settled on slope-breaks, hill-tops, and away from the valleys (Maggs, 1994/5). Iron Age communities lived in changing environmental conditions through time (Tyson, et al 2000), to which they needed to adapt. It is likely that these conditions could have influenced settlement locations and distribution, as people explored the use of alternative raw materials, for example use of wood being replaced by dry stone walling to mark basic boundaries and make enclosures as trees lessened, and sourced new resources. This may have been a conscious effort to balance their livelihood with the natural systems, or a choice imposed by circumstances resulting from historical turmoil events such as the *difaqane* (same as the *mfecane*) (Maggs 1976).

With consideration of a possibility that Late Iron Age farming communities in South Africa settled where they did because of the effects of environmental factors and historical events, this research seeks to draw inferences from settlement location and locality, settlement size, the degree of homesteads clustering, and cattle management in order to investigate the nature of settlement aggregation and variability amongst Sotho/Tswana speakers in the Vredefort Dome.

1.1 Research Question

Large clusters of stone wall settlements have been described as developing towards the end of the 18th century as a result of the growing tensions and competitive relations building up to the *difaqane*, characterizing the aggregation process as a defence strategy, in which safety is assured in large numbers. Aggregations are also linked to hill-slopes and hilltops. And this hill preference is another element of the defence idea (Huffman, 1986). The process of aggregation has therefore been attributed to a specific cause and to a relatively short time period from about 1780 but fully expressed between 1800 and the 1820s. However not all large aggregations are linked to hills. Large sites such as Molokwane (Pistorius, 1992) and Marothodi, to name but a few, are located in flat open locations that could not offer defence. It may, therefore, be incorrect to homogenise the chronology of aggregation to the late 18th and early 19th centuries. By exploring the aggregation of early stone wall settlements- Group I (Type N) - I hope to demonstrate that aggregation as a process may not be constrained to this narrow time range but rather a process that is inherent to societies of Sotho/Tswana speakers and is therefore embedded in their social organisation. And it may not necessarily be attributed only to the conditions and riots of the late 18th and early 19th century, but be seen as an effect of more dynamic variables. It is for these reasons that this research

- Investigates variability in settlement aggregation within less stratified Sotho/Tswana settlements in the Vredefort Dome. Thus answering question as to what is the variability in different aggregation structures; and where does this variability occur geographically.

- Identify environmental factors that may have influenced settlement site location. That is comparing areas ecologically and characterise the variable potentials of different areas as a basis for facilitating different scales of settlement pattern.

- The project seeks to quantify differential wealth in cattle by measuring cattle enclosure size in different kinds of aggregated sites. This will quantify what is already qualitatively evident on the basis of aerial photographic survey. Measuring cattle enclosure size will provide a statistical base upon which to discuss degrees of stratification within a cluster and between clusters. Thus, quantifying wealth disparities within aggregations. In order to answer these questions, the aerial photographs are manipulated in Geographic Information Systems (GIS) to derive and analyse archaeological data.

- And finally, the historical records (oral histories etc.) will be used in order to place different kinds of aggregations within a wider chronological framework and to explore events that could have influenced the nature of these Sotho/Tswana towns, with regard to political organisation, economic strategies and interaction with the surrounding natural resources.

1.2 Background Literature

Of the two provinces that Vredefort Dome straddles, most of the sites fall within the North West, and few on the south bank Free State side of the Vaal River. However Late Iron Age research in the Free State formed basis for settlement sequence and typology in stone-wall settlement studies (Maggs, 1976; Dreyer, 1992). The magnitude of stone-wall settlements in the Free State and elsewhere in South Africa was made clear through the use of aerial photography (Mason 1968, 1986; Maggs 1976; Taylor 1979; Pistorius 1992). This research also makes use of aerial photographs to analyse the data derived from this resource. It is therefore important to outline some of the previous works that directly or indirectly are critical points of reference as far as research in Late Iron Age farming communities is concerned.

In 1964 Revil Mason started a systematic analysis of aerial photographs in order to survey Late Iron Age stone-wall settlements. He counted Iron Age settlements on aerial photographs covering 1 211 square miles (about 3136.5 square kilometres) for parts of North-West, Gauteng, Mpumalanga and Limpopo Provinces (Mason, 1968). He extended the analysis to 47 733 square miles (~123 629 square kilometres) of Gauteng to Mpumalanga. The outcome was five classes of settlement types which were revised in 1986 to yield eleven classes (Mason, 1986).

Maggs' extensive aerial photographic survey of Late Iron Age stone-walls on the Highveld provides critical comparative study for researchers interested in South African stone-wall settlement patterns. He identified four main classes of stone wall settlement types, which he designated as, types V, N, Z and R (Fig. 1.1). In this study he covered the Vredefort Dome area, identified settlements, but did not classify nor analysed them. However, his results inspired Taylor's research in the area in 1979. Maggs's work is also critical for the chronology of stone wall settlements. For these reasons it seems fit to outline Sotho/Tswana settlement types as he classified them, since this classification forms the basis for settlement classification in the Vredefort Dome.

Type N is distributed in the north east corner of Free State and north of the Vaal. These settlements may be located on hilltops or on the terraces or may be spaced out along a ridge. Maggs defines Type N as the settlement unit that "has a group of primary enclosures arranged around in a ring and linked by secondary walling to form a central secondary enclosure" (Maggs 1976: 33). The settlement unit is then surrounded and defined by continuous wall that encloses all structural features in the unit. Although they are invisible on the air photographs, the huts occur in the areas between the surrounding wall and the central enclosures (Fig. 1.2). Radiocarbon dates and oral histories show that Type N settlements were occupied in the fifteenth and sixteenth centuries. These settlements are more widely spaced on the landscape, indicating a small population. Type N sites are associated with early of Sotho-Tswana speaking people. They practiced agriculture, kept livestock and engaged in hunting. They traded for iron implements and used bone and ostrich egg-shell to make ornaments (Maggs, 1976).

Type V sites occur in the Highveld between the Drakensberg escarpment to the east and the 1450m contour to the west. They extend north as far as Bethal and southwards to Ladybrand. The settlement units consist of primary enclosures grouped around a ring (Fig. 1.2). These enclosures may be linked by secondary walling or are in contact with one another to form a central secondary enclosure. Maggs defines their orientation thus: "Primary enclosures open into the secondary enclosure, which normally has only one external entrance. There may be additional free-standing structures, particularly huts, around the periphery of the settlement unit but there is no surrounding wall" (Maggs, 1976: 28). Type V dates to the late 16th century or early 17th century (Maggs, 1976), and may mark stages of population explosion. Except for the general absence of a surrounding wall, Type V derives its basic structure from Type N. The Super-imposition of Types V on N, therefore, makes Type V settlement units occupation later than Type N. Though it is not clear whether they engaged in iron-smelting, Maggs indicated that traded for iron and copper implements and ornaments (Maggs, 1976).

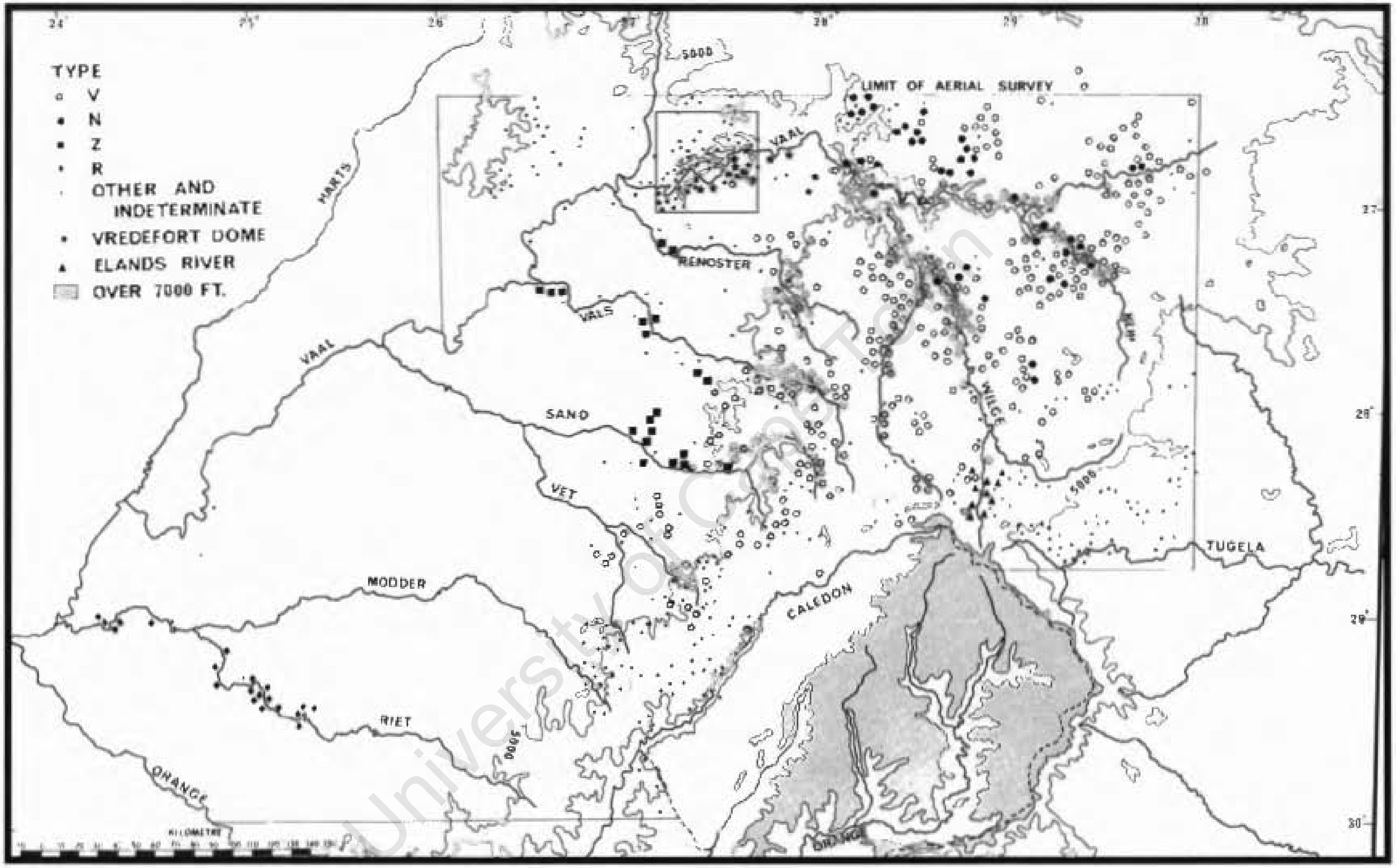

Figure 1.1: The distribution of Late Iron Age sites in the Free State (from Maggs, 1976). The study area is marked with red box.

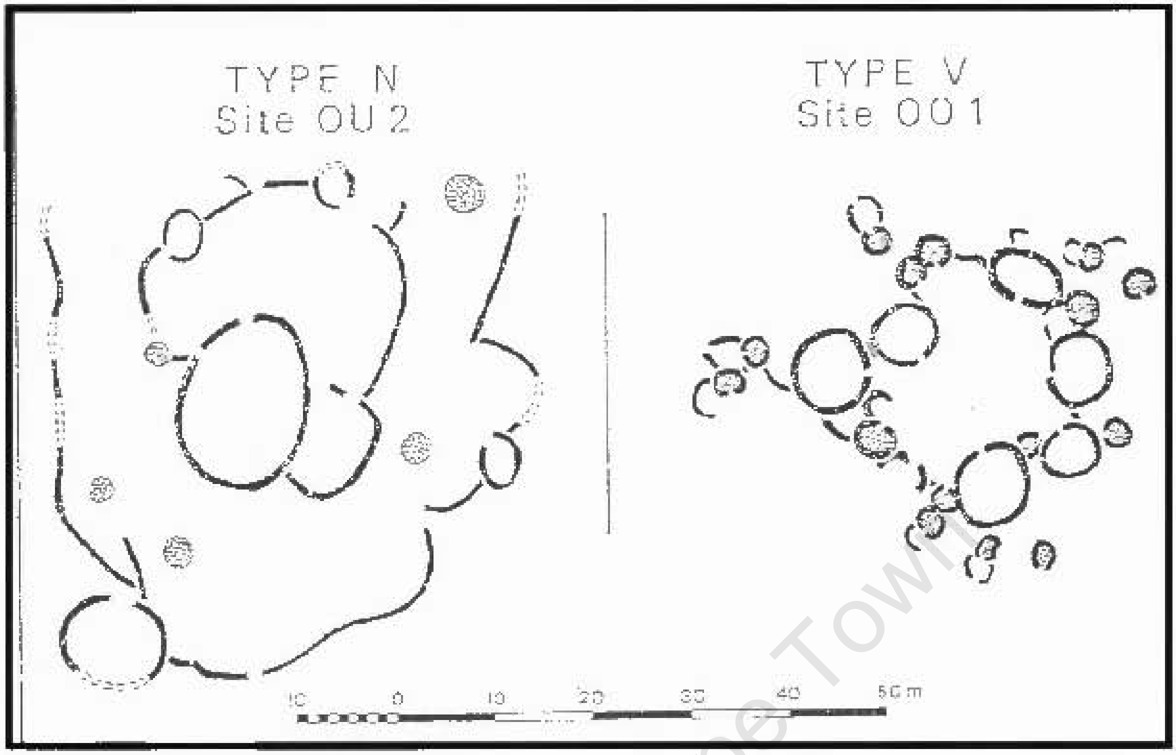

Figure 1.2: Magg's Types N and V

Type Z settlements are distributed from middle Sand River to Vaal River in Kroonstad and Bothaville districts of north western Free State (Maggs, 1976) (Fig. 1.1). And they clearly represent the most westerly of Sotho/Tswana speakers in the Free State. Type Z settlement units have large compact central primary enclosures, "usually from three to eight in number and often so close as to be touching" (Maggs, 1976: 40). Smaller primary enclosures may be included in this type, which may be linked by secondary walling. The primary enclosures generally open into the secondary enclosure which has a single entrance. Between eight to twenty other enclosures surround the central group. These are described as bilobial dwellings because of the distinct arrangement of the back and front courtyards. In summary typical settlement units consist of a central group of primary enclosures (usually cattle byres), surrounded by a discontinuous ring of bilobial dwellings (Fig. 1.3 and Fig. 1.4). Type Z settlements are strongly associated with southern Tswana speakers and were occupied from the sixteenth or seventeenth centuries to the early nineteenth century (Maggs, 1976). The occupants of Type Z settlements practiced agriculture and kept livestock, with a great emphasis on the latter, compared to Type V settlements. They also engaged in hunting and had a limited supply of metal items (Maggs, 1976). In summary, Type V and Z settlements mark the most southerly expansion of Sotho/Tswana speakers, up to the edge of a viable farming environment.

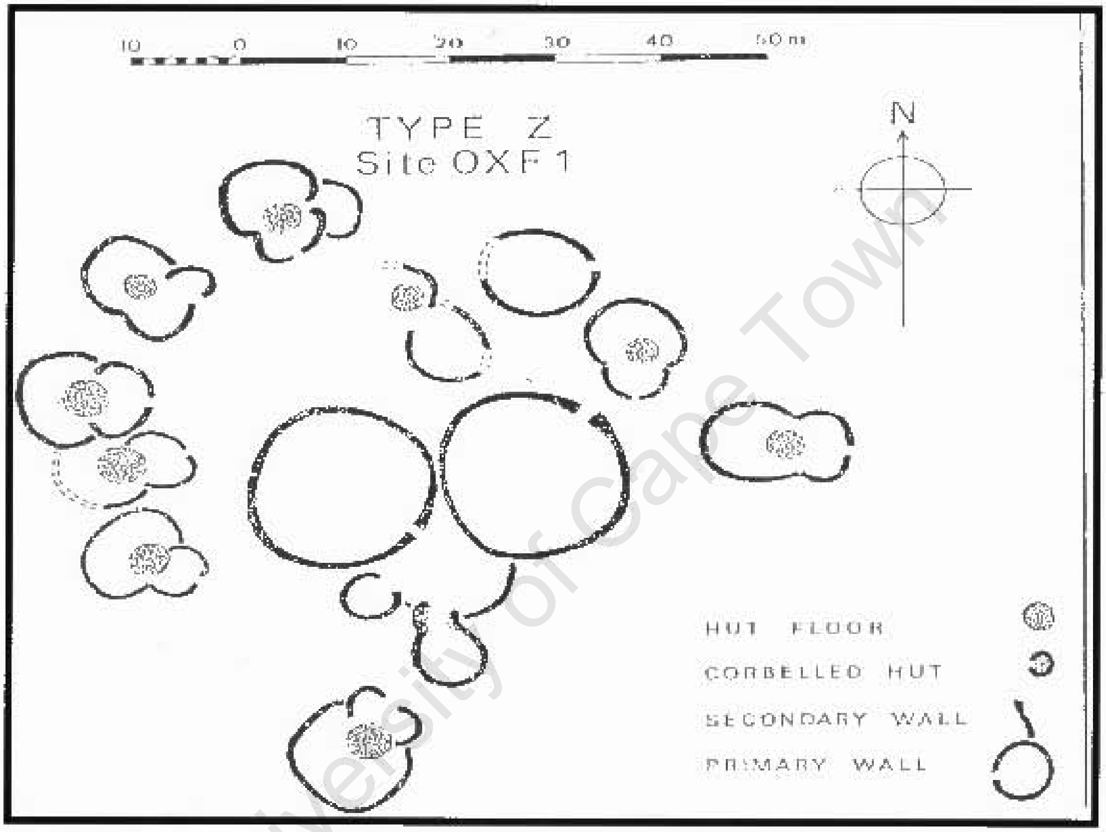

Figure 1.3: Magg's Type Z

Reconstruction of Type Z

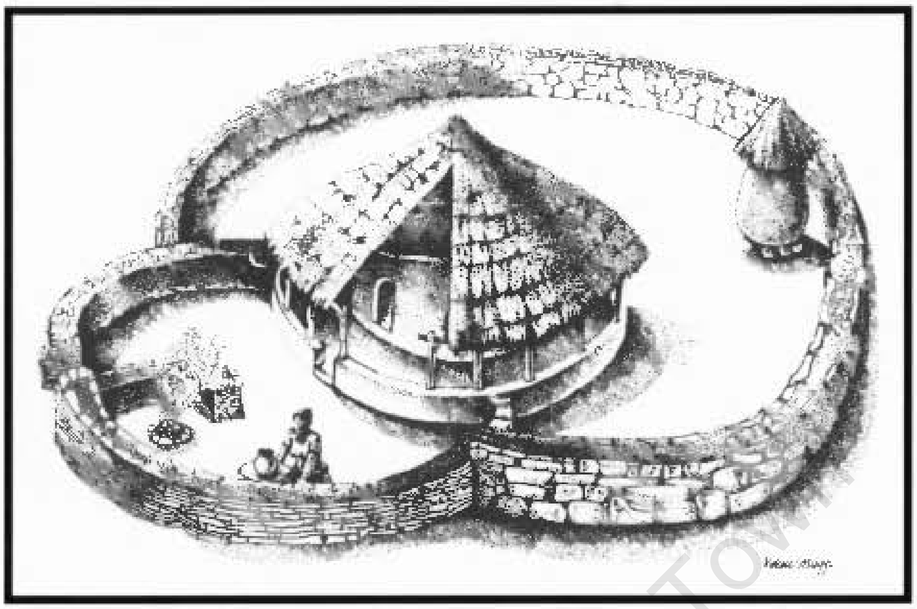

Figure 1.4: A reconstruction of a bilobial dwelling associated with Type Z (Maggs 1976: 241)

While Types V, N, and Z were occupied by Sotho/Tswana speakers and follow Central Cattle pattern (CCP), Maggs also identified Type R settlements which are associated with Khoisan hunter-gatherers and are of no relevance in this research. They are located along the Riet River (Maggs, 1976).

Taylor's work in the Vredefort Dome (1979) focused on a specific locality Buffelshoek. He examined the aerial photographs to classify stone-wall settlements, and identified three types: Group I, Group II and Group III (Fig. 1.5). On the basis of ground survey he excavated two sites, whose results supported his initial classification. This research is important here as it provides the excavation results for comparison with GIS derived data analysed in my work. Because Buffelshoek is in the heart of the Dome the typological classification of settlements done here is directly relevant to the settlement classification in the larger Vredefort Dome area. Since these types are relevant to this research, they are also briefly described.

Group I sites are identified as having elliptical walls enclosing a group of smaller central enclosures (Taylor 1979). Group II settlements are described as a "discontinuous series of semi-circular walls (instead of a clear perimeter wall) facing inwards towards a central ring of smaller enclosures" (Taylor 1979: 10). Group III sites are agglomerations of circular enclosures with the outer boundary marked by varying lengths of curved walls and small circular enclosures (Taylor, 1979:10). Conforming to the Central Cattle Pattern (CCP) model the central enclosures were for cattle and the outer settlement rings marked the domestic space. Group I sites are dated between AD 1500 and AD 1570 , while Group II and III were occupied between AD 1700 and AD 1800 (Taylor, 1979). Of Magg's types, Types N and Z are structurally similar to sites identified by Taylor (1979) in the Vredefort Dome as Group I and Group II, thus a direct relationship to the sites I identified.

Taylor's work (1979) was only limited to Buffelshoek region, an extended larger coverage done in this study will allow testing some of the suggestions made about the distribution, density and locality of Group I and Group II sites in the Vredefort Dome. With varying topography of the Dome it is possible that analysis of settlement locality over large sample area will give more insight on the subject of settlement location and how this preference has changed over time for different groups of people. On the basis of Taylor's survey, despite the small coverage of the sampled area, Huffman suggested that Group I sites "did not concentrate in large settlements" (Huffman 1986:289). With the extended site coverage I will be able to establish whether inferences such as these would change or remain the same. This analysis represents the whole of Vredefort Dome stone-wall settlements as viewed and identified from the aerial photographs, as a result the political boundaries and settlement stratification in this area can be examined in Group I and Group II settlements. And it provides an in-depth comparison between Group I and Group II to establish whether different site preferences within Late Iron Age communities are dictated by different groups of people or more influenced by agricultural productivity and cattle management.

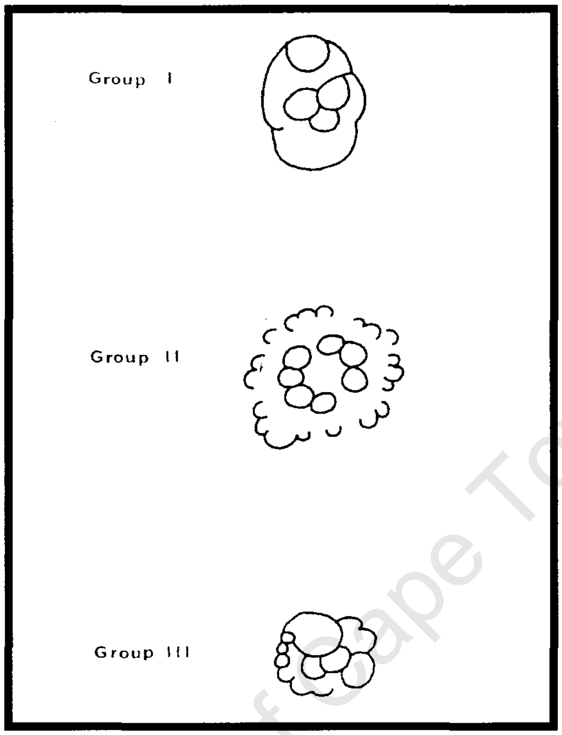

Figure 1.5: Taylor's (1979) Groups I, II, and III

Anton Pelser's MA research (2004) at Askoppies provides another excavation survey for comparison. Askoppies, situated on Tygerfontein 488 farm, forms part of the Vredefort Dome Late Iron Age Sotho/Tswana stone-walls sites. It is a tightly nucleated complex whose settlement unit boundaries are difficult to outline on the aerial photograph and making ground surveys done by Pelser critical in this study. This is a predominately Group II settlement type, dated between 1650AD and 1800AD. On the basis of ceramic analysis Pelser (2004) closely associates the Askoppies complex with the Rolong. The distribution of settlement is explored in detail later in this research as it contributes significantly towards understanding the nature of aggregation in settlements that appear to be structurally less stratified. In Askoppies, Pelser's research concentrated on area containing 20 individual settlements (here referred to as homesteads), each consisting of about 8 to 15 scallops containing huts.

1.3 Methodology

1.3.1 Obtaining Aerial photographs

Aerial photographs are used as basic sources of information in various disciplines. However they come in various editions and the choice of which to use depend very much on the purpose of study, as opposed to the date of the edition. Late Iron Age research has made used of this source in studying the stone-wall settlements of Sotho/Tswana speakers. For this purpose the scale of the original job was very important as the photographs needed to be viewed under various magnifications before they pixilate and blur the view. This research continues to explore and manipulate aerial photographs as rich sources of information by means of incorporating the Geographic Information Systems (GIS) in analysing the archaeological evidence. Every archaeological project has a site, and a site has context. Often the project seeks to derive information that will aid in the understanding of the site and its context; the spatial relationship between structures; the architecture and use of space. This process result into building of a database for the site. This gives detailed geographic information of the site-location, and contains everything found on and about the site. This information is useful for the production of analytical maps for the site and answering some of the questions that may no have been so easy to explore otherwise. The use of GIS in the research has yielded huge data about the Vredefort settlements

The Aerial photograph coverage of the area (scale, 1:20 000 East Region 29/9/1994 edition, Strips 66 to 70) were requested from the Chief Directorate Surveys and Mapping office in Mowbray, Cape Town. This office provided the images as digital photographs scanned at 300dpi resolution. For the purposes of identifying the stone-wall settlement this resolution was not practical- the visibility of stone-walls was poor and allowed very little “zoom-in” detail view of the photo. As a result relevant contact prints were requested, for a limited period, and I scanned them at 600dpi. This resolution was chosen after testing the visibility and clarity of stone-wall sites under different resolutions.

Over 200 photos were scanned and each systematically viewed in detail in "Adobe Photoshop" programme. The photos on which stone-wall sites were identified were marked for geographical spatial referencing and further data processing using the Geographical Information Systems (GIS) software, ArcView 3.3 and ArcGIS 9.1.

1.3.2 Geo-referencing the Aerial photographs

Aerial photographs do not contain spatial reference information. In order to use aerial photographs with other datasets such as topographic maps, they need to be aligned or geo-referenced to a coordinate system. This way the location of the dataset is defined using map coordinates. This allows the dataset to be incorporated, viewed, queried and analysed with other geographical datasets. This is the process of applying real-world coordinate system to images. A geo-referenced image contains information about itself or data file to which it is connected. Aerial photographs can be geo-referenced by means of 'aligning' identical features both the image and the data source file that is already in the format that is accessible in GIS. In order to do this the 1:50 000 Shape files (GIS file format) were purchased from the map office and used as alignment layers.

1.3.3 Grouping Sites

Once I completed the identification of all settlements in the sample area and transferred this data into the GIS environment, the distribution indicated a hierarchy of clustering. This is the grouping of sites on the basis of what is the obvious pattern of distribution after initial identification of sites and outlining them on the basis of boundaries outline. The initial identification appears to have grouped the sites into:

1) Clusters: From these, the sites can be further grouped into Clusters, which are much bigger and whose grouping is mostly influenced by the topography and the natural features such as perennial streams, and hills. A Cluster may contain more than one type of settlements. However, it should be noted that this has no implication on the chronology of these settlements. Often man-made features like arterial routes also outline the boundaries of these Clusters as they follow the topographical landscape.

2) Sub-clusters: These are sites that have more than one homestead in close proximity, a distance of not more than 50m- under the assumption that homesteads must be ≤50m apart (as used by Huffman in determining settlement units) to form a settlement unit. The homestead boundaries may often touch or very close to one another. Sites which stand as single homesteads, as it is often the case with Group I sites, are also grouped as Sub-clusters. Thus Sub-clusters make up the Clusters. They could be located within 500 metres of another. There were other sites were outside the 50m mark and some isolated (outliers) that also fall under this grouping.

3) Homesteads: Finally the small scale of grouping is homestead level, indicative of which is the central enclosures surrounded by what would have being the domestic space, the outer boundaries.

The results were thus: 13 Clusters; 285 Sub-clusters (including outliers); and 582 Homesteads (including outliers) - with Cluster being the most generalized and the Homesteads the most detailed (Figure 1.6). Homesteads were finally mapped to represent the settlements distribution and density of the Sotho/Tswana speakers in the Vredefort Dome. In every visible Cluster, the homesteads were outlined using a free-hand drawing tool and measured, giving square area and perimeter. The structures identified as cattle enclosure due to the centrality in spatial organisation were also measured. The altitude of every homestead was mapped and recorded. Maps representing the results of this survey were generated using the GIS software.

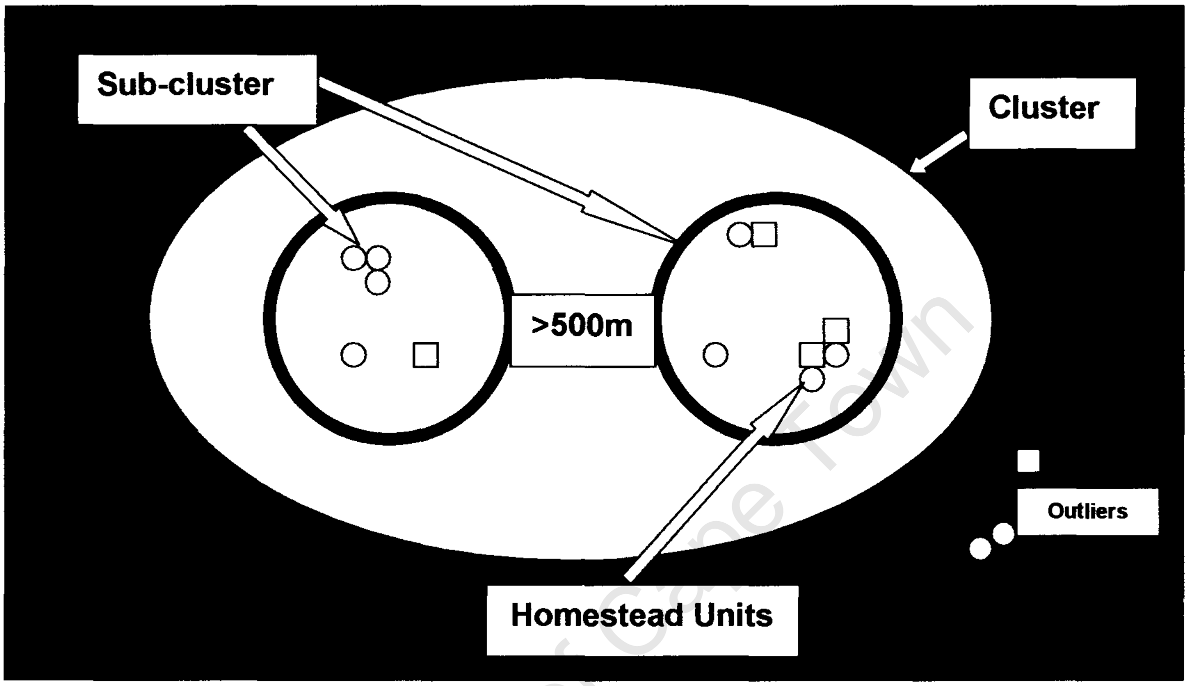

Figure 1.6: Illustration of how sites were grouped and the terminology used in the text.

2. RESULTS AND DISCUSSION

This chapter presents the results of the Late Iron Age settlements in the Vredefort Dome as represented and derived from the aerial photographs. It describes the different types of stone-wall patterns and outlines their spatial distribution. The sites distribution is examined within the environmental context of the area; the purpose being to explore the influence that biophysical factors may have had in the preferential choice of settlement location among these communities. The settlement preferences are examined between different settlement types. The focus of this chapter is to establish whether any of the biophysical factors significantly made any part of the landscape more attractive and suitable for settlement location. On the basis of the outcome of this analysis I examined the viability of crop cultivation and cattle keeping within the different localities across the Vredefort dome.

2.1 Settlement Typology and Classification

All sites were identified from the aerial photographs. The classification of sites conformed to Taylor's types, and consequently I used his labels for consistency. These are - Group I; Group II; and Group III. Though Maggs' classification types are also applicable, I chose to use Taylor's types because these were defined specifically with reference to the Vredefort Dome Late Iron Age Sites.

While the identification of most of Group I and Group II sites was relatively easy to make, I did encounter some settlements that were difficult to allocate to a specific settlement type. This applied particularly to the separation of some Group I and Group III sites. Those that could not be identified as either Group I or Group III, because of homestead concentration and proximity to one another, were classified as either/or, for example, Group I/III. Taylor defines Group III settlements as agglomerations of circular enclosures with the outer boundary marked by varying lengths of curved walls and small circular enclosures (Taylor, 1979:10). However, some aggregated Group I settlement units can appear a lot like Group III. In these cases , where a confident idenfication could not be made, I assigned such settlements to Group I/III. Furthermore, when the main characteristic of a boundary wall was missing, but a central cluster of linked Group II type cattle enclosures could be seen, I assumed that the scalloped perimeter wall was missing and I allocated these homesteads to a Robbed Group II category. The imprint of the perimeter wall is still clearly marked on the photogragraphs affirming these homesteads as Group II settlement patterns.

Some good examples of these settlement types, as they appeared on aerial photographs, are given below (Figures 2.1, 2.2, 2.3, 2.4, 2.5). These are selected because they provide clear examples but there is a range of variability within each settlement type.

Figure 2.1: An example of Group I sites. (Photo reference- Job 1006, Strip 67, Photo N0. 8051)

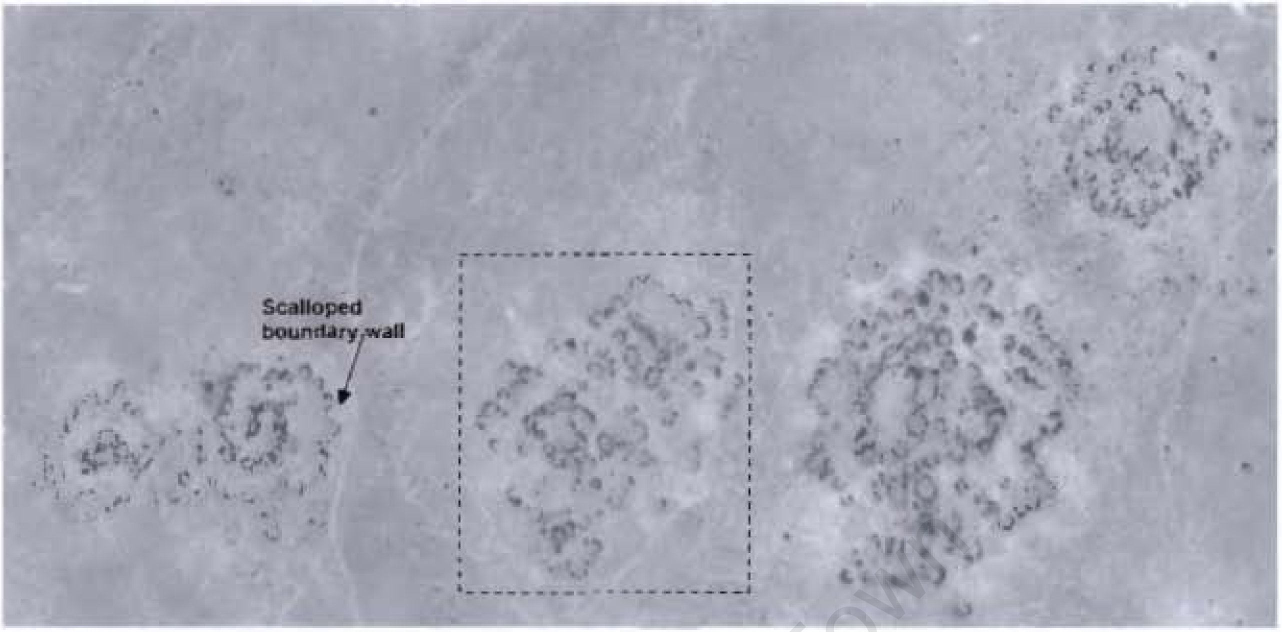

Figure 2.2: Examples of Group II sites. Taylor (1979: 32) excavated the outlined homesteads (2627 CD1). (Photo reference: Job 1006, Strip 66, Photo N0. 4633)

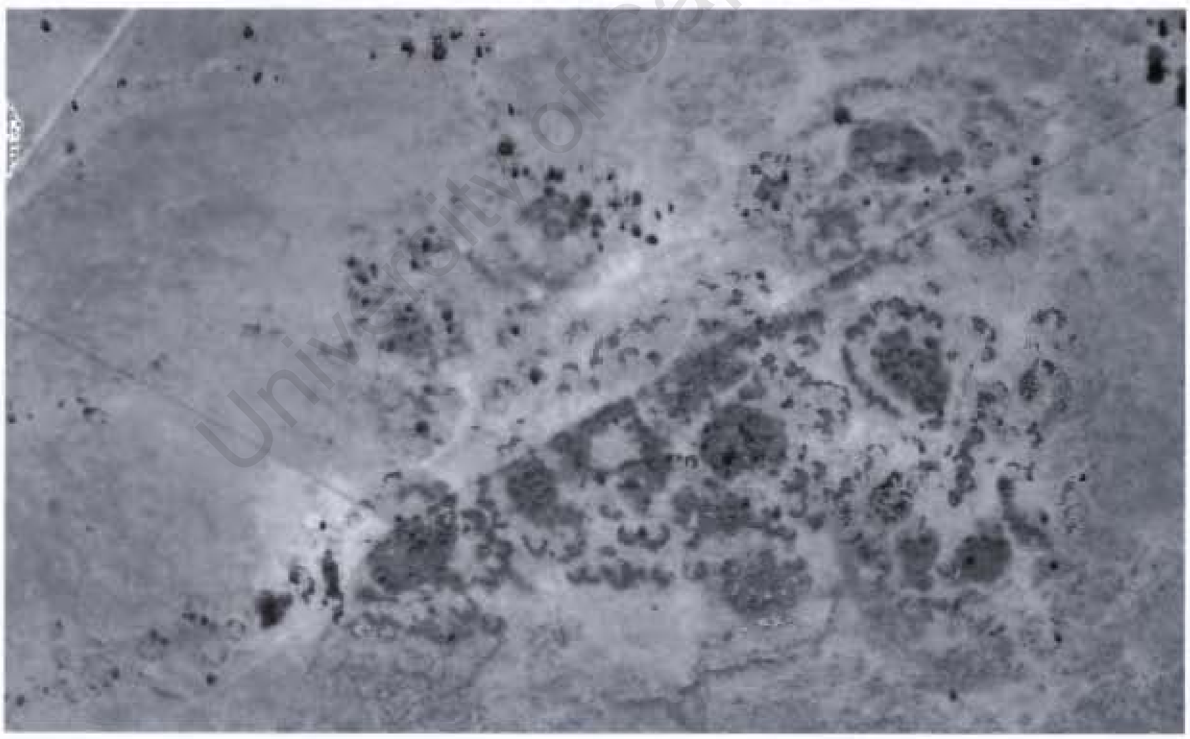

Figure 2.3: Another example of Group II sites, showing a tight cluster of homesteads. (Photo reference: Job 1006, Strip 66, Photo N0. 4629)

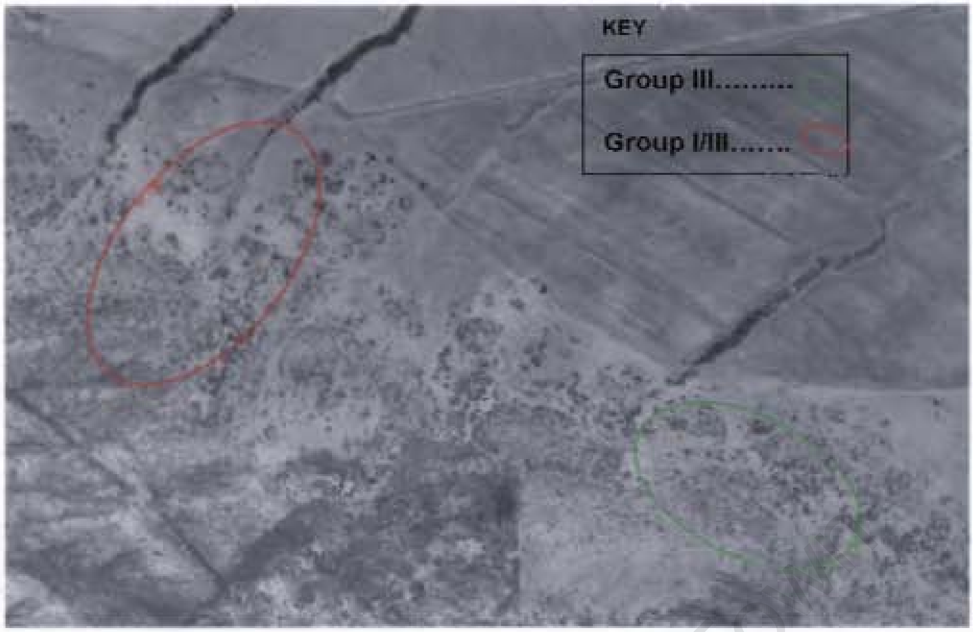

Figure 2.4: Example of Group III and Group I/III. (Photo reference- Job 1006, Strip 66, Photo NO. 8049)

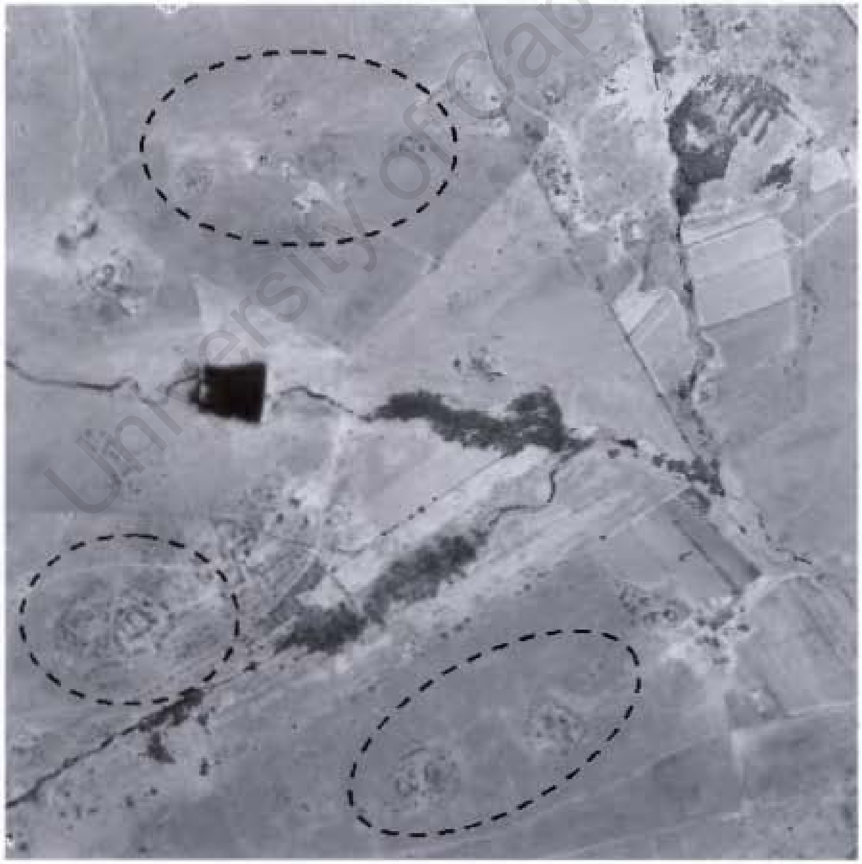

Figure 2.5: Examples of Robbed Group II homesteads (Here referred to as Robbed II) (Photo reference- Job 1006, Strip 66, Photo NO. 4631)

2.2 Frequency of Settlement Types

In order to assess the whole extent of the Vredefort Dome stone-wall settlements, it was important to get numbers accurate, without duplications or omissions. This is possible in Geographic Information Systems (hereafter GIS) environment as every site one identifies and marks appears as a unique record in the attribute table linked to these spatial features. The use of GIS application here generated completely reliable frequencies these settlements. The results presented here are dependent on the accuracy and validity of these frequencies. Following the sites grouping given in 1.3.3 above, I outline the overview of the Vredefort Dome stone-wall settlements divided into homesteads, sub-clusters and clusters. These three groupings are dealt with as different data layers in GIS each with its unique attribute table, thus making data verification over large sample area a manageable process.

Once all the identifiable homesteads were mapped and tabulated, the resulting attribute table of comprised 582 individual homestead units. This is a significantly larger sample compared to Taylor's 114 units. Of these 582 homesteads, 83.16% are Group I settlements, while Group II contributes 14.78%, including Robbed II (Table 2.1, Figure 2.6). Two hundred and eighty-five sub-clusters were identified, and Group I settlements make up 84.2% of these (Table 2.2). The frequencies given in Table 2.1 and displayed in Figure 2.6 include Taylor's Buffelshoek settlements for comparison with the expanded survey reported here. Askoppies Group II site is excluded from this count frequency representation because it presents unique dynamics of settlement aggregation whose discussion here would be premature. It is dealt with later in chapter 4 to elaborate on the settlement aggregation as a resultant effect of a historical event. However, it is worth mentioning that even with Askoppies as part of Group II sites, Group I still dominates.

Table 2.1: Frequency of homesteads in the study area relative to Buffelshoek (Taylor ,1979).

TYPE	Homesteads	% Homesteads	Buffelshoek	
GROUP I	484	83.162	73	64%
GROUP II	77	13.23	27	24%
GROUP III	8	1.375	14	12%
GROUP I/III	4	0.687	0	0
ROBBED II	9	1.546	0	0
Total	**582**		**114**	**20%**

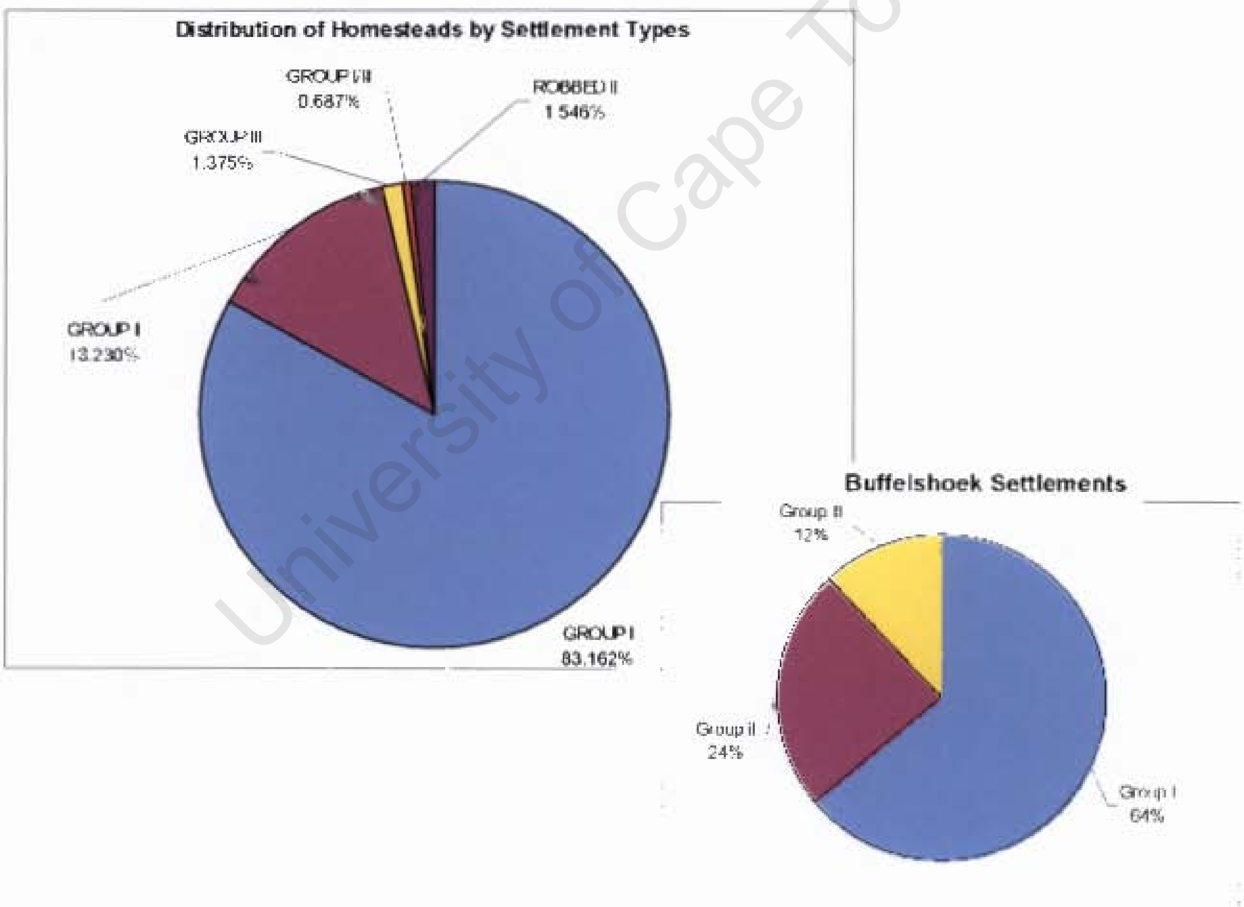

Figure 2.6: The overall percentage of homesteads in the Main Vredefort Dome area, excluding Askoppies. Buffelshoek settlements (Taylor 1979) form part of the Main Vredefort Dome concentration.

The Vredefort Dome stone-wall settlements (excluding Askoppies), as determined from the aerial photographs comprised of 285 sub-clusters (as defined in section 1.3.3). Of these 84.2% (240 sub-clusters) are Group I sites (Table 2.2). Within Group I settlements 116 Sub-clusters are single homestead units with one sub-cluster made up of nine homestead units. This makes it the largest Group I sub-cluster in the Dome. Group II settlements make up 13.3% of these sub-clusters. This value includes Robbed II sub-clusters. The two largest Group II sub-clusters consisted of ten homestead units (Table 2.1). Only 1.4% of the sub-clusters are attributed to the Group III settlement type. The remaining 1.1% is sub-clusters that could not be distinguished as specifically belonging to either Group I or Group III.

The size of the sub-cluster as represented by the number of its constituents homestead units was also analysed (Table 2.2 and Figure 2.7). This compares the percentage contribution of different settlement types to the overall makeup of different sub-cluster sizes ranging from a single homestead sub-cluster to 10-homestead units sub-cluster. Of 141 single homestead sub-cluster 82% of them are Group I settlements. And there is a representation of all settlement types within the single homestead sub-clusters (Figure 2.7). However there are sub-clusters that consist of only Group I settlement types, such as 4-homesteads sub-clusters, 5-homesteads sub-clusters, 7-homesteads sub-clusters and

Table 2.2: The frequency of sub-clusters in different settlement types and their homestead constituents. (HU= Homestead Unit(s))

TYPE	1 HU	2 HU	3 HU	4 HU	5 HU	6 HU	7 HU	8 HU	9 HU	10 HU	Sub-clusters
GROUP I	116	59	39	15	2	4	2	2	1		240(84.2%)
GROUP II	18	6	4			1			1	2	32 (11.2%)
GROUP III	2		2								4 (1.4%)
GROUP I/III	2	1									3 (1.1%)
ROBBED II	3	3									6 (2.1%)
Sub-clusters (HU Total)	141 49%	69 24%	45 16%	15 5%	2 1%	5 2%	2 1%	2 1%	2 1%	2 1%	285

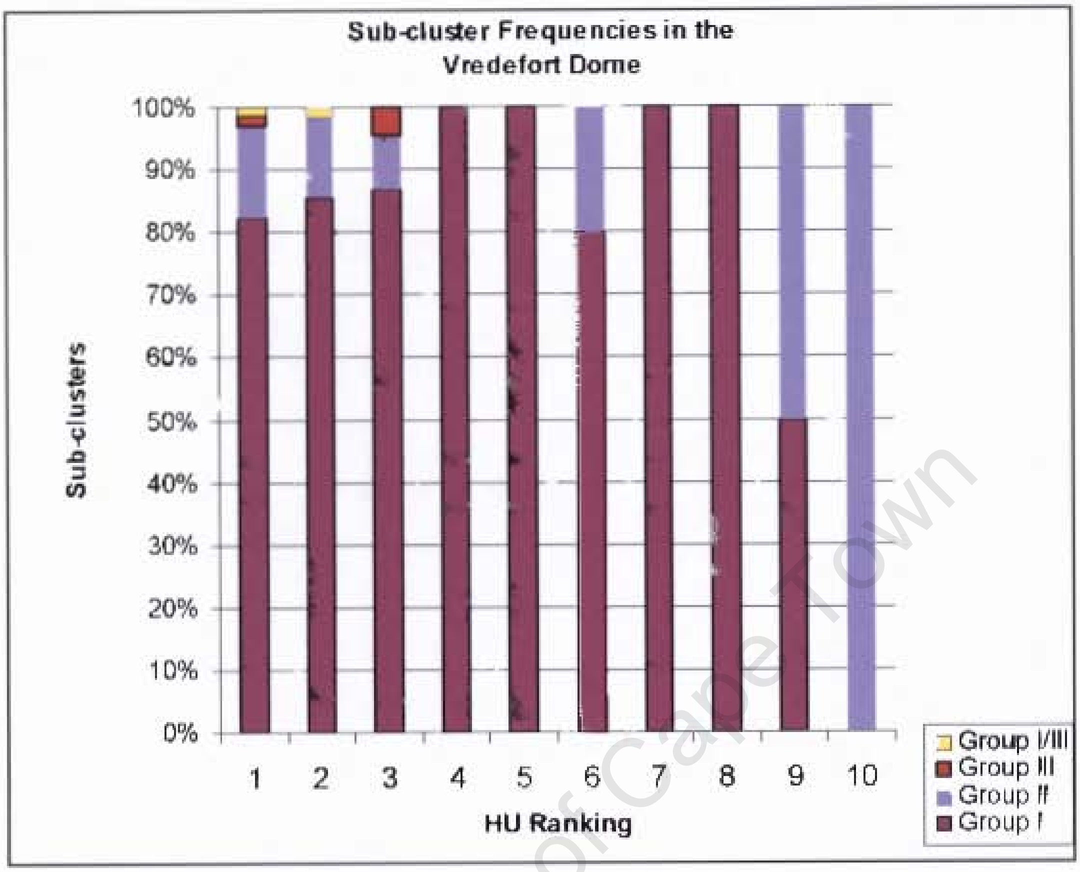

Figure 2.7: Percentage sub-cluster size in diffrent settlement types

On the basis of both the sub-cluster and homestead frequencies it is clear that Group I sites dominate the sample. This is also true for the Buffelshoek sample as presented by Taylor (1979: 12), where 64% of the sample are Group I sites (Table 2.1; Fig. 2.6). Having identified the dominating settlement type, it is the analysis of the settlement distribution of these types within their environmental context is crucial in understanding the selection of settlement site in the region. It is with this interest that the next section examines settlement distribution in detail.

2.3 Settlement Distribution and Environmental Context

From the different settlement types identified in this region, it is evidence that the Vredefort Dome was occupied by various groups of Sotho-Tswana speakers at different times during the pre-colonial period. The distinctive settlement types are evidence of this variability. It is clear, however, on a general inspection of the overall distribution of the settlements that the settlements preference favoured some areas and not others. In order to assess what factors contribute to this I describe what these preferences are and then examine the overall settlement distribution and the specific preferences of settlement types in relation to the local environmental context.

From the aerial visuals and satellite images (Fig. 2.8) the Vredefort Dome is an obvious ring-shaped structure. The Dome is a meteorite impact site and the physical landscape has been folded into a series of hills and ridges that 'ripple' outwards from the centre of impact. The subsequent erosion patterns have also disturbed and worn down this landscape. These hills and ridges are most visible in the north western quadrant of the Dome. It is clear from the site survey that sites are located predominantly and most densely in this area of the Vredefort Dome and not in others. On the basis of the photographic survey, some areas are virtually empty of settlement such as the central area marked "C" in Fig. 2.8), and those areas marked A and B in Fig. 2.9. No sites were identified to the east of the Vaal River; and those settlements found to the south of the Vaal River cluster within the hills and ridges found there. The settlement emphasis on the north western edge of the Vredefort Dome with virtually no are sites at the centre, is clear. This general distribution follows a southwest-northeast line that clearly correlates with the topography of this region. I now go on to examine further a range of biophysical factors that may account for this particular distribution in more detail.

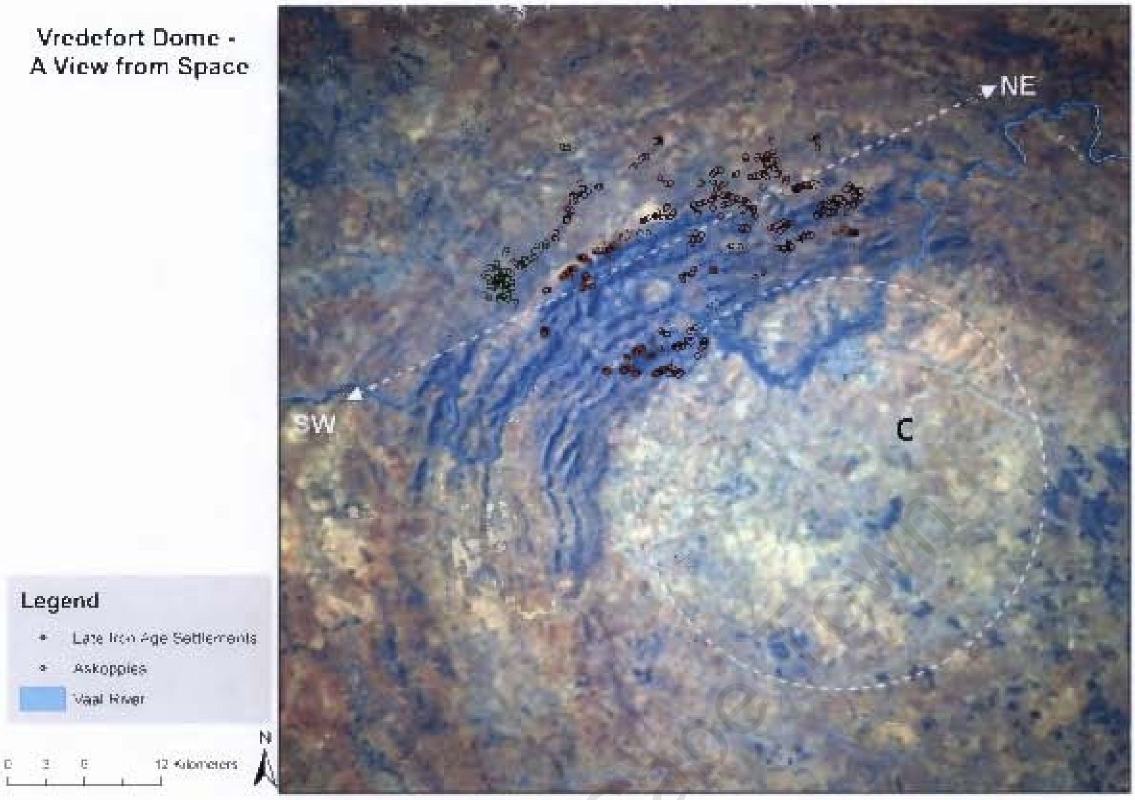

Figure 2.8: A satellite image of the Vredefort Dome showing the distribution of stone walled settlements (www.otters.co.za (Copyright-NASA))

Closer inspection of Figure 2.9 shows that the sites are generally located in close proximity to perennial and non-perennial streams. Of interest is that there are no stone walls settlements found on the banks of the Vaal River, suggesting that there was no apparent urge to settle close to this main river channel.

The distribution of Group I and Group II

The mapping of different settlement types shows that the occupants had distinct site location preferences (Fig. 2.9). For instance, on the one hand, Group I and Group III sites are located within the more broken terrain within the Dome, while Group II settlements, on the other hand, are located at a relatively lower altitude, and associated with hilltops found on the undulating landscape at the outer edge of the Dome (Fig. 2.9). Although Group III sites seemingly use the same terrain as Group I sites, they are confined to the banks of Enselspruit River and their distribution density is very low. My focus will then be on the most dominating settlement types in the region, Group I and Group II.

In order to investigate the characteristics of this distribution and what may account for these differences, I examine physical, environmental and climatic factors such as topography, geology, veld types, soil types, rainfall and agriculture. For convenience I discuss these factors separately although they are all interlinked in their relationship to settlement choices. In the conclusion to this section, I do, however, suggest that some factors were more significant than others in determining settlement choice.

2.3.1 Geology

The Geology map of the Vredefort Dome was created from GIS data files (shapefiles (obtained from GIMS(Pty)Ltd, Data set Sales)). It appears that stone wall sites concentration is high on the quartzite hills (Witwatersrand supergroup) and the andesite (Ventersdorp lava), with very few sites found out on the north-west shales. However, it is worth noting that the there is a significant density of Group I settlements on the south eastern shales(Fig. 2.10). This is interesting because it means that it is not so much of the geology that dictated settlement location but rather more of whether the terrain was suitable. There are virtually no sites on the granites to the south. Group I homesteads dominate this density and are distributed across different geological substrata with no particular preference. Group II sites, however, are confined to the Ventersdorp lava (Fig. 2.10). An obvious and simple correlation is that there is sufficient and easily obtained stone with which to construct homestead enclosures and boundary walls in the area.

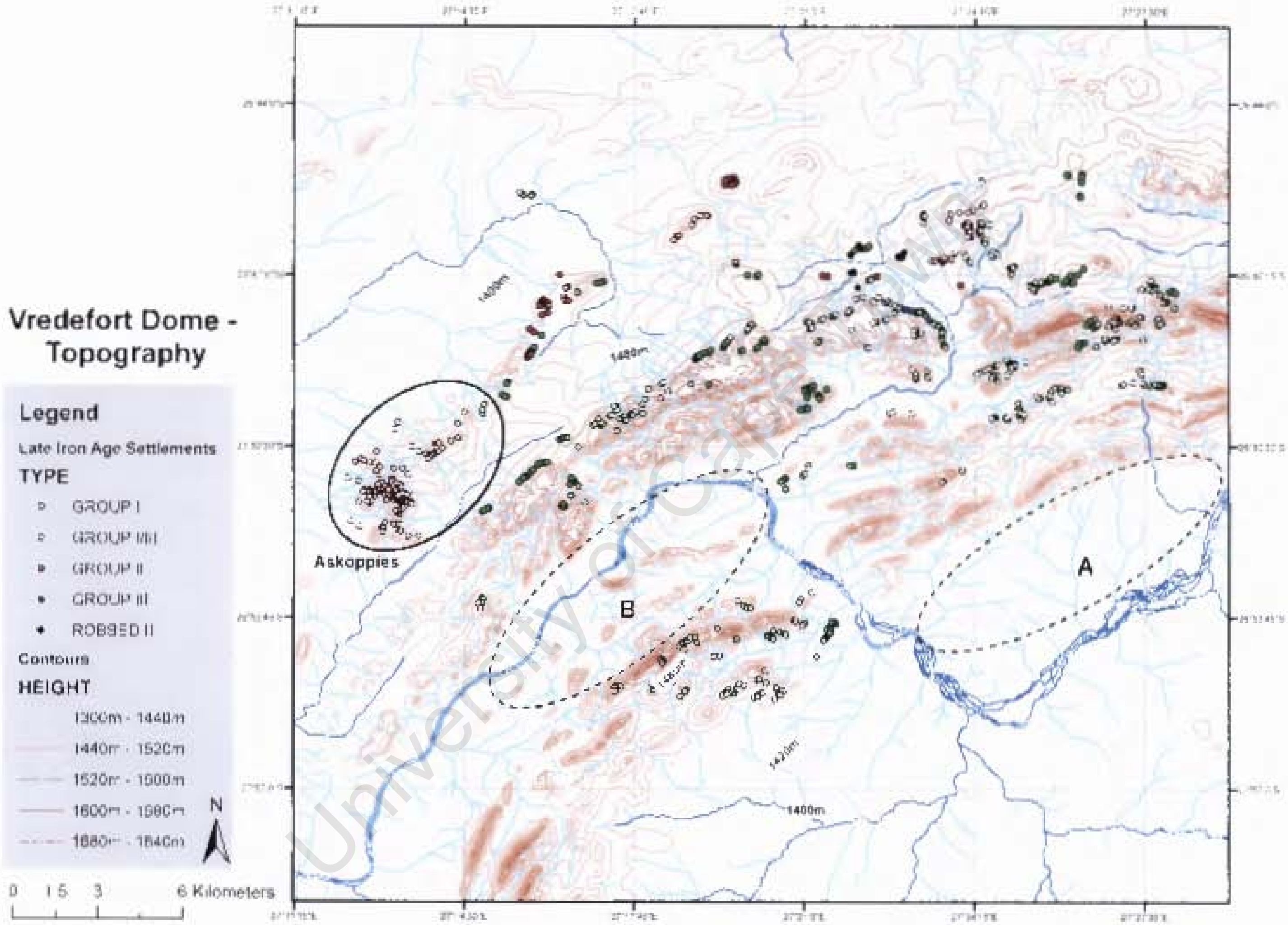

Figure 2.9:Topography of the Vredefort Dome and geographical location of the Late Iron Age Settlements. Note the location of Askoppies settlement (circled). A and B marks unoccupied pockets within the Vredefort Dome.

This distribution is broadly consistent with what Taylor described for Buffelshoek. This is briefly reviewed here because it provides basis for comparison with my larger aerial survey. According to Taylor's survey no sites were found on the granite and the dolomite plains. Rather, sites are located on the open terrain of the Ventersdorp lava and the quartzite hills of the Witwatersrand Supergroup. Group I sites were located on the quartzite hills and others were on high terrain on the Ventersdorp lava with a northerly aspect. Group II sites were built to the west of Group I sites, on open (treeless) Ventersdorp lava below the 1500m contour. Group III sites were located along the 1450m contour at the foot of a northeast facing scarp. One Group III site was found on the Ventersdorp lava (Taylor, 1979; Table 2.3).

Table 2.3 presents a geological settlement densities betweem the aerial photo coverage presented in this study and the area coveres by Taylor in 1979. This coverage provides a more representative data sample whereas Taylor's sample gives the impression of a relatively even distribution over different strata. For example over the quartzite hills Taylor's representation is 58.8% (foot of scarp form part of the quartzite hills), and open lava frequency is 41.2%. There is a huge difference between these geologies when the sample area is extended, 73.5% versas 25.1% respectively.

Table 2.3: Taylor's distribution frequency of Groups I, II, and III (Taken from Taylor, 1979:12). compared to the aerial survey covered in this current study.

	Quartzite hills		**Open lava**		**Foot of scarp**	**Granite**
	(Taylor)	(Current study)	(Taylor)	(Current study)	(Taylor)	(Current study)
Group I	**54**	417	**19**	59	**0**	8
Group II	**0**	0	**27**	86	**0**	
Group III	**0**	8	**1**	0	**13**	
TOTAL	**54 (47.4%)**	425 (73.5%)	**47 (41.2%)**	145 (25.1%)	**13 (11.4%)**	8 (1.4%)

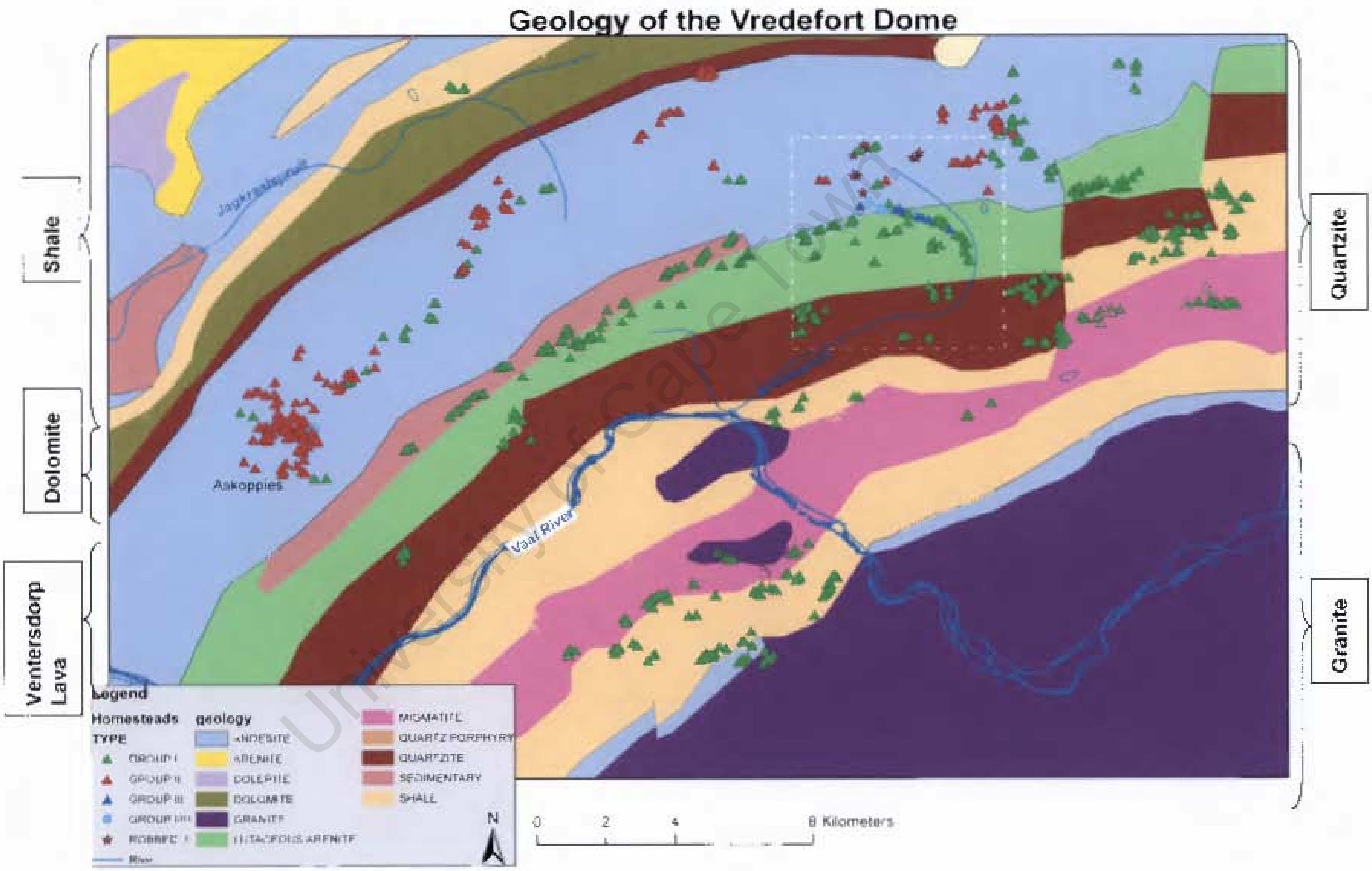

Figure 2 10: A map showing the relationship between the Geology of the Vredefort Dome and the location of different settlement types

While there is an apparent correlation between settlement distribution and the underlying geology, I suggest that geology is a red-herring, and that the topographical nature of the terrain and other biophysical factors were more important in the distribution of different settlement types. And as an attempt to identify these other factors I examine the agricultural potential with all its facets in this area.

2.3.2 Agriculture Potential

It is obvious that agriculture was viable in the Vredefort Dome. The general distribution of settlements in the north west and the further settlement differences between the types, however, may suggest that agricultural potential was not even over the whole area. Consequently I try and establish how agricultural viability may have dictated the distribution of Late Iron Age settlements in the region. In the following section I assess the capacity of these areas for crop production and livestock keeping. I therefore briefly review some environmental and physical factors, such as rainfall, veld type and soils- to establish how these may have influenced and impacted upon agricultural potential across the Vredefort Dome. While this discussion may assume relatively constant environmental conditions over the last four hundred years, which is the period of occupation covered by the different settlement types, it will also pay attention to the marked climatic changes within this period.

Rainfall and Temperature

The Vredefort Dome area gets most of the rain in summer than in other seasons. The winters are dry and cold, and are characterised by frost. This occurs less in the ridges and hills compared to low-lying areas. The rainfall ranges from 550mm to 750mm per annum across the Dome (Mucina, & Rutherford 2006). The average mean annual precipitation is 663.4mm, with the average mean temperature of 15.98°C across the Vredefort Dome (Table 2.4). The rainfall and temperature variation across the Dome is not significantly different (Table 2.4).

As discussed below, all areas have sufficient rain for crop production and there is a sufficient frost free growing season. It is justifiable to conclude that these factors, as they are today, are not dominant in the distinctive distributions of Group I and Group II settlement types.

However, climatic research show that over the periods when these settlements were occupied there had been marked climatic changes. Therefore it is important while in this discussion to outline what these changes were and consider the effects that followed.

Tyson (1993) places a period of 1300 to 1850, occupation of the Vredefort Dome stone-wall sites, as the Little Ice Age event, characterised by viable and unstable temperature and precipitation episodes. Two cooler phases (1300 -1500 and 1675 – 1850). The latter phase is described as being much colder with the worst conditions of very dry and cold spells at about AD 1700 (Fig. 2.11 and Table 2.4).

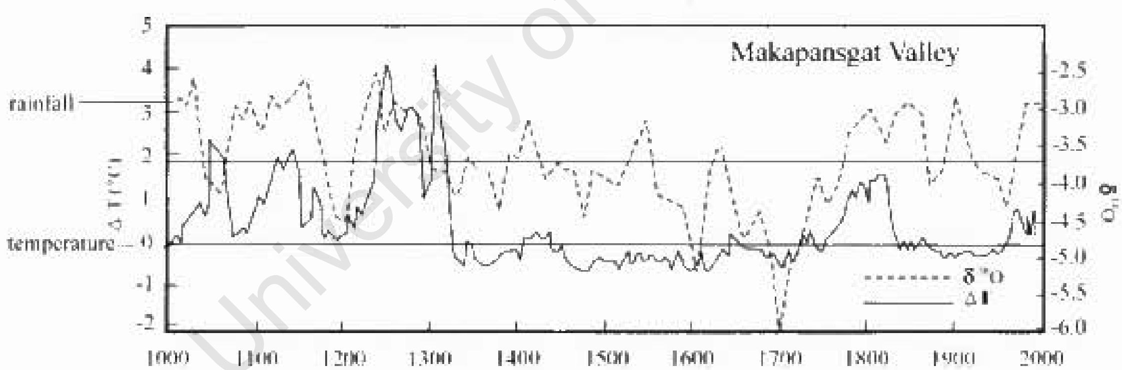

Figure 2.11: General outline of Climatic changes over the last millennium in southern Africa (After Huffman 2004: 95)

Table 2.4: Correlation between the Climatic changes and historical events (After Huffman 2004: 95)

	Temperature	Available Moisture	Event
1900			
1850			
1800	warm	very wet	*mfecane/difaqane*
1750	normal	wet	
1700	cool	very dry	second movement
1650	normal	normal	
1600	cool	dry	first movement and Malore walling
1550	cool	very wet	
1500	cool	wet	

Even with these climatic fluctuations it is must be clear these changes could not have dictated local settlement preferences as their impact would have been similar across the whole region. But they may have affected the agricultural production significantly and this discussion would be most relevant when examining viability of crop cultivation in this area.

Veld Type

The Vredefort Dome falls within both the Savannah and Grassland biome. However, most of the grassland vegetation has been disturbed by recent agriculture (Reimold and Gibson, 2005). According to Mucina and Rutherford, (2006), the Vredefort Dome supports two variants of Bushveld Savanna and three variants of Highveld Grassland. This means that there are five vegetations types in the Vredefort Dome (Table 2.4). These are described as the Vredefort Dome Granite Grassland (Gh 11), Carltonville Dolomite Grassland (Gh 15), Rand Highveld Grassland (Gm 11), Gold Reef Mountain Bushveld (SVcb 9), and Andesite Mountain Bushveld (SVcb 11). As shown in Fig. 2.10 these vegetation types correlate with the underlying geology of the region (Fig. 2.12) as well as topography and take on the roughly circular form of the Dome.

The Vredefort Dome Granite Grassland vegetation grows in the central zone of the Dome, and as the name implies, is geologically underlain by granites (Fig. 2.10). Immediately to the north west there is the Gold Reef Mountain Bushveld and this area is dominated by quartzites. Still further to the north and west and outside the quartzite hills, the Andesite Mountain Bushveld dominates. Beyond this type, vegetation is dominated by grassland with the Carletonville Dolomite Grassland growing on the Dolomite belt and the Rand Highveld Grassland furthest from the core on the outer low-lying hills of the Dome.(Table 2.4; Fig. 2.12) (Mucina & Rutherford 2006).

The two Bushveld types are also referred to as Bankenveld. This veld type is described as "sour and wiry" (Reimold and Gibson, 2005:201) compared to the 'sweet' grasslands in the central core of the Dome. The Bushveld clearly occurs at a higher altitude compared to the Grassland biome, between 1450m and 1750m above sea level. In the Vredefort Dome the Bankenveld favours the hills sloping towards the Vaal river, where the soils have low pH and are poor (Reimold and Gibson, 2005).

Table 2.5: The Vegetation types in the Vredefort Dome (Mucina, L. and Rutherford, M.C. (eds) 2006).

Veld Type (code)	Bioregion	Description	Mean Annual Precipi-tation	Mean Annual Tempe-rature(°C)	Altitude	General Geology	Soils
Gh 11	Dry Highveld Grassland	Vredefort Dome Granite Grassland: 'sweet' grassland	594mm	16.0	1340 - 1520m	Granite	Shallow leached red soils
SVcb 9	Central Bushveld Savanna	Grows in rocky hills and ridges. Dense woody vegetation on south-facing Slopes- Gold Reef Mountain Bushveld.	666mm	15.6	1200 - 1750m	Quartzite	Shallow gravel soils
SVcb 11	Central Bushveld Savanna	Dense thorny bushveld with well Developed grass on hill slopes and valleys-Andesite Mountain Bushveld	660mm	16.4	1350 - 1800m	Ventersdorp Lava	Shallow, rocky, clayey soils
Gh 15	Dry Highveld Grassland	Carletonville Dolomite Grassland: 'sweet' grassland	593mm	16.1	1360 - 1620m	Dolomite	Shallow mispah (not organic, humic topsoil) soils
Gm 11	Mesic (warm and moist) Highveld Grassland	Rand Highveld Grassland: 'sour' grassland.	654mm	15.8	1300 - 1635m	Shale	Shallow soils Lack of well-developed soils(resistanc to weathering) Nutrient-rich soils.

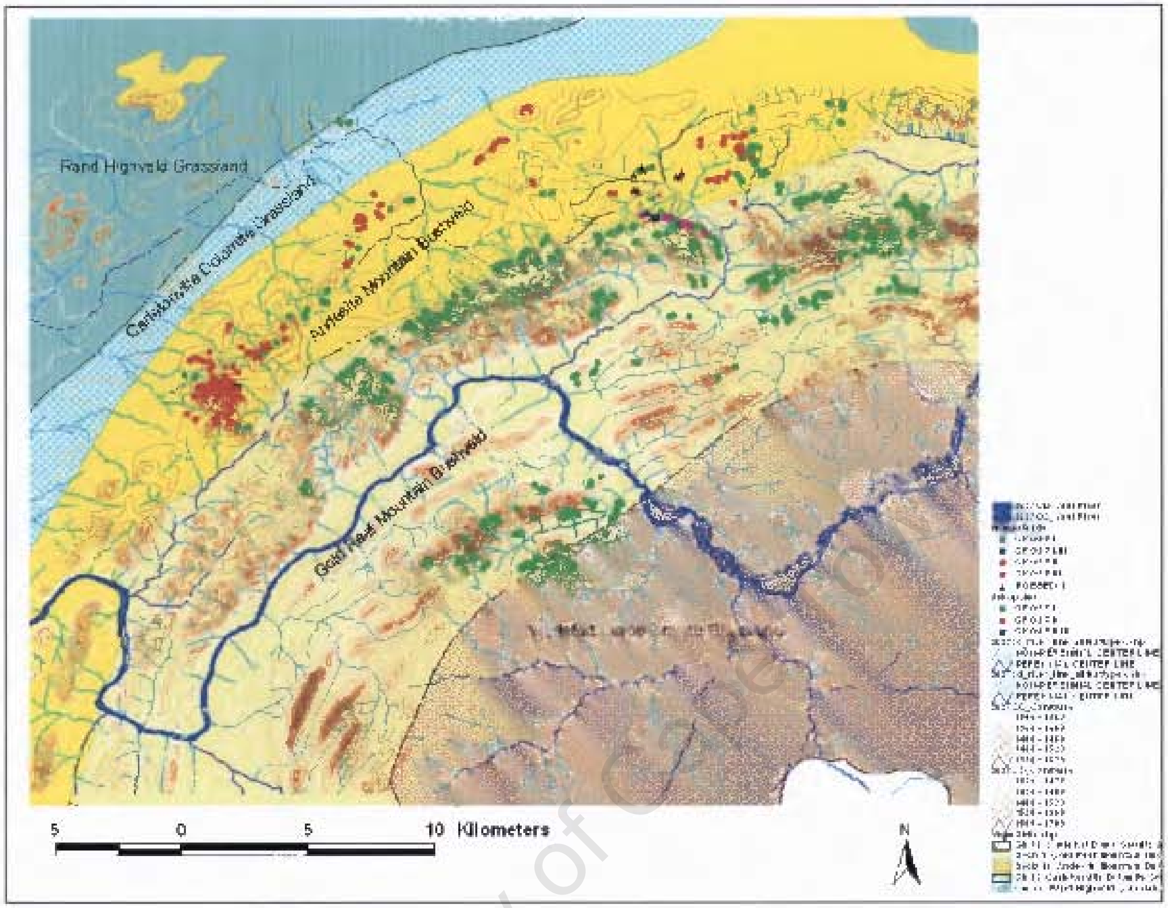

Figure 2.12: The Vegetation types in the Vredefort Dome. (The veld type layer is from Mucina & Rutherford 2006; the drainage and relief layers are from surveyor general data; and the settlement layer is from the aerial survey done in this study)

Both Group I and Group II settlement types are found predominantly within Bushveld vegetation types and clearly avoid the grassland zones to the north west and south east (Fig. 2.12). There is however a slight difference in the altitude and character of these veld types. Group I settlements are concentrated in the quartzite ridges with dense woody vegetation. Group II sites are restricted to lower altitudes on undulating landscape with well developed grass on hill-slopes and valleys (Mucina, & Rutherford 2006: 466- 468). There are some Group I sites here as well.

The dominance of settlements in the Bushveld types may relate simply, but critically, to the availability of wood for fuel in domestic use. These vegetation types are linked to the broken terrain of these areas as well as a possible lower frequency of seasonal fire. While the Bushveld types may satisfy fuel and construction needs, they may have been a negative factor in other areas of the economy such as livestock management. It is worth noting here that the Bushveld types are classified as 'sour and wiry, compared to the granite grasslands to the south and the thin band of Dolomite grassland to the north. This may have been significant in how cattle were seasonally managed because sour vegetation may support livestock in summer but less so in winter, where sweet grasslands retain nutritional quality throughout. Cattle may have been regionally managed over an annual cycle and the distribution of Group I settlements are well placed to take advantage of the sweet grasslands to the south. On the basis of the vegetation types it seems as though Group II settlements are less optimally located for cattle management.

The discussion above alludes that cattle are mobile and could therefore, be taken to suitable grazing lands. Furthermore, cattle do not only provide basic subsistence needs, they have greater value, for instance as social currency for bartering (Kuper 1994). Day-to-day subsistence needs would also be complimented through the cultivation of cereal crops. These provided the predictable supply of carbohydrate staples, without which it would have been difficult for southern African agriculturist communities to be viable (Maggs 1976; Huffman 2007). It seems possible that the same could have applied to the Vredefort Dome agriculturists. Therefore it is relevant to discuss settlement location in the context of some of the factors (soils, crop type, and land-use patterns) that could impact on the outcome of crop production.

Soils

The soils of the Vredefort Dome are influenced by the underlying geology, the slopes and drainage systems and the character of these soils further influences vegetation and soil properties such as moisture and nutrient content directly affects the extent of crop production. By examining the physical soil properties of the Vredefort Dome I outline variability in soil types and discuss whether different soils are better for cereal cultivation than others, and if so, assess the distribution of settlements in relation to this. Table 2.6 and Fig. 2.13 provide data on the different soil types found in the Vredefort Dome.

Table 2.6: The description of different soil types (from Mucina and Rutherford 2006)

Area ID	Soil Description
277	Eutrophic (no or little leaching) red soils widespread, upland duplex (porous topsoil overlaying Slowly permeable layer of soil)
438	Mispah (neither organic nor humic topsoil) gravel soils abundant on middle-slopes, foot-slopes and valley bottoms.
296	Mispah (not organic nor humic topsoil) gravel soils abundant on middle-slopes, foot-slopes and valley bottoms.
304	Rocky areas with miscellaneous soils
313	Dystrophic (leached) red soils widespread, upland duplex (porous topsoil overlaying Slowly permeable layer of soil)

According to data represented in Fig. 2.13 three soil types occur across the five geological substrates (Fig. 2.10) and support the five vegetation types (Fig. 2.12). The soil type in the granite core (Area-ID 313) is similar to soil in Rand Highveld Grassland vegetation (Area-ID 277: Table 2.6; Fig. 2.12 and 2.13). According to clay content data (Fig. 2.13) the soils in the Dome can be generally described as loam-sand, sand-clay-loam and/or sand-clay (Agricultural Research Council, 1999). Soils in Area-IDs 313 and 277 are described as red porous topsoil overlaying slow-permeable layer of soil. These soils retain moisture well.

Because of these characteristics they would seem to provide an advantage for cereal production compared to gravel soils of the hilly areas. However, the soils in the granite core are significantly leached, whereas the soils in Area-ID 277 have little or no leaching, and are nutrient-rich (Tables 2.5 and 2.6), making 277 soils more attractive than soils in Area-ID 313.

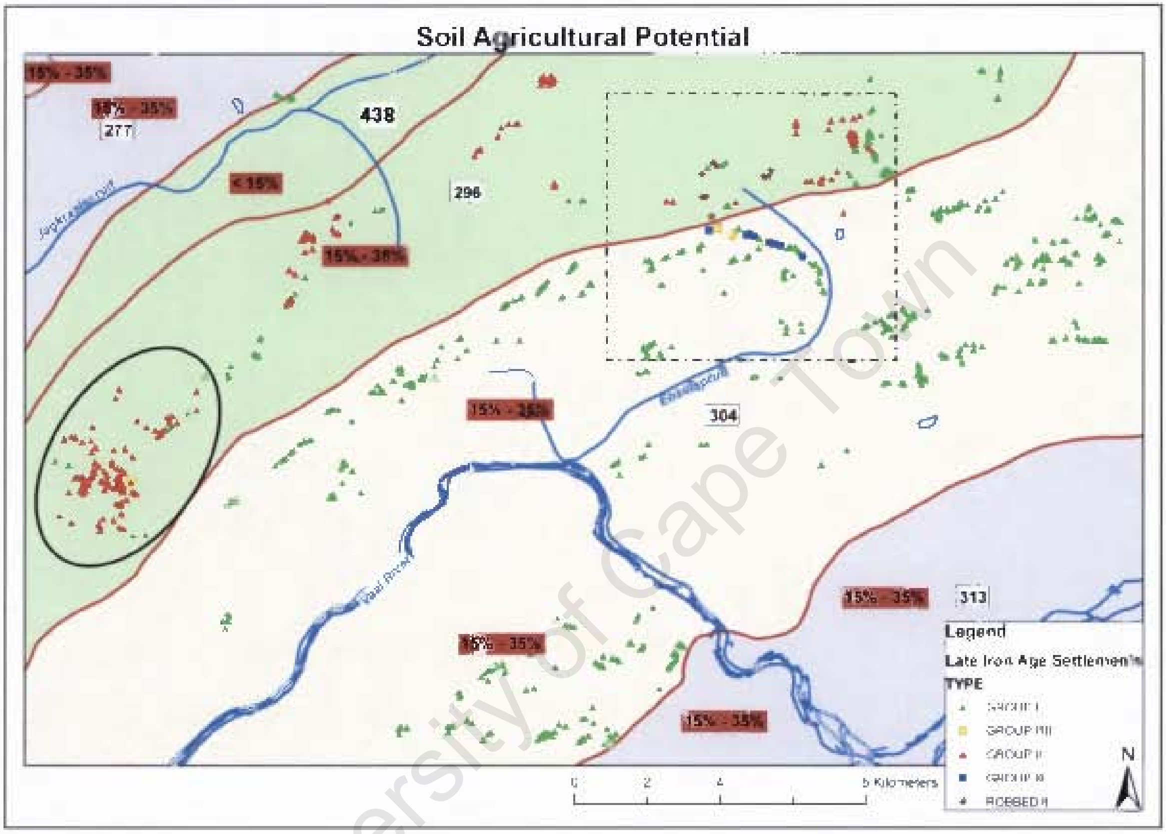

Figure 2.13: The soil types in the Vredefort Dome. The numbers on the map represent the Area ID in Table 2.5. The % values of clay are given in the red boxes.

The soils in Area-ID 304 (Fig. 2.11), that support the Gold Reef Mountain Bushveld vegetation (Fig. 2.10), are described as shallow gravel soils (Table 2.5), and correlate with the hilly and rocky character of this area (Table 2.6). The soils on the hills sloping towards the Vaal River have a low pH (acidic) and are nutrient-poor (Reimold and Gibson, 2005). The soils in Andesite Mountain Bushveld and Carletonville Highveld Grassland (Fig. 2.10) are similar (Fig. 2.11: Area-IDs 296 and 438). These are gravel soils whose topsoil is neither organic nor humic.

Since soil depth over most of the Vredefort is generally shallow, it would seem that the depth variability does not make a significant difference whether cultivation occurs in higher or low lying areas. However, the occurrences of frost are said to be severe in lower altitudes and less prevalent in the hills (Mucina, & Rutherford 2006). This means that the length of the growing season might be longer in the hilly regions.

What the soil data suggests is that crop production would be best on the more moisture retaining soils in the grasslands. It could be suggested that Group II sites may be slightly better off in this regard because they are close to the 277 soil area. However, if we assume that homesteads are located as close as possible to the fields, then the location of the homesteads within the hilly terrain and therefore on the shallow gravel soils would suggest that, if they were using these soils, then the settlement location of Group I sites is not optimal in terms of soil quality. However, these suggestions need to be assessed in relation to crop tolerances and requirements. Hence the next section on analysis of sorghum and maize requirements, and whether any of these two crops would be more viable at any specific bioregion in the Vredefort Dome.

Crop Type

This soil data, however, may only be relevant once an assessment is made of the conditions that the actual crops produced by these farmers required and could tolerate. The aim here is to establish the extent to which cereal agriculture might have been viable in different localities during the Late Iron Age period in the Vredefort Dome, and whether this may account for the specific distribution of settlement types in the Vredefort Dome. The crops that are known to have been grown by the pre-colonial farmers are sorghum, millet, ground beans, cowpeas, and late in the Iron Age maize as well (Huffman, 2006). For the purposes of my inquisition examining the requirements of sorghum and maize production seem like an appropriate choice, mainly because one is an indigenous cereal, sorghum, and the other is an introduced cereal, maize. Since different settlement types were occupied at different periods, examining the requirements of these two crops also provides a chronological facet, which is important in understanding these occupations. The other reason for include maize in this discussion is that while there's a general consensus on later (late 18^{th} and early 19^{th})centuries introduction of this cereal, Huffman (2006: 67) has suggested that in fact this cereal was in use in South Africa as early as the seventeen century. The later introduction of this crop implies relevant consumption for Group II and Group III. But an earlier use suggests that even Group I communities produced this crop. It is therefore of interest to see whether this might have been the case in the Vredefort Dome.

Sorghum: This cereal is indigenous to the Africa. It is plant that is well adapted to marginal conditions and can grow in low potential, shallow soils as well as in soils with high clay content but does better in deep soils which can hold sufficient water. It is tolerant of alkaline and can successfully be grown on soils with a pH between 5.5 and 8.5. It grows under fluctuating rainfall conditions, between ±400mm in the western parts of the South Africa and ±800mm in the eastern parts, but it can also stand drought (Agricultural Research Council, 1999).

Maize: This is an exotic crop introduced from meso-America to the south east African coast by the Portuguese from, perhaps from as early as the 16^{th} century (Huffman 2006: 67). It is a warm weather crop which grows well in soil with good effective depth (60cm), favourable texture and structure, good internal drainage, balanced and sufficient plant nutrients and chemical properties. Compared to sorghum, maize needs a lot of water, thus drought can affect the yield tremendously. For instance at optimal soil conditions the yield of 2500 to 2800 kg ha^{-1} would require at least 550mm of rainfall per annum (Table 2.6). And so production increases with increasing precipitation (Agricultural Research Council, 1999).

Generally the rainfall in the Vredefort Dome ranges between 500mm and 750mm per annum (Table 2.5). The soil clay content in the locality of the settlements ranges between 15% and 35% (Fig.2.13), and the soil depth varies between 45cm and 75cm (Reimold and Gibson, 2005). Agricultural Research Council (1999) guidelines for sorghum and maize yield potential, as they would apply in the Vredefort Dome, are provided in the Tables 2.7). Although this data is quantitative, it provides an indication of the effects of precipitation and how the production of crops would vary under different rainfall conditions (this is assuming the temperature is optimal). The yield of both sorghum and maize varies with soil depth and rainfall, but additionally, soil clay content is also important.

Table 2.7: Sorghum and maize yield at different rainfall (adopted from Agricultural Research Council, 1999).

Rainfall (mm/annum)	**Soil Clay (%)**	**Cereal yield ($kg^{-1}ha$)**	
		Maize	**Sorghum**
550	**15**	**2500**	2825
	20	**2600**	2825
	25	**2700**	2825
	30	**2800**	2825
600	15	2900	3640
	20	2300	3640
	25	3000	3640
	30	3200	3640
650	**15**	**3300**	4006
	20	**3400**	4006
	25	**3500**	4006
	30	**3700**	4006
700	15	3700	4314
	20	3900	4314
	25	3900	4314
	30	4200	4314

750	**15**	**4200**	4622
	20	**4400**	4622
	25	**4500**	4622
	30	**4800**	4622

The soil depth in the Vredefort Dome is mostly shallow with minimum depths in the ridges and hills and maximum depths in the outer low-lying areas of the Dome, foot-hills, valleys and the central granite core area. Data from Agricultural Research Council (1999) guidelines show that on the basis of soil depth, sorghum has the potential to be viable across the whole region, whereas maize can be grown in most areas but would have less potential in the Gold Reef Mountain Bushveld and the quartzite hills. Therefore, the conclusion is that cereal production, either maize or sorghum was viable for most areas in Dome. However, Sorghum is also a hardy plant and if it is raining a lot, then the porous, gravel soils may be favoured because with high rainfall, sorghum will not do well in waterlogged soils. Therefore well drained soils are better. In contrast, if there are droughts, farmers would use soils with high moisture retention qualities. It is also possible that Group II settlements could be more optimally located if maize production was part of their cereal cultivation.

Production of maize in southern African has temporal implications on the question of whether was maize introduced earlier as suggested by Huffman (2006) or later in the 18^{th} century in this region. If the earlier introduction of Maize does hold in the Vredefort Dome, it would have been most affected around AD 1700 at the worst of the Little Ice Age in southern Africa (Tyson et al. 2000). Taylor's (1979) excavations revealed large lower grinding stones which Huffman (2006) associate with maize production in Group II sites but none were found in Group I or Group III sites. Pelser's (2004) work in Askoppies, Group II settlement associate small grind stones with sorghum and he suggests that maize may have not been produced at this period. It is obvious from Taylor's evidence that maize was produced during the Group II occupation in the Vredefort Dome, therefore during the AD 1700 Little Ice Age event both maize and sorghum would have been affected, since the occupation of Group II is estimated between AD 1700 and AD 1800. This is assuming the Vredefort Dome landscape was effectively utilised during the Late Iron Age occupation. It is of interest to examine the land-use patterns across the Vredefort Dome landscape today relative to the distribution of settlement types.

Land-use Patterns

A further indication of areas of viable crop production in the Vredefort Dome can be obtained from the contemporary map of land use patterns. Of particular interest are the historic ploughing patterns which clearly focus on certain areas and not others. This contemporary land use potentially shows where pre-colonial agriculturists could also have farmed.

The land-use map of the Vredefort Dome (Fig. 2.14) shows that the area used for crop cultivation today is small relative to the area that is classified as "vacant/unspecified". It is instructive however, to note that contemporary ploughing patterns universally fall outside the areas in which the stone-wall sites are located. Group I settlements, for example, are located in the higher, more rugged, and uneven terrain of the Vredefort Dome, within the area labelled "vacant/unspecified" on the land use map. As indicated above, however, I assume that homesteads were located close to arable land and that small pockets of cultivation could have been used but these are too small to have been considered by the larger, most probably commercial, scale of contemporary agriculture and therefore do not appear on the land use map. It is difficult to imagine that the Group I settlements on either side of the Enselspruit, for example (Fig. 2.14), were not growing crops in close proximity to this drainage.

In other areas, some of the contemporary plough zones occur very close to Group I settlements. One such area is along the south bank of the Tierfonteinspruit where in some cases, modern ploughing patterns stop immediately before the settlements because of the slope angle and increasingly rocky terrain. In this case, Group I settlements are linearly strung out along the base hill contour, and this pattern suggests that each homestead had fields immediately in front and down-slope. This same correlation occurs near some sites south of the Vaal River are located near contemporary cultivated lands. This could mean that the inhabitants selected area unsuitable for crop cultivation for homesteads, but ensured that viable fields were not far away.

Group II settlements, on the other hand, occupied relatively lower altitude areas (Fig. 2.10), but are located mostly on hill-tops. It seems that this settlement pattern is less optimal in terms of distance to fields, compared to Group I settlements. Other than the altitude, the settlement preference by different settlement types as dictated by crop cultivation potential is not that distinct. This raises the possibility that there are other factors that could have influenced choice of settlement location.

It is possible that most of the settlements in the Vredefort Dome were located in specific areas that considered proximity to arable land to be a prime factor. Other areas are less cultivable (Fig. 2.14), but would have been used in other ways. The importance of the wood component in the Bushveld zones has already been mentioned above. The manner in which cattle were managed in terms of their grazing and water needs has also been mentioned. I now discuss livestock management in the Vredefort Dome in relation to the stone wall settlements.

2.3.3 Cattle Management

The Sotho/Tswana speakers' settlement layout conforms to the Central Cattle Pattern (CCP) (Huffman, 1986 and 2001), which underpins the importance of cattle in the economic and social make-up of the community. It is obvious that all settlements identified in this study have central cattle enclosures and cattle husbandry over the periods occupied was clearly viable and sustainable in the

Vredefort Dome and the surrounding regions. While it has been rectified above that crop cultivation could not have dictated different settlement preferences in the Vredefort Dome, it is important to consider whether cattle keeping, as one of the characteristics of pre-colonial farming communities, could have had an influence on the distribution of different settlement types.

As many have established, cattle-keeping in Sotho/Tswana communities is pivotal to the structural layout and social organization of the settlement (Huffman, 2001). And it has implications on the social, economic, religious and political systems.

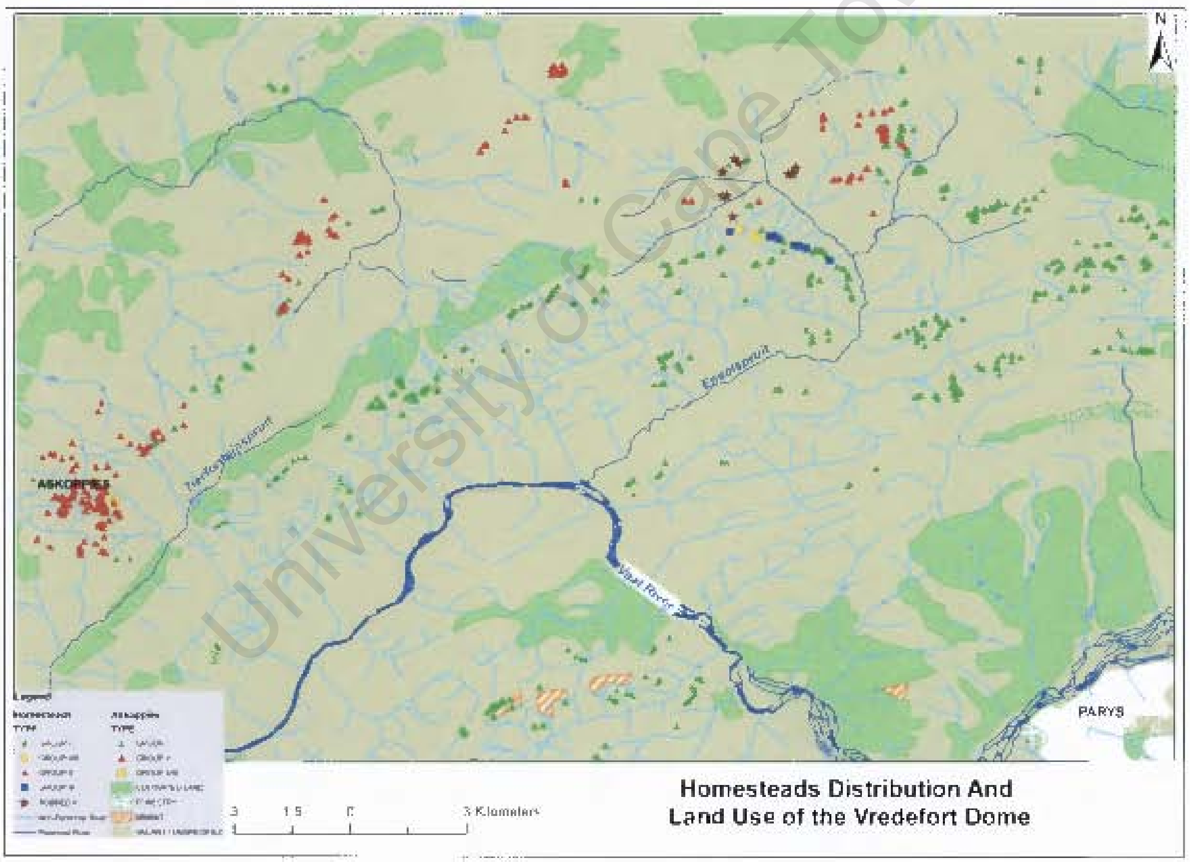

Figure 2.14: Agriculture viability of the Vredefort Dome today. Note that large part of the area, where Group I settlements are located is classified as "vacant/unspecified".

Cattle are highly valuable as indicators of wealth, power, status, and even getting wives (Kuper, 1982). The various uses of cattle meant keeping large numbers of cattle (Ashton 1967). Since actual number of cattle kept on any prehistoric sites cannot be inferred from archaeological remains, I will use the acceptable standard for enclosed herd as used today. According to Dreyer (1992) one cattle occupies $10m^2$ to avoid over-crowding in the enclosure. Though animal husbandry involves other animals such as sheep, goats, etc, I am going to assume that all the enclosures in the Vredefort Dome were occupied by cattle unless if the area is less than $10m^2$.

The central enclosures could only be measured in the Main Vredefort Dome. On the aerial photographs Askoppies settlements appear as a tight nuclear. From the scale the boundary walls are blurred, making it difficult to trace and measure the actual parameters.

The measurable enclosures in different clusters were counted. And the results are as follows: C01 contains fifty-seven enclosures; all of these are in Group I settlement types. C02 has seventeen enclosures. As shown in the below C12 has the highest number of enclosures, one-hundred and nineteen of these are Group I;   and C07 the lowest number, one-hundred and thirty-nine and six, respectively. 592 cattle enclosures were measured. The results represented in Table 2.8 and Fig. 2.15 are the settlement types and clusters in which these central enclosures are distributed.

From these results 70% of the central enclosures in the Vredefort Dome are found in Group I settlements. Group II settlements only constitute 25%. Often Group II settlements are characterised by exceptional large central enclosures compared to Group I. Though Group I has by far the greater number of central enclosures one would expect that most of the stock capacity to be contained in Group II settlements because most of Group II homesteads have multiple central enclosures compared to Group I homesteads that mostly have one central enclosure. From the available data it was possible to determine the stock capacity in both settlement types, as demonstrated in the Tables below, which would establish the likely viability of the immediate environment on which these settlement types are located. Stock capacity required that the number of cattle per enclosure be counted. Using this application the number of cattle for every measurable central enclosure in all settlement types in the Main Vredefort Dome was counted (Tables 2.9, 2.10, 2.11, 2.12, 2.13, 2.14).

Table 2.8: Frequency of central enclosures by Clusters and settlement type, comparison within clusters.

Clusters	**N0. of Kraals**	Group I	%	**Group II**	%	**Group III**	**%**	**Group I/III**	**%**	**Robbed II**	%
C01	57	57	100%	0		0		0		0	
C02	17	17	100%	0		0		0		0	
C03	21	21	100%	0		0		0		0	
C04	40	40	100%	0		0		0		0	
C05	26	26	100%	0		0		0		0	
C06	33	33	100%	0		0		0		0	
C07	6	6	100%	0		0		0		0	
C08	103	33	32%	68	66%	0		0		2	2%
C09	17	17	100%	0		0		0		0	
C10	44	0		44	100%	0		0		0	
C11	33	5	15%	28	85%	0		0		0	
C12	139	119	86%	0		13	9%	7	5%	0	
C13	25	3	12%	10	40%	0		0		12	48%
Outlier	31	31	100%	0		0		0		0	
	592	**408**	**70%**	**150**	**25%**	**13**	**2%**	**7**	**1%**	**14**	**2%**

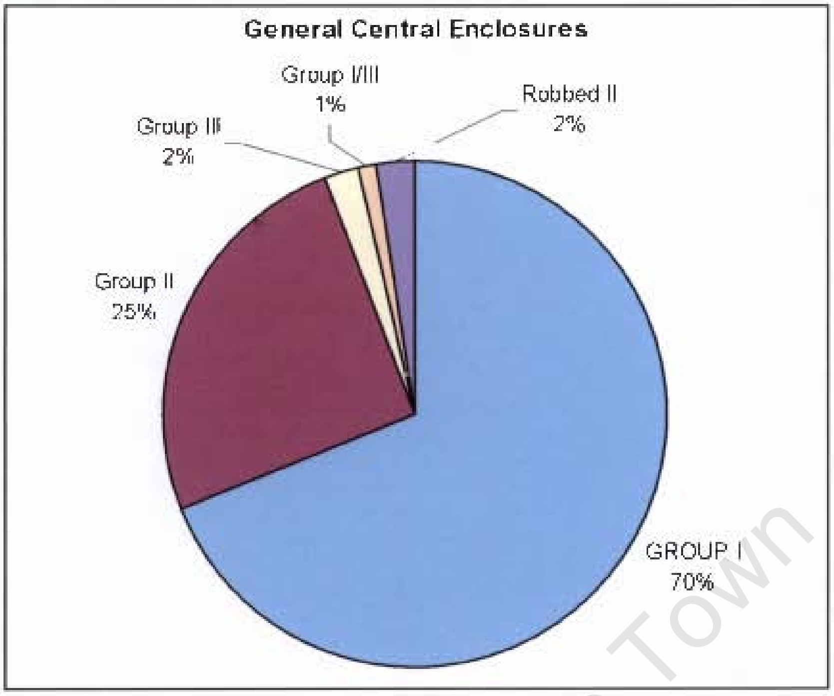

Figure 2.15: Settlement type representation of central enclosures in the main Vredefort Dome (excluding Askoppies)

Table 2.9: Stock capacity per central enclosure in the whole of the Vredefort Dome.

	Perimeter (m)	Kraal Area(sqm)	Stock Capacity
TOTAL	39005.81	221293.1	22436
Minimum	19.5	28.58	3
Maximum	317.29	4939.67	494
Average	65.88819	373.8058	37.89865

Group I

There 408 cattle enclosures in Group I homesteads across the Vredefort Dome. These carry stock capacity of 17 376 cattle. On average each of these central enclosures has the capacity of 43 cattle (Table 2.10).

The highest number of cattle in Group I homesteads is 257. These cattle are enclosed in enclosure CE_416 with the area of 2575.09m^2. The central enclosure CE_416 is a single central enclosure in homestead VRD_223/1. This homestead is one of the homesteads that could not be grouped in any cluster hence classified as an Outlier. Central enclosure CE_296 with the area of 32.66m^2 can take in the smallest number of cattle, 3. It is one of the six central enclosures in homestead VRD_165/1 in cluster C06.

Table 2.10: Stock capacity per central enclosure in Group I settlements.

	Perimeter (m)	**Kraal_ Area(sqm)**	**Stock Capacity**
TOTAL	29549.2	171929.57	17376
Minimum	21.03	31.87	3
Maximum	206.25	2575.09	257
Average	72.42	421.40	42.59

Group II

Independent of Askoppies, Group II settlements in the main Vredefort Dome has both enclosures with greatest number of cattle and the smallest stock capacity in Cluster C08. Homestead VRD_27/1 has the central enclosure, CE_41, which could enclose 494 cattle. Central enclosure CE_527, on the other hand, could have enclosed only 3 cattle (Table 2.11).

Table 2.11: Stock capacity in Group II settlements.

	Perimeter (m)	**Kraal_ Area(sqm)**	**Stock Capacity**
TOTAL	7160.43	35978.02	3725
Minimum	19.5	28.58	3
Maximum	317.29	4939.67	494
Average	47.7362	239.8535	24.83333

Robbed II

Table: 2.12: Stock capacity in Robbed Group II settlements.

	Perimeter (m)	Kraal_ Area(sqm)	Stock Capacity
TOTAL	1093.2	7163.68	715
Minimum	23.06	38.96	4
Maximum	188.35	1732.10	173
Average	78.09	511.69	51.07

Since settlements here classified as Robbed II are clearly Group II settlement types, from here onwards they will be dealt with them collectively as Group II sites to give a total number of Group II homesteads in the Dome. This way the sample is representative of Group II sites (Table 2.13).

Table 2.13: Stock capacity per central enclosure in all Group II homesteads in the Vredefort Dome

	Perimeter (m)	Kraal_Area (sqm)	Stock Capacity
TOTAL	8253.63	43141.7	4440
Minimum	19.5	28.58	3
Maximum	317.29	4939.67	494
Average	50.33	263.06	27.07

However, I was able to identify on the aerial survey one of the Group II sites that Taylor excavated, 2627 CD 1(Taylor 1979: 32). On this survey this settlement is VRD_22, composite of three homesteads: VRD_22/1, VRD_22/2, and VRD_22/3. Since this settlement has been examined in detail through actual field excavations, it provides 'a control' on which to verify the stock capacity in Group II settlements. Based on the plan drawn by Taylor VRD_22 has about 22 central enclosures. The average stock capacity calculated above for Group II homesteads is about 27 cattle per kraal (Table 2.13: Average stock capacity 27.07) per enclosure. Thus the expected stock capacity of VRD_22 according to these calculations is 22 X 27 = 594 cattle. From the aerial photograph twelve kraals could be measured in two homesteads, VRD_22/2 and 22/3. And the stock capacity of 108 cattle was calculated in both of them (Table 2.14). Though it appears that aerial photograph evidence falls short by 10 enclosures, about 45%, it worth noting that this number could have been higher if the central enclosures in VRD_22/1 were measurable This emphasises the importance of carrying out field excavations to verify and make absolute conclusions on the inferences made in this research. However, the results represented here are enough to give an indication of stocking rates in the Vredefort Dome.

Table 2.14: Stock capacity per central enclosure in sub-cluster VRD_22.

Hom-ID	Hom_Area (sqm)	Kraal-ID	Kraal_Area (sqm)	Stock Capacity	Kraal area as a % of Homestead area
VRD_22/2	9759.28	CE_524	124.04	12	
VRD_22/2	9759.28	CE_525	53.02	5	
VRD_22/2	9759.28	CE_526	87.15	9	
VRD_22/2	9759.28	CE_527	28.58	3	
VRD_22/2	9759.28	CE_528	57.83	6	
VRD_22/2	9759.28	CE_529	245.01	24	
VRD_22/2	9759.28	CE_530	46.93	5	6.58
VRD_22/3	6656.4	CE_531	110.51	11	
VRD_22/3	6656.4	CE_532	53.19	5	
VRD_22/3	6656.4	CE_533	110.97	11	
VRD_22/3	6656.4	CE_534	48.98	5	
VRD_22/3	6656.4	CE_535	119.13	12	2.53
		TOTAL	**1085.34**	**108**	**9.11**

Group III

Table 2.15: Stock capacity per central enclosure in Group III homesteads.

	Perimeter (m)	**Kraal_ Area(sqm)**	**Stock Capacity**
TOTAL	801.74	4324.72	431
Minimum	24.78	46.41	5
Maximum	142.42	1371.41	137
Average	61.67	332.67	33.15

Group I/III

Table 2.16: Stock capacity per central enclosure in Group I/III homesteads.

	Perimeter (m)	**Kraal_ Area(sqm)**	**Stock Capacity**
TOTAL	401.24	1897.06	189
Minimum	35.07	86.54	9
Maximum	92.48	621.41	62
Average	57.32	271.01	27

On the basis of these data the Vredefort Dome supported 22 436 cattle at different periods depending on settlement type occupation. During Group I occupation (AD1500 – AD1570 (Taylor 1979: 106)) the Dome, at some point, supported Group I inhabitants with possible stock capacity of 17 376 cattle. And between AD1700 and AD 1800 this region could support Group II communities with the stock capacity of 4 440 cattle. On the basis of these values it is justifiable to conclude that cattle husbandry formed part of land use patterns in the Dome.

Chapter 2 Summary Discussion

On the basis of the discussion presented in this chapter it is clear that different stone-wall settlements identified in the larger area of the Dome have different settlement location preferences irrespective of their different occupation periods. Notable distinction is between Group I and Group II sites, where Group I tended to be on the rugged hilly terrain on the north western corner of the Dome. And Group II settlements are distributed on the outside undulating landscape away from the ridges.

In terms of settlement type densities, a significantly large percentage of stone-wall sites in the Vredefort Dome are Group I settlements, followed by Group II settlements. Other types, as a Group III, make-up very little percentage of these frequencies.

It was also clear that while settlement distribution can be attributed to environmental and biophysical factors such as geology, climatic conditions, vegetation type, soils and economic factors, collectively, other factors would still be more crucial to determining the pattern of settlement distribution such as observed in the Dome. For instance, while there is an apparent correlation between settlement distribution and the underlying geology, I suggest that geology is a red-herring, and that the more obvious topographical nature of the terrain, though it is itself determined by geology, had a more direct influence on where these communities chose to settle.

It is also possible that the climatic changes that have occurred during the occupations in the Vredefort Dome could have similar effects across the whole of the Dome region, and would have not presented any significant variable impact at a micro bioregional scale.

3. GROUP I SETTLEMENT STRATIFICATION AND HIERARCHY

The previous section examined the density and distribution of stone-wall settlements in the whole of Vredefort Dome and the characteristics of their immediate localities that may have influenced their spatial location. While these aspects were dealt with at the more general scale of settlement types, I now examine settlements at a more detailed, cluster, scale. The main aim is to explore for settlement stratification and hierarchy based on homestead clustering or aggregation and cattle stocking capacity within a cluster, in order to identify homestead units that may have political advantage at a cluster level. The basis for carrying out this analysis stems from the question of when settlement aggregation started and development of stratified political hierarchies among Sotho/Tswana communities. This is done mindful of the fact that the results from this research would need to be substantiated by field excavations to fairly explore the dynamism of this question. Before doing this it is important to briefly review the ethnographic basis of searching for political organisation.

It has been argued by Silitshena (1979) that while ecological factors and defence theory can explain the existence of historically nucleated settlements and seasonal migrations between settlements and agricultural activity amongst the Tswana the significant influence depends on the role played by the power of chief in controlling the movement of his people. Power has clear material consequences and so Huffman has developed a model of settlement ranking that is based upon the ethnography of political hierarchy. Huffman notes that every group of Bantu-speakers has "possessed at least two: the courts of the family head and the ward headman" (Huffman 1986:280). This means that in the Bantu-speaking world every homestead has a leader, and leaders of homesteads in a cluster of settlements are ranked relative to each other in a number of political levels. In the Bantu-speaking world this is the result of an unequal distribution of wealth due to "intertwined relationship of wealth and power" (Huffman 1986:

283). This relationship is of direct value for archaeology because power and hierarchy can be recognised archaeologically by the number of settlements in clusters and their degree of aggregation, the size of settlements, their courts, and in particular, through the size of cattle enclosures.

On the basis of this worldview, I will examine political hierarchy within settlement clusters in the Vredefort Dome. However, before undertaking this exploratory discussion one important assumption needs to be explicitly stated. Quite clearly, the comparison between clusters in order to interrogate regional political hierarchy assumes that similar settlement types (i.e. Group I or Group II), in these clusters were chronologically contemporary. I have no control over this but assume that because, for example, Group I clusters are discrete and that there are no obvious stratigraphic superimpositions of Group I settlements over other Group I settlements, this is a reasonable assumption. Furthermore, the distribution of Group I clusters may represent a sequence, in which the discrete spatial location of clusters suggests that the development of the Group I landscape took place coherently and progressively, so that over the period of Group I occupation the addition of new settlements was negotiated with settlements that were already there. The assumption of contemporary settlement sub-clusters within a cluster is more secure because of the discreteness of clusters and therefore the discussion of possible hierarchical relationships between sub-clusters within a cluster is more confident.

3.1 The Analysis of Group I Settlement Clusters

As outlined above stone wall settlements in the Vredefort Dome are made up of three types (Table 2.2). Of these, only Group I and Group II settlement types represent a significantly large sample upon which an examination of hierarchy can proceed. I started by identifying sub-clusters which were defined as either a single homestead or contiguous homesteads less than 50m apart. Within each sub-cluster I counted individual homesteads to give a degree of aggregation. In

Table 3.1, for example, I identified 241 Group I sub-clusters that ranged between single, isolated homesteads and one sub-cluster that comprised nine homesteads.

Table 3.1: Aggregation frequency of Group I settlements in the Vredefort Dome.

GROUP I			
Aggregation ranking	**Sub-Clusters**	**Homesteads per rank**	**% of sub-clusters per rank**
1	115	115	47.72
2	63	126	26.14
3	38	114	15.77
4	14	56	5.81
5	2	10	0.83
6	4	24	1.66
7	2	14	0.83
8	2	16	0.83
9	1	9	0.41
TOTAL	**241**	**484**	

On the basis of this preliminary data there is already some expectation concerning political hierarchy within the Group I sample. This draws attention to the few sub-clusters at the higher end of the aggregation ranking scale. Such a discussion, however, is premature because sub-clusters are not evenly distributed over the Vredefort Dome landscape. An examination of Fig. 3.1 shows that many sub-clusters belong within larger clusters, which in turn can be separated from other clusters by open ground and topographic features. While the identification of some of these larger clusters is somewhat arbitrary, and furthermore, some individual homesteads are outliers and do not obviously fall within a cluster, the affiliation of most sub-clusters to a larger cluster can, for the most part, be made. It is because of the relative spatial coherence of clusters that I suggest that each cluster represents a contemporary set of homesteads.

Before one can develop a discussion of political and social hierarchy at the regional scale, however, I first describe individual clusters by comparing sub-cluster localities, sub-cluster aggregation ranking, cattle enclosure numbers and size as basic parameters from which to assess political and social relationships within clusters. Analysis of this level provides a necessary first step before a consideration of relationships between clusters can be made.

Overall thirteen clusters have been defined (Fig. 3.1). Three Group II clusters share the same space with Group I clusters and for convenience have been given the same cluster number, although these Group II clusters are discussed separately (see Chapter 4). There is one cluster that comprises only Group II settlements. In addition, homesteads that dot the landscape with no close proximity to other homesteads, and are not part of a cluster are referred to as outliers. All outliers are Group I settlements. Outliers are not included in the analysis of clusters but do contribute to showing the greater dispersal of Group I homesteads compared to Group II, and additionally Group I outliers also provide a control over the possible political ranking of settlements within clusters (Fig.. 3.1 and Table 3.2).

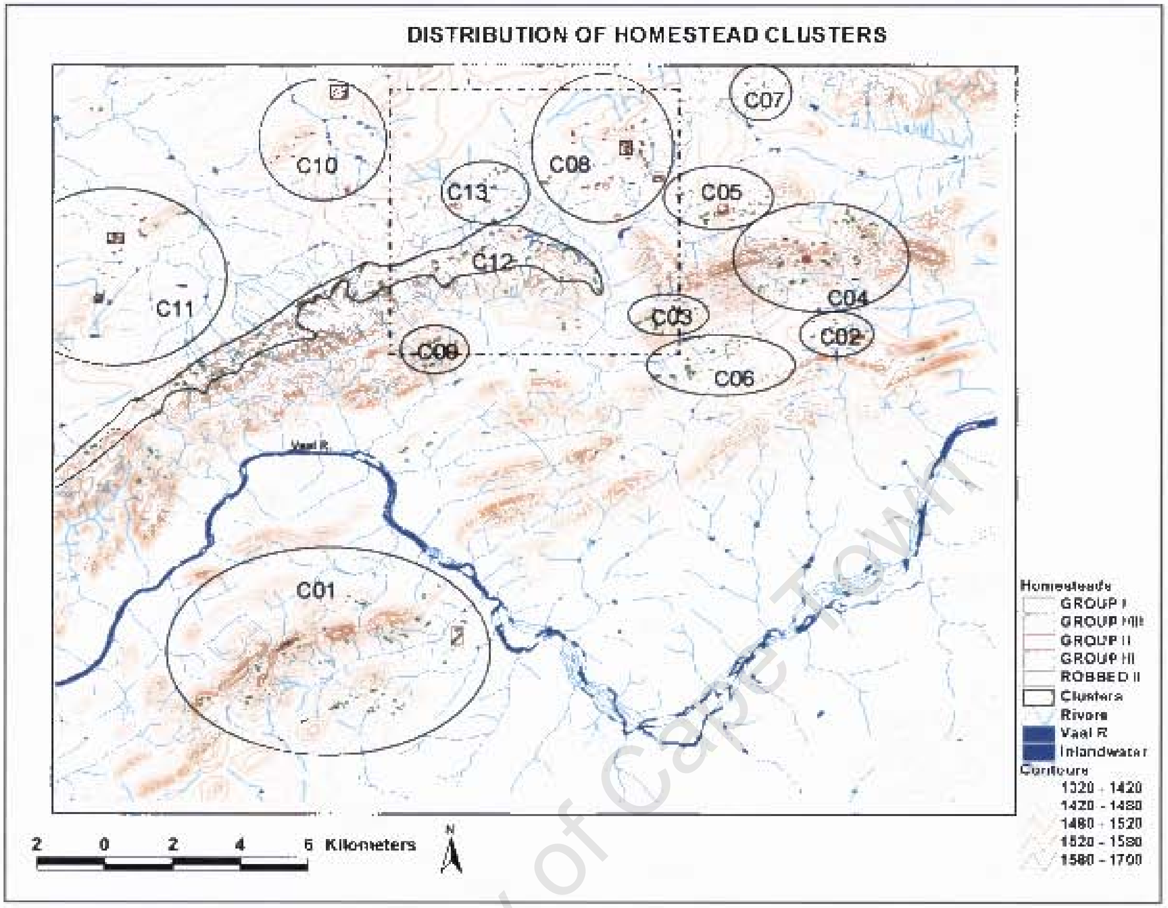

Figure 3.1: The distribution of settlements and clusters in the Vredefort Dome.

Table 3.2: Group I clusters showing the frequency of sub-clusters for each aggregation rank.

Aggregation ranking	C01	C02	C03	C04	C05	C06	C07	C08	C09	C11	C12	C13	Outlier
1	28	3	2	15	7	8	1	4	2	5	23	1	16
2	10	1	4	6	3	4	3	2	2	1	19	2	6
3	5		3	6	1	4		3	2	1	9		4
4	1	1	1	2	2			1	1		4		1
5	1										1		
6	1				1						2		
7		1									1		
8				1				1					
9	1												
TOTAL	47 19.5%	6 2.5%	10 4.1%	30 12.5%	14 5.8%	16 6.6%	4 1.6%	11 4.6%	7 2.9%	7 2.9%	59 24%	3 1.2%	27 11.6%

All Group I clusters are located in the hilly terrain on the north western edge of the Vredefort Dome, except for one that is located south of the Vaal River. This cluster (C01), however, still shows the same preference for hilly terrain. I now briefly describe each of these clusters in order to identify the details, variability and pattern within this settlement type.

Cluster 01

This is the only cluster located south of the Vaal River. It consists of eighty-seven Group I homesteads that combine to produce a total of forty-seven sub-clusters. Single unit sub-clusters dominate the distribution with twenty-eight homesteads (60%). Ten settlements were made up of two-homestead units, five were three-homestead units, and there is one sub-cluster each of four, five, six and nine homestead unit (Fig. 3.2 and Table 3.3). I reiterate that the distribution of this cluster encourages the view that all homesteads were contemporary and this assumption underpins the following discussion of C01.

The distribution of sub-clusters in C01 (Fig 3:1) is generally in an east to west direction, a characteristic that is controlled by a small, eastwards flowing tributary of the Vaal River and two lines of hills that run parallel to this drainage, with one range to the south and the other to the north. The most easterly sub-clusters are located about 1km from the Vaal River, and despite the obvious attraction of being closer to this permanent water source, these sub-clusters are set back from the river and cluster around a low hill. The biggest sub-cluster in C01, comprising of nine homesteads units, is located in this area and occurs across the 1400m contour line (Fig. 3.2). An examination of the aerial photo (Fig. 3.3) shows that there is suitable agricultural land next to this sub-cluster, as marked by recent ploughing.

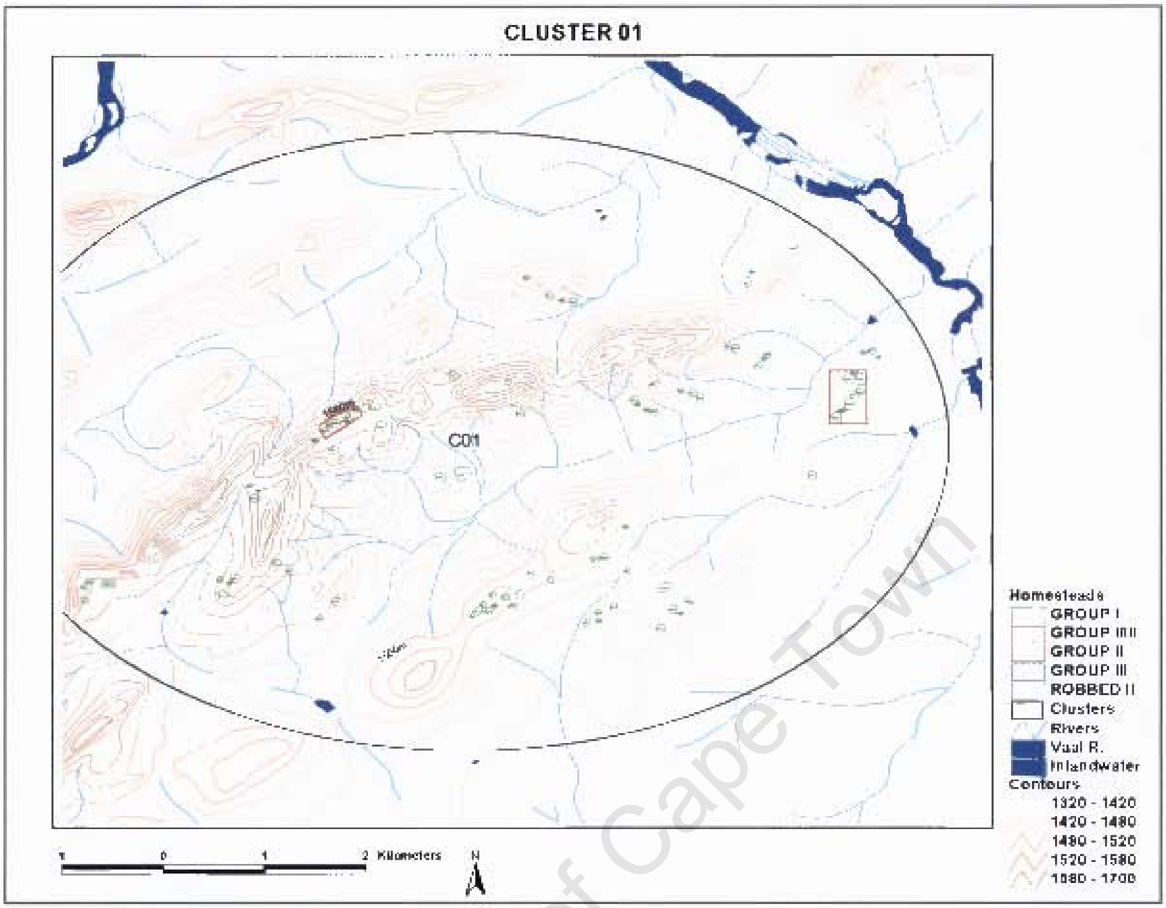

Figure 3.2: Homestead distribution in Cluster 01. The red rectangle marks the location of the biggest sub-cluster.

As one moves westwards up the drainage in this cluster, there is a notable preference for homesteads to be on the southern aspect and on gentle interfluves between minor drainages. These settlements are set back about 500 metres from the central drainage and just below the steeper basal contours of the hills. The land below these settlements was presumably also suitable for agriculture. The other settlements on the southern line of hills also favour a southern aspect, as do most settlements found on the northern line of hills. In this cluster 54% of the homesteads are located at an altitude lower than 1500m, while 46% are above 1500m (Table 3.4). The highest in this cluster are found at an altitude between 1600 and 1640 m.

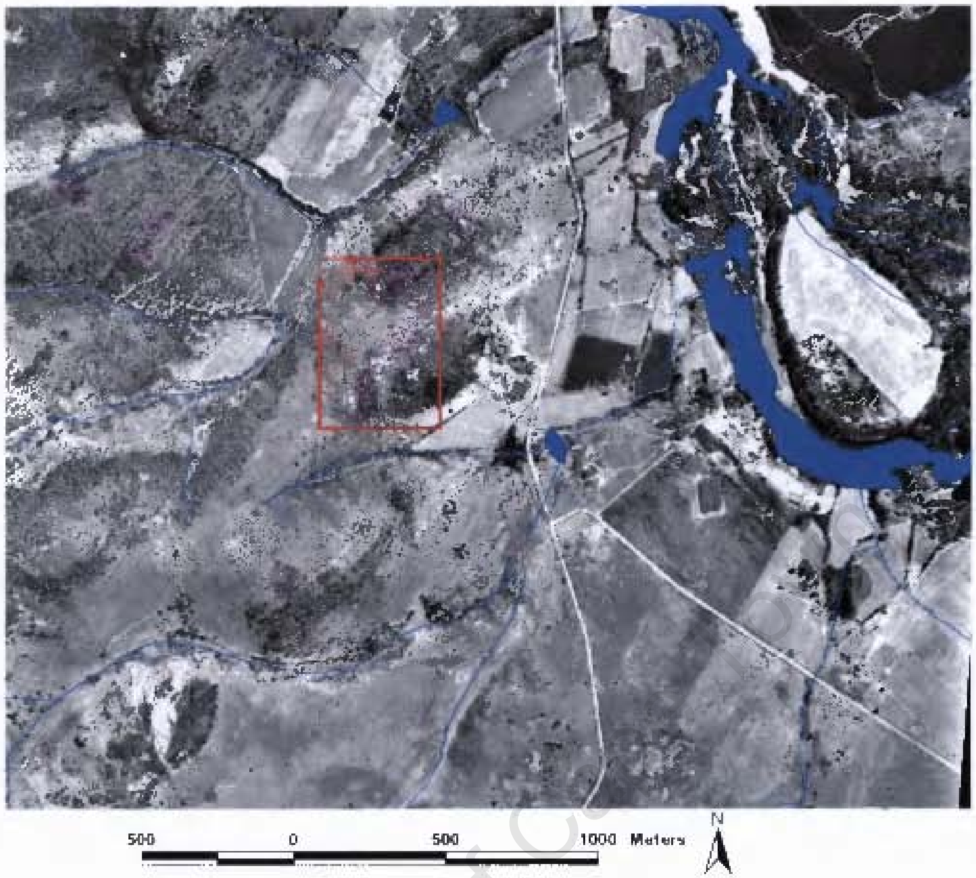

Figure 3.3: Aerial photograph showing the location of the largest sub-cluster (VRD 298, 300, enclosed in red rectangle) relative to modern cultivation.

All the sites in this cluster are located in close proximity to the small drainages, either separating the two ranges or the drainages running off these hills. In the past these small streams may have been perennial but if not then water would have been available in the Vaal River. The distance of sub-clusters to the Vaal ranges between 1 and 6km, either to the east or to the north. If the smaller drainages were managed for domestic use and cattle had to be herded on a daily basis to the Vaal to drink, then homesteads located closer to this river would have had an advantage. This raises the question as to whether this assumed advantage of these settlements can be measured in anyway that suggests political precedence.

It is clear from Fig. 3.2 and Fig. 3.3 that the largest sub-cluster (VRD 298, 299 and 300) is located closest to the Vaal River. On the basis of this size alone it can be suggested that this was a prominent sub-cluster in C01. However, the second largest sub-cluster, with six homestead units is perched on the hilltop above the 1560m contour line (Fig. 3.2). On ecological grounds it can be suggested that the VRD 298, 299, 300 sub-cluster is more optimally located. In order to search further for the possibility of a hierarchy between these sub-clusters I compared kraal size as a proportion of homestead size and calculated cattle numbers using the standard of $10m^2$ for one stock unit (Dreyer, 1992:371)

These calculations show, not unexpectedly, that overall this sub-cluster possessed more cattle than the VRD 268, 269 sub-cluster. Furthermore, two of the homesteads have a double kraal system (VRD298/2 and VRD298/5), in which the kraal area as a percentage of homestead area and projected cattle numbers (118 and 124 respectively), were among the highest in this sub-cluster and the calculated cattle numbers per homestead were far higher than the VRD 268, 269 sub-cluster (Table 3.5). The presence of two double kraal systems in the lower sub-cluster also suggests more complex kin relationships. These numbers, however, may be misleading because the average size of the VRD 268, 269 cattle kraals is just under 20% of the homestead area, compared to an average of 11.2% for the VRD 298, 299, 300 sub-clusters. Given the potential error in taking these measurements and the high degree of variability in the VRD 268, 269 sub-cluster, the VRD298, 299, 300 sub-cluster still seems dominant. On ecological factors, cattle holdings and organisational complexity, this sub-cluster is the most commanding in C01.

Table 3.3: Settlement aggregation within Cluster 01.

Aggregation ranking	Sub-clusters	Homesteads
1	28	28
2	10	20
3	5	15
4	1	4
5	1	5
6	1	6
9	1	9
TOTAL	**47**	**87**

Table 3.4: The altitudinal distribution of homesteads in Cluster 01

Altitude(+)	N0.of Homesteads	
1340m	3	3%
1380m	11	13%
1400m	2	2%
1420m	7	8%
1440m	6	7%
1460m	9	10%
1480m	9	10%
1500m	11	13%
1520m	6	7%
1540m	5	6%
1560m	11	13%
1580m	3	3%
1600m	4	5%
	87	

Table 3.5: Analysis of stock capacity in C01, representing homesteads whose kraals were measurable. The highlighted homesteads make up a sub-cluster. (Different shades of grey highlight a sub-cluster). For single homesteads with more than 1 kraal, the total kraal area is used to calculate the percentage (e.g. VRD_277/1). The homesteads that could not be measured are left as gaps (e.g. VRD_255/1). (This applies for all clusters).

H-ID	**HArea (m^2)**	**Kraal-ID**	**Kraal Area (m^2)**	**Kraal as a % of homestead**	**N0.of Cattle**
VRD_254/1	6698.99	CE_248	898.02	13.41	90
VRD_255/1	2983.94	CE_249			
VRD_255/2	1880.3	CE_250	426.18	22.67	43
VRD_257/1	5469.38	CE_245	1190.81	21.77	119
VRD_259/2	2010.46	CE_444	199.99	9.95	20
VRD_260/1	4181.5	CE_244	1001.19	23.94	100
VRD_261/1	2366.35	CE_243			
VRD_263/1	5675.42	CE_246	1214.12	21.39	121
VRD_263/2	2797.23	CE_247	608.51	21.75	61
VRD_265/1	14761.47	CE_235	244.24	1.65	24
VRD_266/1	7017.93	CE_236	838.6	11.95	84
VRD_268/1	2345.97	CE_240	280.04	11.94	28
VRD_268/2	3970.09	CE_239	229.17	5.77	23
VRD_268/3	2075.32	CE_241	481.71	23.21	48
VRD_268/4	1857.18	CE_242			
VRD_269/1	4922.72	CE_238	1742.98	35.41	174
VRD_269/2	1298.39	CE_442	231.44	17.83	23
VRD_269/3	1407.65	CE_443	326.25	23.18	33
VRD_270/1	6235.31	CE_237			
VRD_274/1	4938.79	CE_234	690.68	13.98	69
VRD_277/1	4050.67	CE_231	263.49		26
VRD_277/1	4050.67	CE_232	256.08		26
VRD_277/1	4050.67	CE_233	125.61		13
				15.93	
VRD_279/1	2090.42	CE_230	399.29	19.10	40
VRD_282/1	4498.42	CE_229	469.5	10.44	47

VRD_283/1	3933.22	CE_227	1320.84	33.58	132
VRD_284/1	1355.01	CE_228			
VRD_288/1	1369.5	CE_226			
VRD_290/1	3452.16	CE_225	584.13	16.92	58
VRD_291/1	4060.32	CE_224			
VRD_292/1	2171.31	CE_223	424.77	19.56	42
VRD_293/1	3893.45	CE_222	498.77	12.81	50
VRD_293/2	4634.89	CE_221	419.78	9.06	42
VRD_297/1	5247.78	CE_219	284.8		28
VRD_297/1	5247.78	CE_220	180.8		18
				8.87	
VRD_298/1	**3285.84**	**CE_212**	**356**	**10.83**	**36**
VRD_298/2	**7413.12**	**CE_213**	**561.05**		**56**
VRD_298/2	**7413.12**	**CE_214**	**618.85**		**62**
				15.92	
VRD_298/3	**1573.19**	**CE_215**	**305**	**19.39**	**31**
VRD_298/4	**1012.9**	**CE_216**	**197.04**	**19.45**	**20**
VRD_298/5	**6245.09**	**CE_217**	**874.45**		**87**
VRD_298/5	**6245.09**	**CE_218**	**372.84**		**37**
				19.97	
VRD_298/6	**3446.27**	**CE_211**	**401.41**	**11.65**	**40**
VRD_300/1	**2129.82**	**CE_210**	**130.47**	**6.13**	**13**
VRD_300/2	**6940.1**	**CE_209**	**628.85**	**9.06**	**63**
VRD_301/1	2935.61	CE_208	348.75	11.88	35
VRD_302/1		CE_207	728.02		73
VRD_304/1	2166.93	CE_435	452.43	20.88	45
VRD_305/1	2988	CE_434	391.85	13.11	39
VRD_306/1	1828.19	CE_433	154.28	8.44	15
VRD_308/1	2166.47	CE_432	164.98	7.62	16
VRD_338/1	2358.78	CE_441	301.44	12.78	30
VRD_339/1	1245.6	CE_437	310.19	24.90	31
VRD_339/2	4421.6	CE_439			
VRD_340/1	3972.92	CE_436	249.32	6.28	25
VRD_341/2	5219.23	CE_438	214.99		21
VRD_341/2	5219.23	CE_440	470.46		47
				13.13	

57 Kraals	Average	15.65	49.06
	Total		2404

Cluster 02

This is one of the twelve clusters (Fig. 3.1) north of Vaal River and along with C04, is one of the most easterly. It has six sub-clusters and with only sixteen homesteads, it is a low density cluster. The largest sub-cluster is made-up of seven homestead units (Table 3.6), located on gently sloping terrain with a northern aspect. No settlements are located below the 1500m contour line, and all homesteads in this cluster fall between the 1500m and 1540m contour lines (Fig. 3.4 and Table 3.7). They all would have had reasonably easy access to water sources (Fig. 3.4), for domestic use as well as for livestock. The Vaal River is only about 6km away, and despite the hills to the south of this cluster (Fig. 3.1), the Vaal River would have been easily accessed.

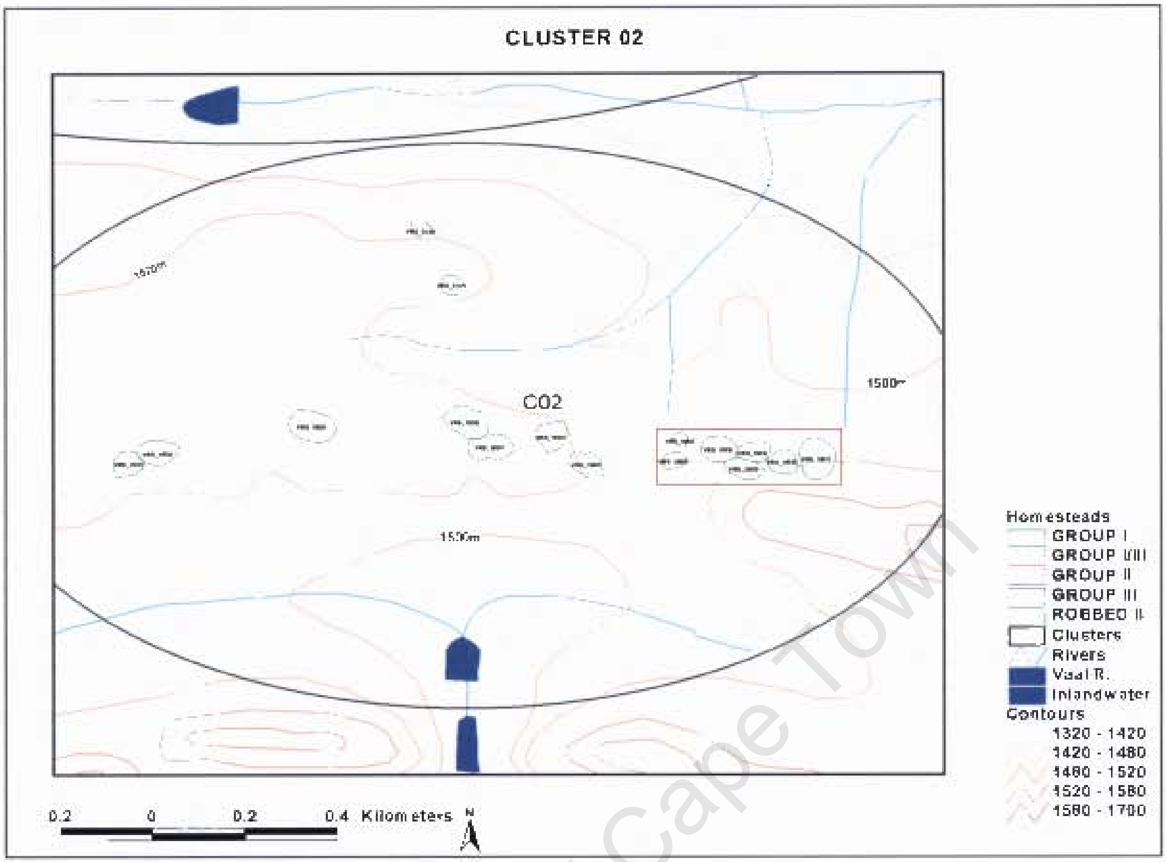

Figure 3.4: Homesteads topographical distribution in Cluster 02. The red rectangle marks the biggest settlement unit.

Table 3.6: Settlement aggregation within Cluster 02

Aggregation ranking	Sub-clusters	Homesteads
1	3	3
2	1	2
4	1	4
7	1	7
TOTAL	**6**	**16**

Table 3.7: The altitudinal distribution of homesteads in Cluster 02

Altitude(+)	N0.of Homesteads	
1500m	9	56%
1520m	7	44%
TOTAL	**16**	

One five homestead sub-cluster (VRD_197) within C02 is particularly outstanding (Fig. 3.4), and on the basis of the aggregation rank would suggest that this sub-cluster was dominant. This is supported by the kraal calculations. As shown in Table 3.8 there are 17 central kraals in this cluster of which 15 could be measured. (VRD_193/1 and 213/1 are omitted because of the poor clarity of the boundary walls.) This cluster has a livestock capacity of 527 cattle, with 45% (239 cattle) associated with VRD_197. The kraals in this cluster have the capacity of about 35 cattle per kraal on average and kraals take up an average of 12.8% of the homestead area. The highest number of kraals in this cluster is found in VRD_197, with five kraals. This number would have been higher if the enclosures of the other two homesteads (VRD_196/1 and VRD_196/2) could be included, but the central enclosures were not measurable. Next is VRD_195/1 with three central enclosures with a total of 93 cattle, taking up 33.2% of the homestead area. Another large capacity kraal is in sub-cluster VRD_197 with 79 cattle (Table 3.8).

Clearly VRD_197 has highest number of cattle, and most complex degree of homestead clustering. In terms of cattle capacity VRD_195/1, with a complex three kraal system, also stands out as single homestead with a relatively large stock capacity. Based on these calculations these two sub-clusters (VRD_195 and 197) physically dominate this cluster. Therefore, based on stock capacity and homestead complexity, this sub-cluster is dominant.

Table 3.8: Analysis of stock capacity in C02, representing homesteads whose kraals were measurable. The highlighted homesteads make up a sub-cluster.

H-ID	HArea (m^2)	Kraal-ID	Kraal Area (m^2)	Kraal as a % of homestead	N0.of Cattle
VRD_191/1	2649.72	CE_183	267.42	10.09	27
VRD_191/2	3576.4	CE_184	591.62	16.54	59
VRD_192/1	5169.81	CE_187	177.58	3.43	18

VRD_193/1		CE_268			
VRD_193/2	4550.22	CE_188	342.98		34
VRD_193/2	4550.22	CE_269	150.75		15
				10.85	
VRD_194/1	3144.95	CE_189	225.54	7.17	23
VRD_195/1	2787.81	CE_190	318.69		32
VRD_195/1	2787.81	CE_191	330.81		33
VRD_195/1	2787.81	CE_192	275.77		28
				33.19	
VRD_197/1	**5173.07**	**CE_197**	**686.47**	**13.27**	**69**
VRD_197/2	**2461.57**	**CE_196**	**348.93**	**14.18**	**35**
VRD_197/3	**2595.42**	**CE_195**	**266.15**	**10.25**	**27**
VRD_197/4	**2389.77**	**CE_194**	**286.32**	**11.98**	**29**
VRD_197/5	**3306.82**	**CE_193**	**794.30**	**24.02**	**79**
VRD_213/1		CE_185		0.00	
VRD_214/1	1646.12	CE_186	185.58	11.27	19
		17 kraals	Average	12.79	35.13
			Total		527

Cluster 03

The homesteads in this cluster (Fig. 3.1) form a tight arrangement on the northern slopes of a low hill (Fig. 3.5). The homesteads are located within 400m to water sources, and most (96%) fall between the 1460m and 1500m contour lines with 4% above 1540m (Table 3.9). This cluster consists of ten sub-clusters, made up of twenty-three homestead units (Table 3.10). A four homestead sub-cluster is the biggest unit and could be seen as the most aggregated, but no one sub-cluster stands out. However, the homesteads sizes of settlements on the western aspect are bigger than of those to the east (Fig. 3.5). I again calculate the general stock capacity of sub-clusters in order to make a comparison (Table 3.11).

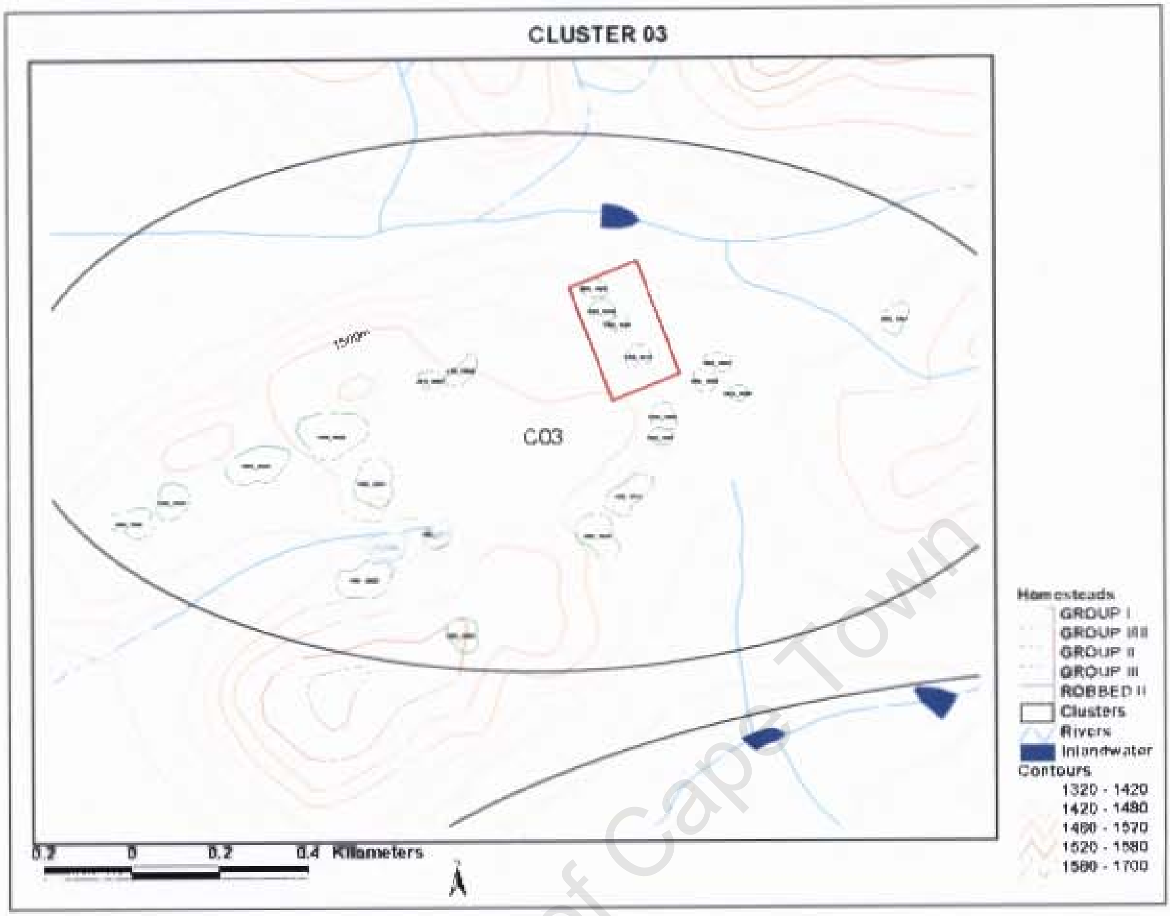

Figure 3.5: The distribution of homesteads in cluster 03. The red rectangle encloses the biggest sub-cluster.

Table 3.9: The altitudinal distribution of homesteads in cluster 03

Altitude(+)	N0.of Homesteads	
1460m	10	43.5%
1480m	7	30.4%
1500m	5	22%
1540m	1	4%
	23	

Table 3.10: Settlement aggregation within Cluster 03

Aggregation ranking	Sub-Clusters	Homesteads
1	2	2
2	4	8
3	3	9
4	1	4
TOTAL	**10**	**23**

Cluster 03 would have had an overall stock capacity of 725 cattle, with an average of 35 cattle for each kraal (Table 3.11). However, the four homestead sub-cluster (VRD_161 and 162) could have accommodated about 57 cattle. The average kraal is 9.1% of the homestead area for this sub-cluster, and is not too different from the cluster average of 12.0%. This, however, is small compared to VRD_153 (25%), which had a capacity of about 225 cattle, and has the largest ratio in this cluster. Although the number of cattle in VRD_153 is 31% of the cluster total, it seems that the stocking capacity in this cluster was distributed relatively evenly between homesteads and, as shown by the general homestead distribution, there is no one sub-cluster that is significantly dominant over others within this cluster and there is no obvious hierarchy.

Table 3.11: Analysis of stock capacity in C03, representing homesteads whose kraals were measurable. The highlighted homesteads make up a sub-cluster.

H-ID	HArea (m^2)	Kraal-ID	Kraal Area (m^2)	Kraal as a % of homestead	N0.of Cattle
VRD_153/1	4352.74	CE_287	1065.37	24.48	107
VRD_153/2	4560.22	CE_285	317.57		32
VRD_153/2	4560.22	CE_286	857.72		86
				25.77	
VRD_155/2	11268.07	CE_284	355.57	3.16	36

VRD_156/1	2821.85	CE_282	145.22	5.15	15
VRD_156/2	4261.59	CE_283	342	8.03	34
VRD_156/3	7118.85	CE_290	228	3.20	23
VRD_157/1	5357.87	CE_279	552.42		55
VRD_157/1	5357.87	CE_280	560.28		56
				20.77	
VRD_157/2	5968.63	CE_281	613.43	10.28	61
VRD_158/1	1412.97	CE_278	192.66	13.64	19
VRD_158/2	2384.84	CE_276	188.07		19
VRD_158/2	2384.84	CE_277	183.48		18
				15.58	
VRD_159/1	3814.16	CE_288	431.58		43
VRD_159/1	3814.16	CE_289	142.5		14
				15.05	
VRD_161/1	**1934.15**	**CE_272**	**104.85**	**5.42**	**10**
VRD_162/1	**1094.77**	**CE_273**	**144.82**	**13.23**	**14**
VRD_162/2	**1956.19**	**CE_274**	**178.24**	**9.11**	**18**
VRD_162/3	**1775.85**	**CE_275**	**154.65**	**8.71**	**15**
VRD_163/3	1830.39	CE_271	268.02	14.64	27
VRD_164/1	2690.65	CE_270	226.73	8.43	23
		21 Kraals	Average	12.04	34.52
			Total		725

Cluster 04

The settlements in this cluster are located on a number of hills towards the eastern end of the Group I distribution. There is no obvious pattern in aspect. The cluster is a very loose arrangement and it may be that the settlements around the eastern hill are distinct from those on the ridge to the west (Fig. 3.6). The small drainage that separates these, and in many other Group I clusters, may have been an important feature that marked boundaries within these larger clusters. The settlements are distributed between the 1620m and 1500m contours, with 77%, of the homesteads, above the 1540m contour, but with a few homesteads above 1600m, and none are located on hilltops (Table 3.12). They are all within 500m of small water sources (Fig. 3.6).

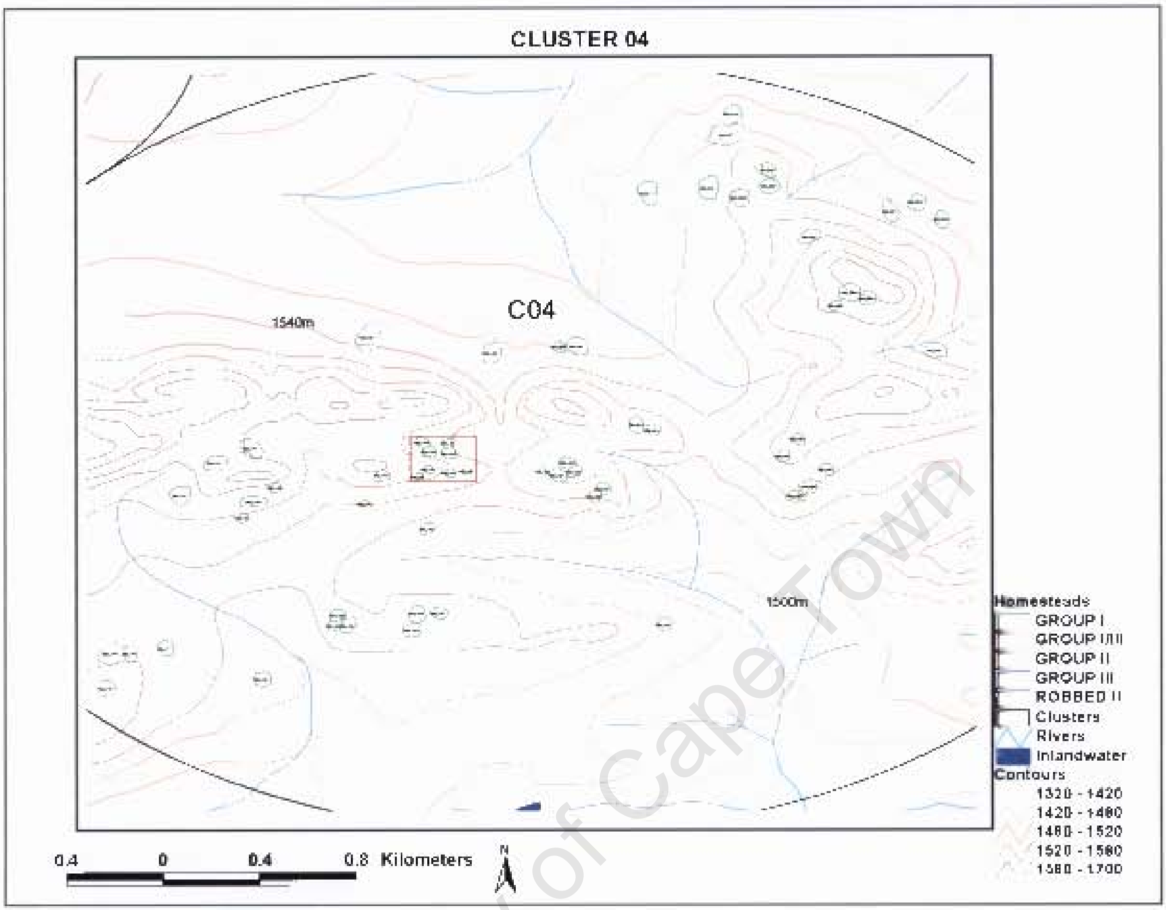

Figure 3.6: The distribution of settlements in cluster 04. The biggest settlement unit is marked.

Table 3.12: The altitudinal distribution of homesteads in Cluster 04

Altitude(+)	N0.of Homesteads	
1500m	8	13%
1520m	6	10%
1540m	13	21%
1560m	21	34%
1580m	9	15%
1600m	4	7%
	61	

Cluster 04 has a total of sixty-one homesteads. I grouped these into thirty sub-clusters, 50% being single homestead units. There are six sub-clusters each with two and three homestead units, two sub-clusters have four-homesteads and the biggest sub-cluster has eight-homestead units (Fig.3.6 and Table 3.13).

Table 3.13: the Settlement aggregation within Cluster 04

Aggregation ranking	Sub-Clusters	Homesteads
1	15	15
2	6	12
3	6	18
4	2	8
8	1	8
TOTAL	**30**	**61**

I measured 40 kraals with an estimated stock capacity of 1810 cattle. On average each kraal had 46 cattle and kraals averaged 18.5% of the total homestead space with a range between 6.4% (VRD_205/2) and 35.9% (VRD_206/1), which had a stock capacity of 153 cattle, which is about 8% of the cluster total. Even larger is VRD_172/2 with 182 cattle (10% of the total cattle in C04) and it is also a triple kraal homestead. Also of note are VRD_207/1, with102 cattle and VRD_198/1 with 113 cattle. In contrast, the estimate for the largest 8 homestead sub-cluster is 103 cattle with an average kraal to homestead area of 13.7% (Table 3.14).

Most of the sub-clusters in this cluster are single homestead units and they have lower cattle numbers. While the sub-clusters with a high percentage of kraal area to total homestead area have higher cattle numbers, none of them is particularly outstanding. An exception may be VRD_172 which has the highest number of cattle, distributed between a three kraal arrangement In contrast, the VRD 181 to 184 settlements are the most aggregated but estimates of cattle capacity are relatively low. It would be difficult to highlight any particular sub-cluster as dominant within this cluster.

Table 3.14: Analysis of stock capacity in C04, representing homesteads whose kraals were measurable. The highlighted homesteads make up the largest sub-cluster.

H-ID	**HArea (m^2)**	**Kraal-ID**	**Kraal Area (m^2)**	**Kraal as a % of homestead**	**N0.of Cattle**
VRD_170/1	3309	CE_451	237.55	7.18	24
VRD_171/1	2862.07	CE_181	594.32	20.77	59
VRD_172/2	6682.53	CE_182	660.16		66
VRD_172/2	6682.53	CE_266	1011.73		101
VRD_172/2	6682.53	CE_267	151.78		15
				27.29	
VRD_179/1	2064.41	CE_172	330.6	16.01	33
VRD_181/1	**852.88**	**CE_171**	**77.3**	**9.06**	**7**
VRD_182/1	**1113.95**	**CE_170**	**173.2**	**15.55**	**17**
VRD_183/1	**709.92**	**CE_169**	**120.65**	**16.99**	**12**
VRD_184/1	**1537.63**	**CE_165**	**139**		**14**
VRD_184/1	**1537.63**	**CE_166**	**31.87**		**3**
				11.11	
VRD_184/2	**2042.62**	**CE_167**	**137.21**	**6.72**	**14**
VRD_184/4	**1588.95**	**CE_168**	**360.15**	**22.67**	**36**
VRD_186/1	2824.17	CE_179	561.88	19.9	56
VRD_186/2	1937.7	CE_178			
VRD_186/3	2089.96	CE_180	589.48	28.21	59
VRD_187/1	2260.66	CE_175	215.95	9.55	22
VRD_187/2	3342.5	CE_176	1030.85	30.84	103
VRD_187/3	3250.19	CE_177	683.83	21.04	68
VRD_190/1	2456.07	CE_173	206.41		21
VRD_190/1	2456.07	CE_174	469.83		47
				27.53	
VRD_198/1	7996.36	CE_159	1125.02	14.07	113
VRD_200/1	4702.01	CE_155	110.83		11
VRD_200/1	4702.01	CE_156	301.27		30

VRD_200/1	4702.01	CE_157	55.31		5
VRD_200/1	4702.01	CE_158	90.15		9
				11.86	
VRD_202/1	1763.35	CE_160	203.73	11.55	20
VRD_202/2	1768.93	CE_161	504.95	28.55	50
VRD_203/1	2022.92	CE_164	269.38	13.32	27
VRD_203/2	2385.34	CE_162	535.42		54
VRD_203/2	2385.34	CE_163	133.42		13
				28.04	
VRD_205/1	3023.32	CE_150	723.7	23.94	72
VRD_205/2	4645.72	CE_151	297.76	6.41	30
VRD_206/1	4245.74	CE_152	1525.87	35.94	153
VRD_207/1	4011.89	CE_147	1020.4	25.43	102
VRD_207/2	3365.64	CE_148	702.63	20.88	70
VRD_207/3	2992	CE_149	618.5	20.67	62
VRD_208/1	3529.83	CE_265	583.01	16.52	58
VRD_210/1	5812.64	CE_154	921.2	15.85	92
VRD_211/1	5604.31	CE_153	620.27	11.07	62
		40 Kraals	Average	18.53	46.41
			Total		1810

Cluster 05

This cluster has thirty homesteads, mostly distributed above the 1500m contour line (Table 3.15). Most of the settlements are located around a gentle spur overlooking small drainages (Fig. 3.7). A small drainage may mark a boundary that separates the eastern, main part of the cluster, from the five most westerly settlements. There are fourteen sub-clusters in C05, and 50% of these are single homestead units, which are generally located at a higher altitude than other sub-clusters. The biggest sub-cluster, made-up of six-homestead units, is situated immediately to the east of other three and four homestead clusters and although the distances are small, this area seems to be optimal for settlement (Fig. 3.6 and Table 3.16). On the basis of aggregation these six homesteads (VRD_50/3, 50/4, 50/5, 50/6, 50/7, and VRD_51/1) stand out as dominant. This can be checked through the estimate of cattle stocking capacity.

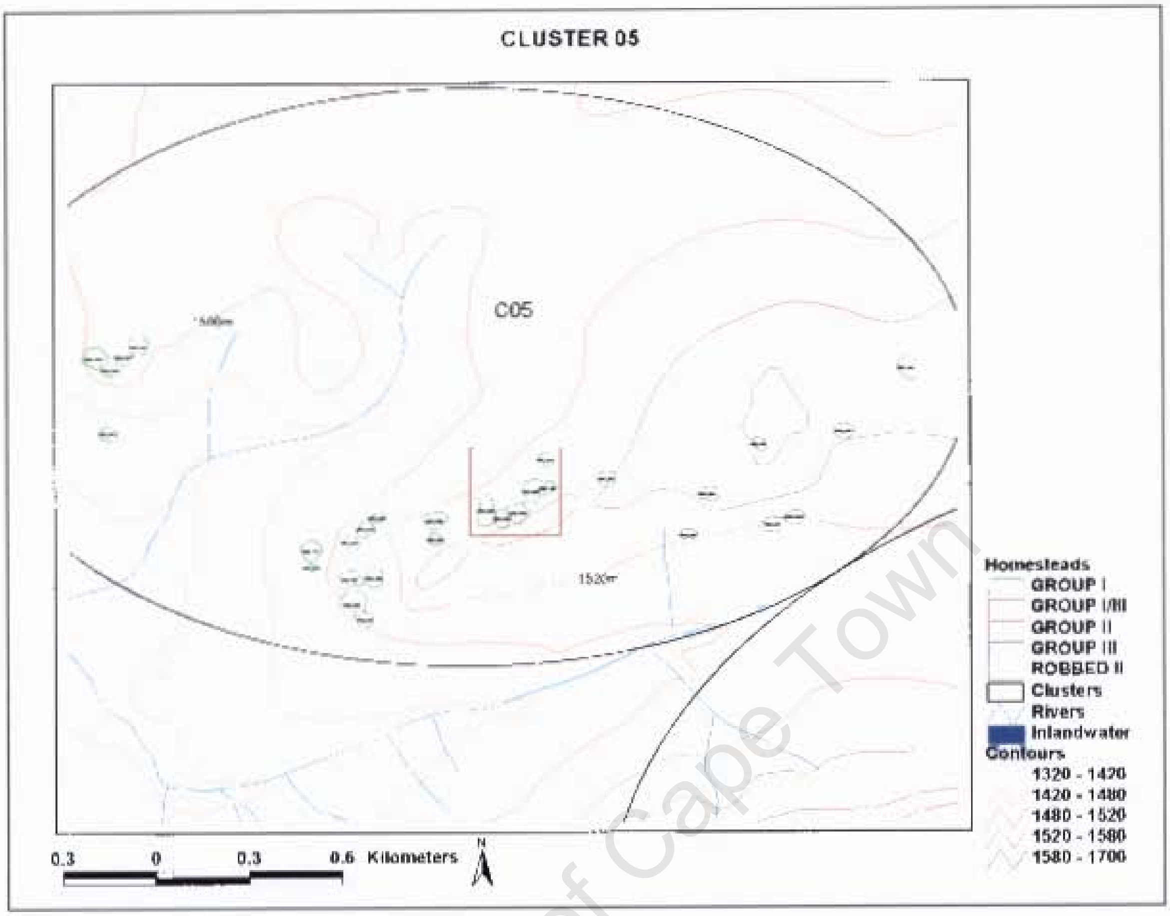

Figure 3.7: Cluster 05 homestead distribution.

Table 3.15: The altitudinal distribution of homesteads in Cluster 05

Altitude(+)	NO. of Homesteads	
1460m	1	3%
1480m	2	7%
1500m	12	40%
1520m	11	37%
1540m	3	10%
1560m	1	3%
	30	

Table 3.16: Settlement aggregation within Cluster 05

Settlement Units	Sub-Clusters	Homesteads
1	7	7
2	3	6
3	1	3
4	2	8
6	1	6
TOTAL	**14**	**30**

Cluster 05 has 26 kraals with an estimated capacity of 1043 cattle. On average each kraal held 42 cattle and kraals averaged 18.5% of the total homestead area, with a range between 5.0% (VRD_50/3) and 36.0% (VRD_49/3). The largest sub-cluster has a capacity of 229 cattle with the average kraal-homestead proportion at 18.4% (Table 3.17). Within this sub-cluster, VRD_50/6 with 105 cattle has the highest stock capacity in cluster C05, and the kraal takes up about 33% of homestead space. The spatially adjacent VRD_49/1-4 sub-cluster also has high stock capacity and kraal/homestead ratios. Although VRD_47/1 is classified as a single homestead sub-cluster, it is not surprising, given its close proximity to the VRD 47 and 49 sub-clusters, that both the estimated stock capacity (98 cattle) and the kraal/homestead ratio (32%) is high.

Based on these calculations the VRD_50/3, 5, 6, 7 and VRD 51/1 sub-cluster is relatively aggregated with a large estimated cattle capacity, and this sub-cluster physically dominates C05. Most of the sub-clusters in C05 are single homestead units (50% of sub-cluster frequency). It is also clear that sub-clusters with a high kraal-homestead ratio do not necessarily have high cattle numbers.

Table 3.17: Analysis of stock capacity in C05, representing homesteads whose kraals were measurable.

H-ID	HArea (m^2)	Kraal-ID	Kraal Area (m^2)	Kraal as a % of homestead	N0.of Cattle
VRD_45/1	3465.48	CE_38	418.95	12.09	42
VRD_45/2	2650.85	CE_39	323.41	12.20	32
VRD_45/3	1828.91	CE_205	591.76	32.36	59
VRD_45/4	1857.37	CE_206	283.9	15.29	28
VRD_46/1	1950.99	CE_40	333.27	17.08	33
VRD_47/1	3018.44	CE_42	979.16	32.44	98
VRD_48/1	1566.6	CE_262	123.61	7.89	12
VRD_48/2	1901.08	CE_263	394.19	20.74	39
VRD_48/3	1005.58	CE_264			
VRD_49/1	1705.75	CE_43	423.01	24.80	42
VRD_49/2	5073.14	CE_45	804.67	15.86	80
VRD_49/3	2531.6	CE_46	910.04	35.95	91
VRD_49/4	3147.74	CE_44	414.48	13.17	41
VRD_50/1	1293.52	CE_261	127.24	9.84	13
VRD_50/3	**4150.76**	**CE_260**	**207.89**	**5.01**	**21**
VRD_50/5	**2850.72**	**CE_258**	**122**		**12**
VRD_50/5	**2850.72**	**CE_259**	**464.73**		**46**
				20.58	
VRD_50/6	**3167.42**	**CE_257**	**1050.84**	**33.18**	**105**
VRD_50/7	**1137.82**	**CE_256**	**138.83**	**12.20**	**14**
VRD_51/1	**1503.75**	**CE_47**	**314.82**	**20.94**	**31**
VRD_52/1	2076.81	CE_48	237.52	11.44	24
VRD_53/1	2016.22	CE_49	191.3	9.49	19
VRD_54/1	2889.71	CE_50	768.19	26.58	77
VRD_54/2	2083.87	CE_51	245.5	11.78	25
VRD_56/1	2291.27	CE_255	248.86	10.86	25
VRD_57/1	1044.76	CE_254	341.3	32.67	34
		26 Kraals	Average	18.52	41.72
			Total		1043

Cluster 06

This cluster has twenty-eight homesteads, mostly distributed below the 1500m contour line (five homesteads are above 1500m) (Table 3.18). The homesteads are generally located on gentle slopes in close proximity to small drainages. There are sixteen sub-clusters in C06, and 50% of these are single homestead units. These are mostly located in the north-east and are separated by a drainage from a relatively dense series of sub-clusters (VRD 216, 217, 218, 219, 220; Fig. 3.8). The highest aggregation index here is three (Table 3.19) but no one sub-cluster stands out. Although these homesteads are given sub-cluster status, as a whole, they clearly stand out within this cluster. This central series of sub-clusters are in turn, separated by another drainage from another three unit sub-cluster further to the west (VRD 221; Fig. 3.8).

Table 3.18: The altitudinal distribution of homesteads in Cluster 06.

Altitude(+)	N0.of Homesteads	
1420m	2	7%
1440m	4	14%
1460m	3	11%
1480m	14	50%
1500m	5	18%
	28	

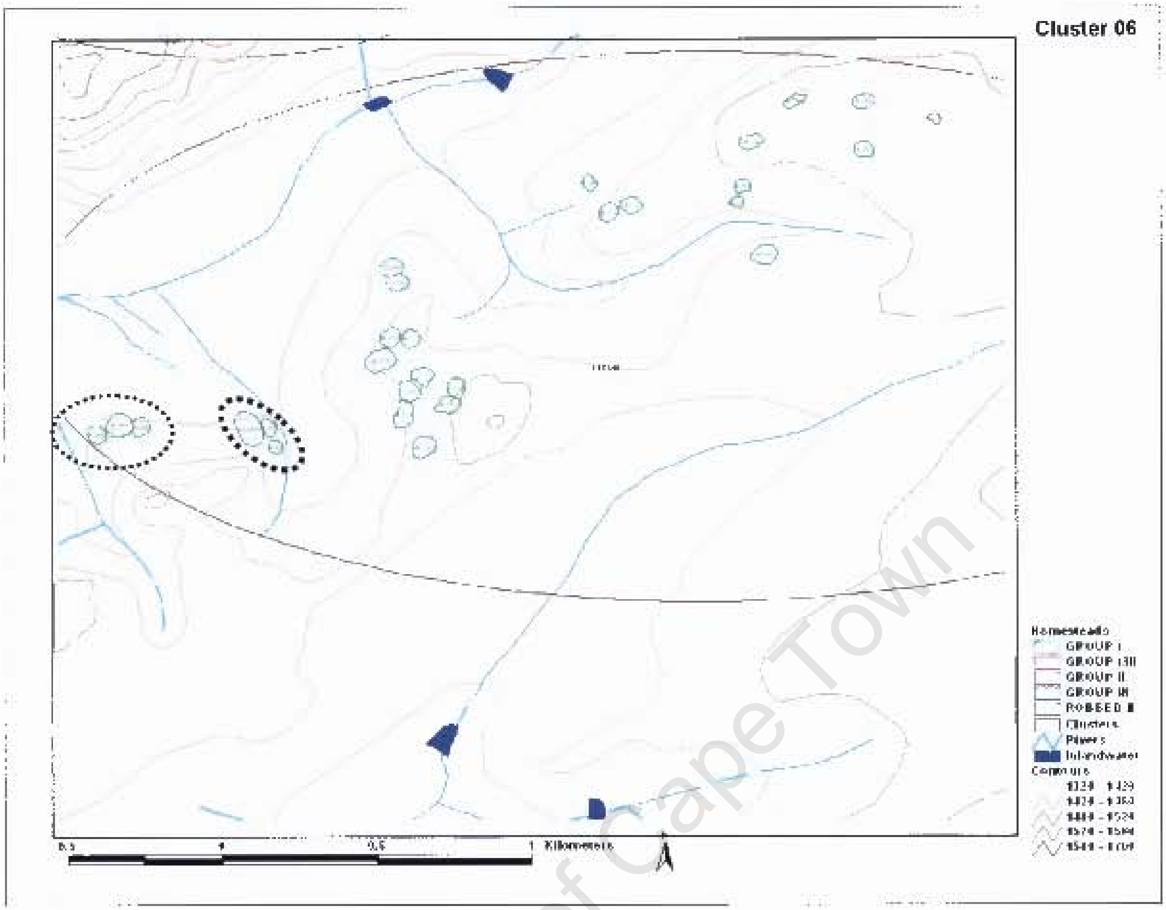

Figure 3.8: The homestead distribution in C06. The dotted oval highlights the sub-cluster with the highest number of cattle.

Table 3.19: Settlement aggregation within Cluster 06

Aggregation ranking	Sub-Clusters	Homesteads
1	8	8
2	4	8
3	4	12
TOTAL	**16**	**28**

There are 33 kraals in C06 with an estimated capacity of 1162 cattle. On average each kraal held 35 cattle and kraals averaged 17.5% of the total homestead area, with a range between 6.6% (VRD_222/2) and 27.3% (VRD_221/3). The VRD 221 sub-cluster stands out with a combined estimate of 213 cattle (VRD

221/2 145 cattle which is 12.5% of the cluster total, VRD_221/3 50 cattle). None of the centrally located sub-clusters exceed this total, but would if, as indicated above, the VRD 216 to 220 sub-clusters were seen as a loosely aggregated whole. Additionally, VRD 218/2 and 3 could not be measured. There are relatively high cattle estimates for single homestead units elsewhere in the cluster, i.e. VRD_168/1 with 84 cattle and VRD_218/1 with 87 cattle. Although VRD_165 appeared to have five kraals the cattle estimate is only 40 and the kraal/homestead ratio is 15.9%. On the basis of cattle numbers VRD_221 appears to be the dominant sub-cluster. On the basis of aggregation ranking, however, no particularly large sub-cluster is evident, although the central series of sub-clusters that include 3, three homestead units does stand out.

Table 3.20: Analysis of stock capacity in C06, representing homesteads whose kraals were measurable. Each shade of grey highlights homesteads in a sub-cluster.

H-ID	HArea (m^2)	Kraal-ID	Kraal Area (m^2)	Kraal as a % of homestead	N0.of Cattle
VRD_165/1	2595.51	CE_291	101.1		10
VRD_165/1	2595.51	CE_292	51.96		5
VRD_165/1	2595.51	CE_293	51.4		5
VRD_165/1	2595.51	CE_294	102.6		10
VRD_165/1	2595.51	CE_295	71.85		7
VRD_165/1	2595.51	CE_296	32.66		3
				15.86	
VRD_166/1	2417.03	CE_199	625.98	25.90	63
VRD_167/1	2386.46	CE_200	406.16	17.02	41
VRD_168/1		CE_198	835.65		84
VRD_169/1	1927.4	CE_201	220.71	11.45	22
VRD_215/1	2542.89	CE_297	263.78	10.37	26
VRD_216/1	2686.03	CE_308	244.39		24
VRD_216/1	2686.03	CE_309	205.87		21
				16.76	
VRD_217/1	2320.89	CE_307	521.37	22.46	52
VRD_217/2	2610.15	CE_310	320.58	12.28	32

VRD_217/3	5140.55	CE_314	378.47	7.36	38
VRD_218/1	**3314.34**	**CE_311**	**869.65**	**26.24**	**87**
VRD_219/1	3039.63	CE_305	507.04	16.68	51
VRD_219/2	2772.2	CE_306	378.43	13.65	38
VRD_220/1	3821.58	CE_304	558.43		56
VRD_220/1	3821.58	CE_315	681.5		68
				32.45	
VRD_221/1	1363.42	CE_316	184.79	13.55	18
VRD_221/2	6354.74	CE_313	1454.28	22.88	145
VRD_221/3	1837.27	CE_312	501.88	27.32	50
VRD_222/1	**2543.81**	**CE_317**	**210.83**	**8.29**	**21**
VRD_222/2	**4577.81**	**CE_318**	**300.69**	**6.57**	**30**
VRD_222/3	**2407.1**	**CE_319**	**492.95**	**20.48**	**49**
VRD_242/1	1521	CE_302	231.19		23
VRD_242/1	1521	CE_303	62.45		6
				19.31	
VRD_243/1	1046.48	CE_298	244.74	23.39	24
VRD_243/2	1693.37	CE_299	257.95	15.23	26
VRD_244/1	3602.04	CE_300	218.74		22
VRD_244/1	3602.04	CE_301	50.75		5
				7.48	
		33 Kraals	Average	17.52	35.21
			Total		1162

Cluster 07

This is the most northerly Group I cluster and is about 12km from the Vaal River (Fig. 3.1). It is also the smallest cluster comprising only seven homesteads that make up three 2 homestead sub-clusters and a single homestead (Fig. 3.9 and Table 3.21). The homesteads are distributed around a small drainage up to 1540m (Table 3.22). Due to the small size of this cluster, there is no obvious hierarchy between settlements. Nothing stands out in the estimates of cattle numbers and the kraal/homestead ratios are well within the range so far seen for the other clusters (Table 3.23).

Table 3.21: Settlement aggregation within Cluster 07

Aggregation ranking	Sub-Clusters	Homesteads
1	1	1
2	3	6
TOTAL	**4**	**7**

Table 3.22: The altitudinal distribution of homesteads in Cluster 07

Altitude(+)	N0.of Homesteads	
1520m	3	43%
1540m	4	57%
	7	

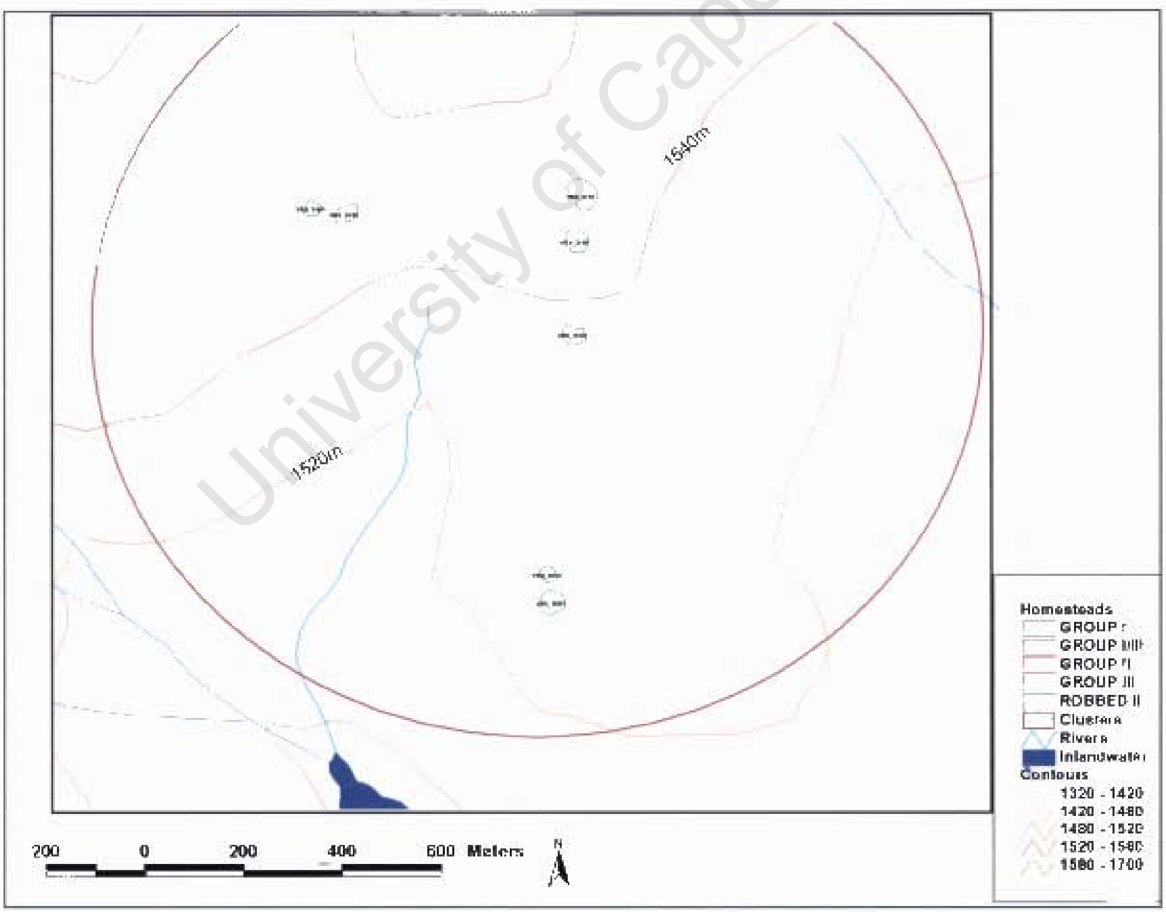

Figure 3.9: The distribution of Group I homesteads in C07.

Table 3.23: Analysis of stock capacity in C07, representing homesteads whose kraals were measurable.

H-ID	HArea (m^2)	Kraal-ID	Kraal Area (m^2)	Kraal as a % of homestead	N0.of Cattle
VRD_315/1	1211.29	CE_25	203.34	16.79	20
VRD_316/1	1499.9	CE_23	210.26		21
VRD_316/1	1499.9	CE_24	55.4		6
				17.71	
VRD_317/1	2437.61	CE_22	390.39		39
VRD_317/1	2437.61	CE_253	130.72		13
				21.38	
VRD_320/1	1709.62	CE_26	202.01	11.82	20
		6 Kraals	Average	16.92	20
			Total		119

Cluster 08

Cluster 08 contains both Group I and Group II settlement types. However, the focus here is on Group I settlements. In this case the definition of the cluster boundary may be seen as arbitrary, especially on the eastern edge of C08 and the western edge of C05 (Fig. 3.1 and 3.10). Here sub-cluster VRD 44/1-8 is included in C08 because it is closer to other C08 homesteads than those in C05. Additionally, although it is separated from the other C08 sub-clusters by a small drainage, it is nevertheless orientated in their direction.

Group I homesteads run in a rough north to south direction across the western edge of the hill to the east of the cluster. Most of the homesteads are located on the southern aspect of this hill, with an altitude range between 1440m to +1540m (Fig. 3.9 and Table 3.24). The twenty-nine Group I homesteads in this cluster are grouped into 9 sub-clusters, consisting of four single homesteads, 2 two-homestead units, 3 three-homestead units, 1 four-homestead unit and the largest is 1 eight-homestead unit (VRD 44/1-8)(Table 3.25) and this is clearly dominant in the sense of complex set of related kin.

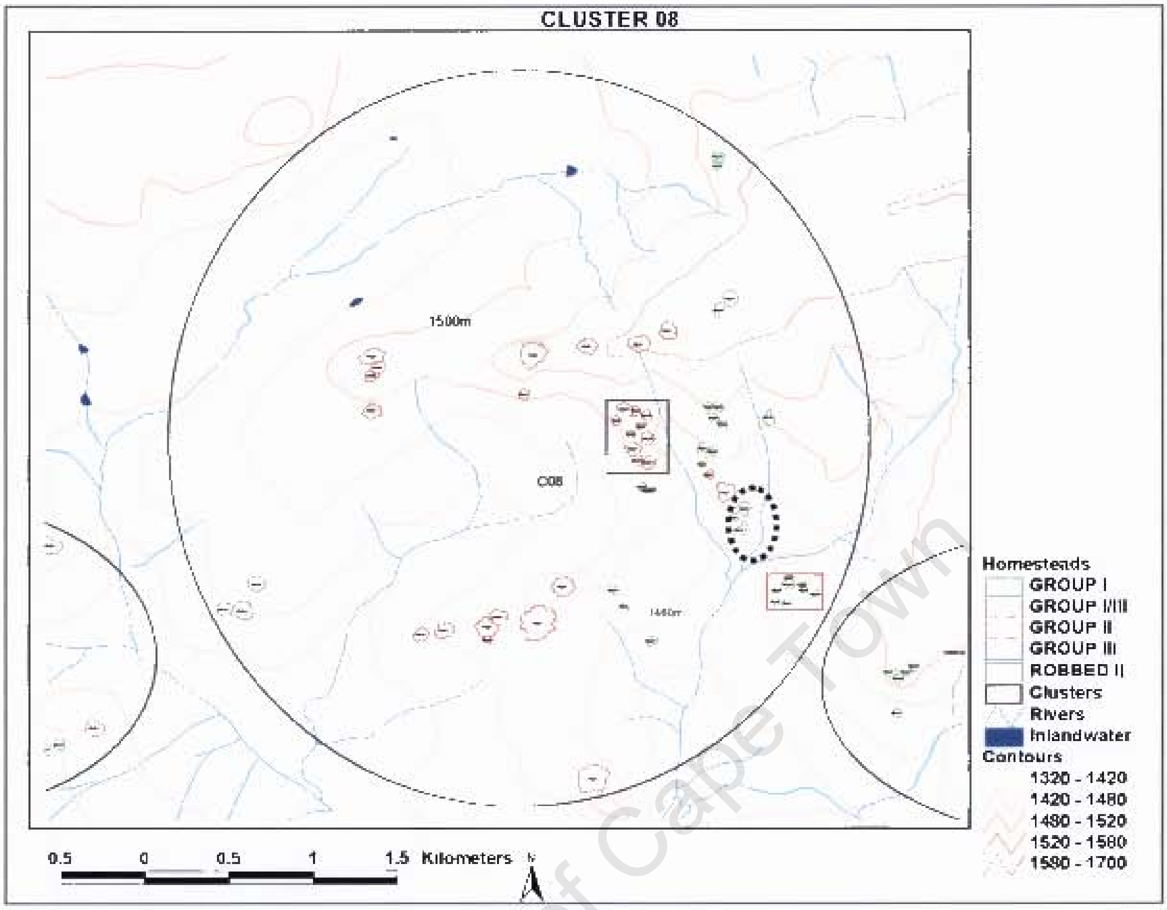

Figure 3.10: Group I homestead distribution within C08. The red box encloses the biggest sub-cluster and the black circle highlights the sub-cluster with highest number of cattle.

Table 3.24: The altitudinal distribution of homesteads in C08

Altitude(+)	N0.of Homesteads	
1440m	3	5%
1460m	18	30%
1480m	12	20%
1500m	19	31%
1520m	5	8%
1540m	4	7%
	61	

Table 3.25: Settlement aggregation within Cluster 08 Group I settlements

Aggregation ranking	Sub-Clusters	Homesteads
1	4	4
2	2	4
3	3	9
4	1	4
8	1	8
TOTAL	**11**	**29**

Cluster 08 has 33 kraals associated with Group I settlements. These have a total stocking capacity of 1041 cattle. On average each of these kraals can accommodate about 32 cattle and kraals average about 17.5% of homestead area. This ranged between 7.1% (VRD_44/6) and 30.5% (VRD_44/8).

The largest sub-cluster is VRD_44 with eight homestead units (Tables 3.25 and 3.26). It has an estimated capacity of 124 cattle at an average kraal area of 13.5% of homestead space. However, this number would be higher if the central enclosure in VRD_44/3 was measurable. Sub-cluster VRD 44/8 has two kraals, but despite a high kraal to homestead ratio of 30.5%, this is a small homestead and consequently the estimated stock capacity is only 27 cattle.
Based on these calculations VRD_44 has a relatively high number of cattle, but cattle capacity of individual homesteads within this sub-cluster are relatively low.
Other homesteads with high kraal percentage usage per homestead area, but with relatively small cattle number are VRD_36/2 and VRD_36/4(Table 3.26).

In comparison, there are smaller aggregations with relatively large cattle numbers. VRD_312/1, for example, has a stock capacity of 144 cattle, and VRD_42/2 has 126 cattle while kraal/homestead ratios are 25.5% and 27.9% respectively. Furthermore, another sub-cluster with high stock capacity is a three-homestead unit (VRD_42/1, 42/2 and 43/1), with 176 cattle (Fig. 3.10).

In summary, the VRD 44 sub-cluster stands out because of its degree of aggregation but the estimated cattle numbers are not particularly high. If aggregation and the more complex kin network this implies means precedence within a cluster then VRD 44 stands out. Smaller aggregations, however, had higher potential cattle numbers and it is not obvious which sub-cluster had a possible dominance within this cluster

Table 3.26: Analysis of stock capacity in C08, representing homesteads whose kraals were measurable

H-ID	HArea (m^2)	Kraal-ID	Kraal Area (m^2)	Kraal as a % of homestead	N0.of Cattle
VRD_25/1	2365.08	CE_31	292.96	12.39	29
VRD_26/1	1513.37	CE_32	233.39	15.42	23
VRD_312/1	5628.29	CE_18	1437.58	25.54	144
VRD_314/1	3681.19	CE_20	343.72		34
VRD_314/1	3681.19	CE_21	124.3		12
				12.71	
VRD_314/2	1316.69	CE_19	169.15	12.85	17
VRD_322/1	2933.68	CE_33	508.17	17.32	51
VRD_337/1	1887.5	CE_424	309.51	16.40	31
VRD_36/1	1690.69	CE_3	233.78	13.83	23
VRD_36/2	1783.54	CE_4	350.7		35
VRD_36/2	1783.54	CE_422	173.9		17
				29.41	
VRD_36/3	2487.07	CE_1	680.59	27.37	68
VRD_36/4	1860.61	CE_2	316.97	17.04	32
VRD_37/1	2704.03	CE_11	208.32		21
VRD_37/1	2704.03	CE_425	481.25		48
				25.50	
VRD_38/1	727.72	CE_5	142.3	19.55	14
VRD_38/2	805.21	CE_6	178.95	22.22	18
VRD_38/3	1404.28	CE_7	234.32	16.69	23
VRD_39/1	1016.34	CE_13	157.77	15.52	16
VRD_42/1	1504.95	CE_15	197.48	13.12	20
VRD_42/2	4513.32	CE_423	1257.27	27.86	126

VRD_43/1	4175.34	CE_16	297.44	7.12	30
VRD_44/1	1599.7	CE_34	271.18	16.95	27
VRD_44/2	1145.41	CE_36	106.2	9.27	11
VRD_44/4	2909.67	CE_35	230.63	7.93	23
VRD_44/5	1082.76	CE_448	144.67	13.36	14
VRD_44/6	1570.9	CE_204	110.97	7.06	11
VRD_44/7	681.29	CE_37	113.4	16.64	11
VRD_44/8	899.94	CE_449	119.76		12
VRD_44/8	899.94	CE_450	154.74		15
				30.50	
VRD_75/1	3737.86	CE_8	210.76		21
VRD_75/1	3737.86	CE_9	198.04		20
VRD_75/1	3737.86	CE_10	442.55		44
				22.78	
		33 Kraals	Average	17.49	31.55
			Total		1041

Cluster 09

This cluster has sixteen homesteads, fourteen above the 1500m contour line, and two homesteads below. The homesteads are located on gentle slopes associated with three different hills, each of which is separated by a small drainage (Fig. 3.11 and Table 3.27). There are seven sub-clusters in C09, made up of single homesteads through to one four-homestead sub-cluster (Table 3.28). Although the distance criterion defines VRD 238 and 239 as a sub-cluster, in this case one could also include the other homesteads close by (i.e. VRD 235, 236 and 237). These most northerly homesteads in C09 stand out in terms of their density but there is no obvious dominant sub-cluster.

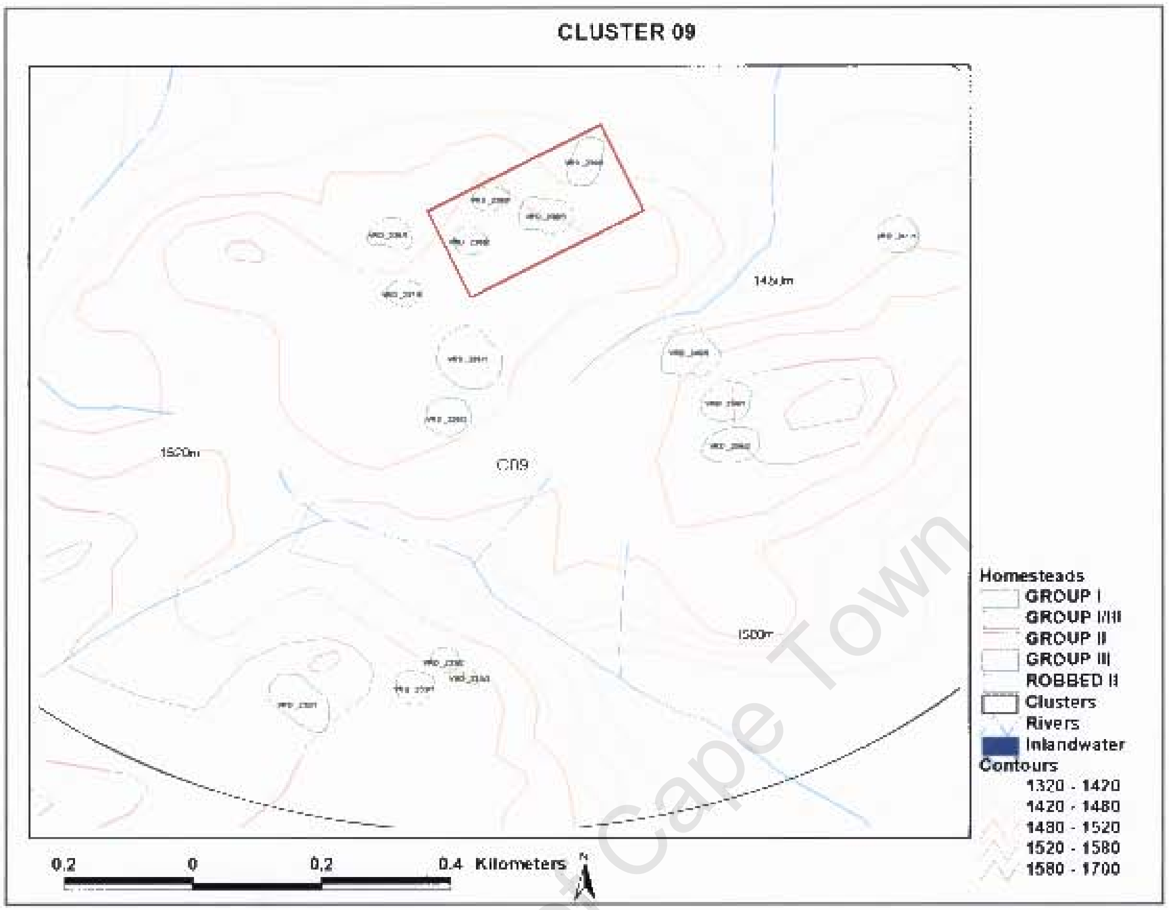

Figure 3.11: Cluster 09 Group I homesteads.

Table 3.27: The altitudinal distribution of homesteads in Cluster 09

Altitude(+)	N0.of Homesteads	
1480m	2	13%
1500m	3	19%
1520m	10	63%
1540m	1	6%
	16	

Table 3.28: Settlement aggregation within Cluster 09

Aggregation ranking	Sub-Clusters	Homesteads
1	2	2
2	2	4
3	2	6
4	1	4
TOTAL	**7**	**16**

Cluster 09 has 17 kraals with an estimated capacity of about 485 cattle. On average kraals accommodated nearly 29 animals with kraals averaging about 11.6% of the total homestead area with a range between 3.1% (VRD_239/1 - 9 cattle) and 25.4% (VRD_237/1 – 40 cattle). The highest stocking capacity of 66 cattle is homestead VRD_235/1 (Table 3.29). The estimate for the four-homestead sub-cluster (VRD_238/1, 238/2, 238/3 and VRD_239/1), is 78 cattle (average kraal/homestead ration of 9.3%). VRD_238/2 could not be measured but if so stock capacity would not rise significantly. Therefore, because the kraal-homestead area percentage and cattle numbers are all close to the average for most homesteads it is reasonable to say that there is no particularly dominating sub-cluster.

Table 3.29: Analysis of stock capacity in C09, representing homesteads whose kraals were measurable.

H-ID	HArea (m^2)	Kraal-ID	Kraal Area (m^2)	Kraal as a % of homestead	N0.of Cattle
VRD_232/1		CE_411			
VRD_233/1	2176.78	CE_412	219.29	10.07	22
VRD_233/2	1139.61	CE_414	200.35	17.58	20
VRD_233/3	N/A	CE_413	276.91		28
VRD_234/1	3457	CE_407	332.12	9.61	33
VRD_234/2	3476.59	CE_408	534.9	15.39	53
VRD_235/1	6542.07	CE_403	663.29	10.14	66

VRD_235/2	2990.52	CE_404	214.04	7.16	21
VRD_236/1	2253.19	CE_401	218.62	9.70	22
VRD_237/1	1572.61	CE_402	399.33	25.39	40
VRD_238/1	**1545.97**	**CE_400**	**121.51**	**7.86**	**12**
VRD_238/3	**3363.06**	**CE_398**	**109.21**		**11**
VRD_238/3	**3363.06**	**CE_399**	**458.09**		**46**
				16.87	
VRD_239/1	**2865.97**	**CE_410**	**87.65**	**3.06**	**9**
VRD_240/1	4720.8	CE_405	392.83		39
VRD_240/1	4720.8	CE_406	156.51		16
				11.64	
VRD_241/1	2572.67	CE_409	176.7	6.87	18
		17 kraals	Average	11.64	28.5
			Total		484.5

Cluster 11

Like C08, cluster 11 (Fig. 3.1) contains both Group I and Group II settlement types but the focus is still on Group I settlements. These are distributed in a discontinuous northeast to southwest line along a low outer arc of hills on the north-western edge of the dome and comprise a loose trail of ten rather isolated homesteads that can hardly be called a cluster (Fig. 3.12 and Table 3.30). The low density of Group I homesteads in this outer arc is not surprising, given that the Group I preference, as observed in Chapter 2, tended to be in the more rugged ridges of the Dome.

There are seven sub-clusters, which are mostly single homesteads, (50%) one two-homestead unit, and one three-homestead unit (Table 3.31). Given the doubtful cluster status of C011 any discussion of sub-cluster precedence becomes spurious. Additionally, the overall estimate of stock capacity is low (98 cattle), and in keeping with the below average kraal to homestead calculations given in Table 3.32. On all counts, these Group I settlements are marginal and on the edge of the overall Group I distribution.

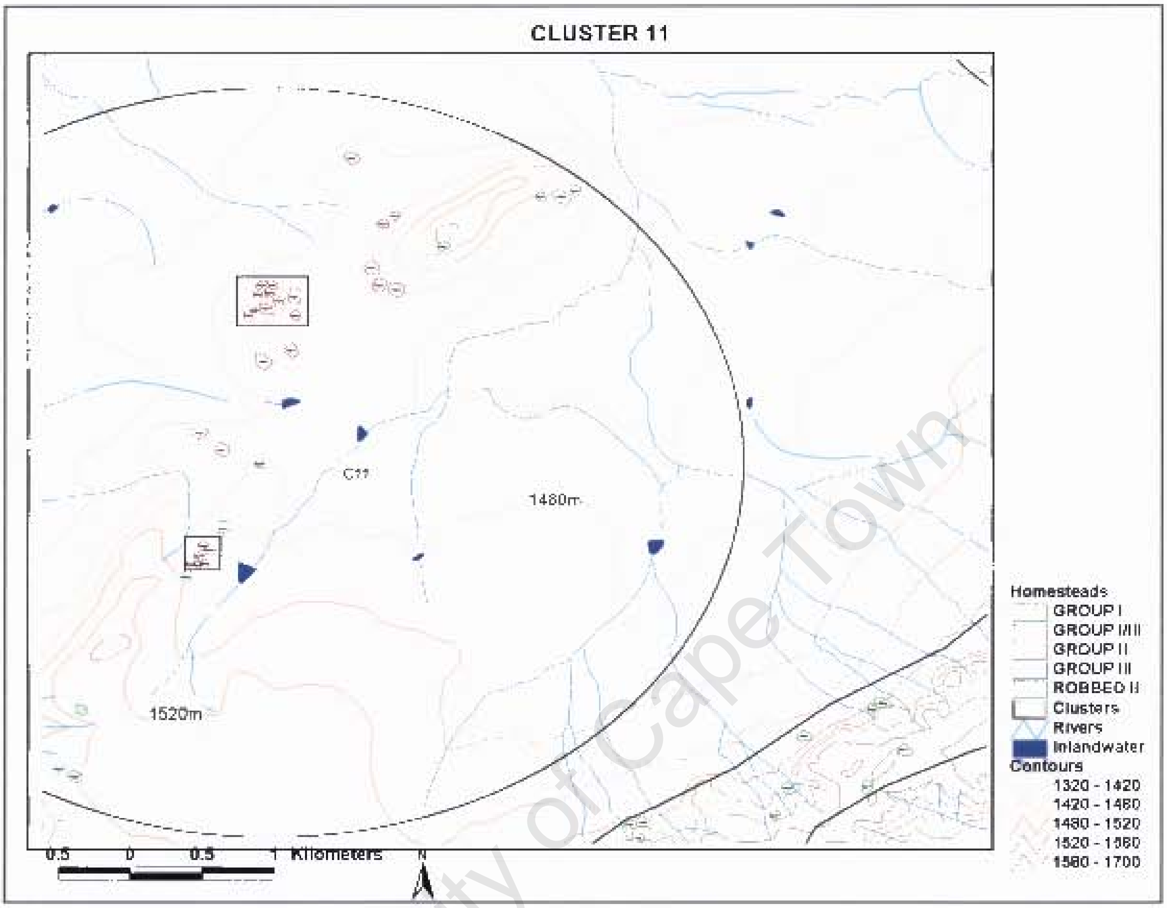

Figure 3.12: Homesteads distribution in Cluster 11 (focus is on Group I).

Table 3.30: The altitudinal distribution of homesteads in Cluster 11

Altitude(+)	N0.of Homesteads	
1460m	13	39%
1480m	19	53%
1500m	2	6%
1520m	2	6%
	36	

Table 3.31: Settlement aggregation within Cluster 11

Settlement Units	Sub-Clusters	Homesteads
1	5	5
2	1	2
3	1	3
TOTAL	**7**	**10**

Table 3.32: Analysis of stock capacity in C11, representing homesteads whose kraals were measurable.

H-ID	HArea (m^2)	Kraal-ID	Kraal Area (m^2)	Kraal as a % of homestead	N0.of Cattle
VRD_332/1	2266.92	CE_426	96.78	4.27	10
VRD_60/1	5150.98	CE_427	195.03		20
VRD_60/1	5150.98	CE_428	78.36		8
				5.31	
VRD_61/1	3773.99	CE_429	203.62	5.40	20
VRD_72/1	3161.91	CE_452	395.89	12.52	40
		5 Kraals	Average	6.87	19.6
			Total		98

Cluster 12

Cluster 12 (Fig. 3.1) requires some preliminary discussion because It is the biggest cluster. It is made up of one hundred twenty-eight Group I homesteads, eight Group III and four Group I/III homesteads. It is defined by a common preference for homesteads to be located linearly along the basal contours of the long stretch of steep ridges that mark the north-western edge of the impact structure. They range in altitude between 1440m and 1620m (Table 3.33). While settlement preference is consistent, this cluster is much larger than those discussed so far. Whereas, there are reasonable grounds for discussing the previous clusters in terms of social or political units, C12 is clearly too big. In order for the discussion of C12 to be consistent with the previous clusters I grouped the homesteads into smaller clusters. These were defined by clear gaps between settlements along the northern aspect of the outer dome ridge and formed four sub-groups: A, B, C and D (Fig. 3.13). The aim here is still to examine settlements within each sub-group, in order to identify prominent sub-clusters on the basis of homestead aggregation and cattle stocking capacity.

Table 3.33: The altitudinal distribution of all the homesteads in Cluster 12

Altitude(+)	**N0.of Homesteads**	
1400m	4	3%
1420m	11	8%
1440m	5	4%
1460m	11	8%
1480m	4	3%
1500m	16	11%
1520m	17	12%
1540m	24	17%
1560m	19	14%
1580m	17	12%
1600m	9	6%
1620m	3	2%
	140	

Generally, the 128 C12 homesteads, are found mostly above the 1500m contour line and are distributed in a distinctive linear pattern, "like a beaded string" (Taylor, 1979:12). They are mostly located on the slope-break, overlooking the flatter land immediately to the north. The aerial photos show that historic and current ploughing stops just short of these homesteads and indicate that they were optimally situated to take agricultural advantage of the deeper soils away from the hills.

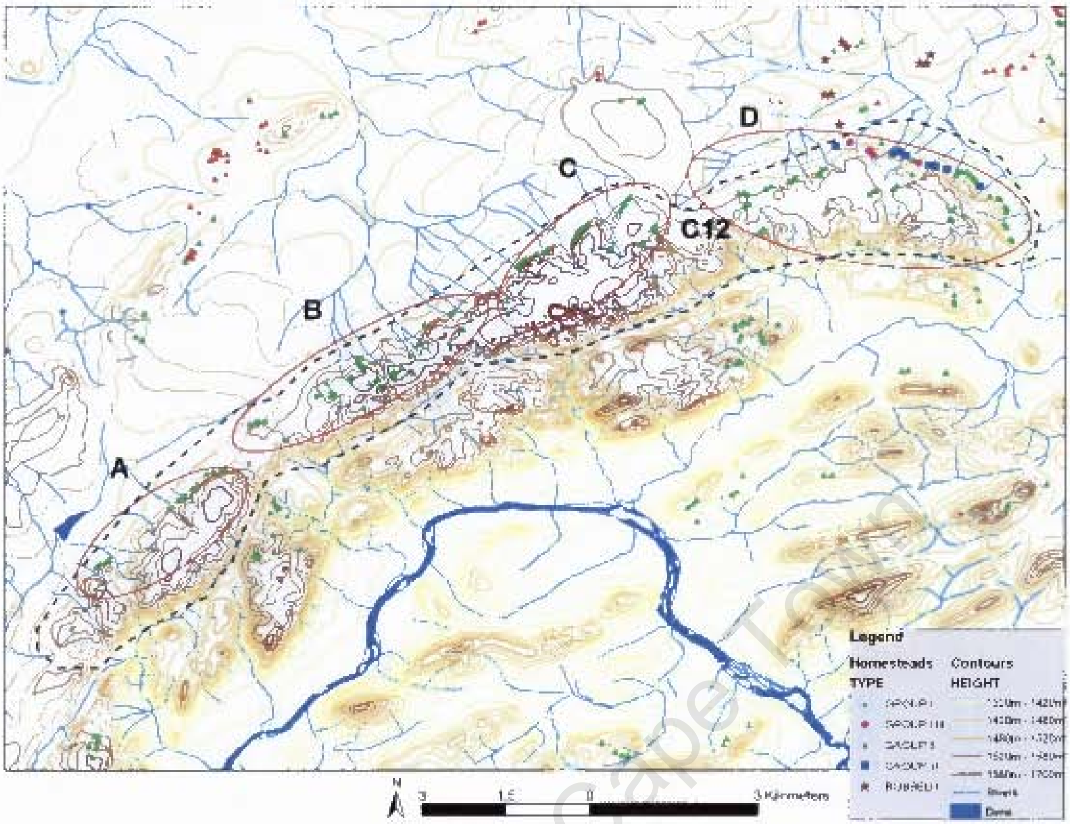

Figure 3.13: Cluster 12 Group I settlement distribution showing the cluster outline and the sub-groups A, B, C and D.

Twenty-three Group I sub-clusters are single homestead units, eighteen are two-homesteads units, nine are three-homestead units and four settlements are made up of four-homestead units. There is one settlement consisting of five-homestead units, and two settlements consist of six-homestead units. Finally, the largest aggregation is made up of seven-homestead units (Fig. 3.13 and Table 3.34).

Table 3.34: Settlement aggregation within Cluster 12.

Aggregation ranking	Sub-Clusters	Homesteads
1	23	23
2	19	38

3	9	27
4	4	16
5	1	5
6	2	12
7	1	7
TOTAL	**59**	**128**

C12A

This sub-group (Fig. 3.14) has fourteen homesteads, mostly distributed above 1500m, and four homesteads below 1500m. As noted, the location of these settlements relative to modern agriculture, suggests that they were located to exploit these arable soils (Fig. 3.15). Homesteads are located at the north eastern ends of hills. Although speculative, this choice might suggest that immediate access to the lower ground between hills allowed easier and quicker routes south eastwards into the dome. The small drainages running off the ridge towards the north-west provide natural boundaries between sub-clusters.

There are five sub-clusters in C12A, that range between one single homestead sub-cluster to two, four-homestead sub-clusters (Table 3.35).

Table 3.35: Settlement aggregation within Cluster 12, sub-group A.

Aggregation ranking	**Sub-Clusters**	**Homesteads**
1	1	1
2	1	2
3	1	3
4	2	8
Total	**5**	**14**

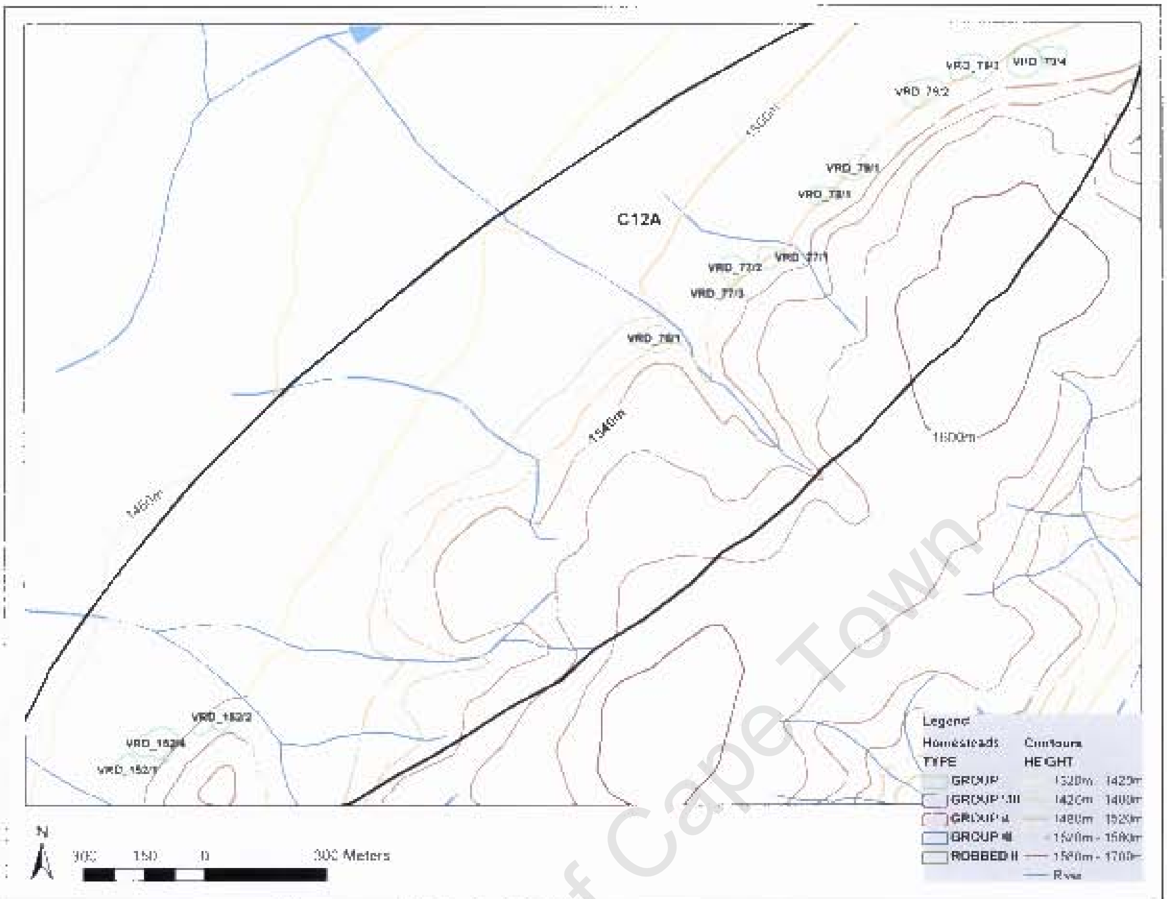

Figure 3.14: Group I homestead distribution of cluster 12, sub-group A.

C12A (Fig. 3.14) has 13 kraals with an estimated total stock capacity of about 558 cattle. On average each kraal held nearly 43 cattle. Kraals are on average 14.5% of homestead area with a range from 3.0% (VRD_78/1) with 6 cattle, to 22.9% (VRD_77/3) with 48 cattle (Table 3.36). The highest stocking capacity of 99 cattle is in homestead VRD_79/3. The two four-homestead sub-clusters are VRD_79 and VRD_152 with 184 and 161 cattle respectively. Based on these calculations, sub-cluster VRD_79 is dominant, on the basis of sub-cluster complexity and estimated stock holdings.

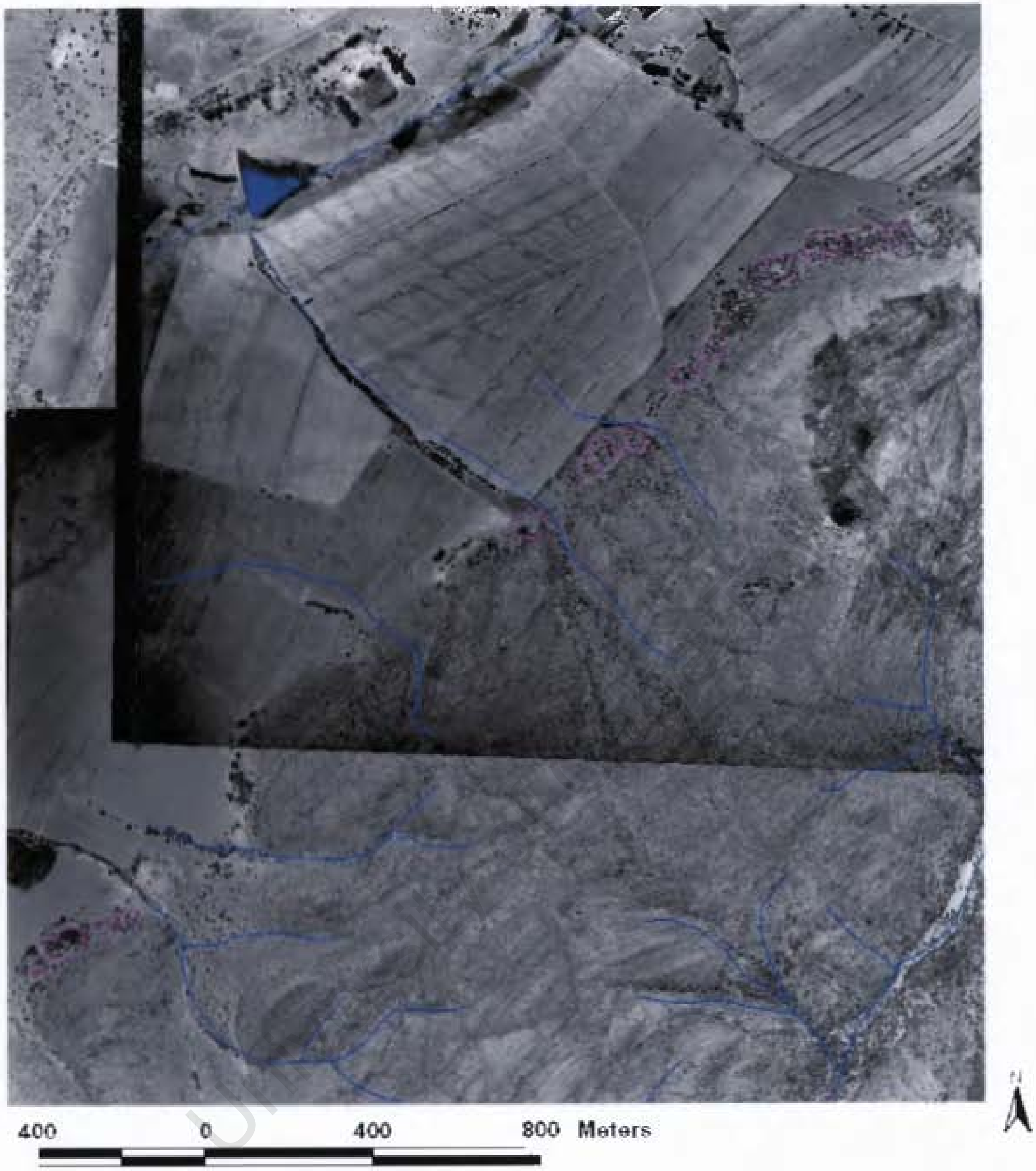

Figure 3.15: Sub-group A homesteads in relation to modern ploughing. (The homesteads are highlighted in pink)

Table 3.36: Stocking capacity in Cluster 12A. (Different shades of grey highlight sub-clusters with high aggregation ranking).

Hom-ID	HArea (m^2)	Kraal-ID	Kraal Area (m^2)	Kraal as a % of homestead	N0.of Cattle
VRD_152/2	1871.96	CE_325	126.95	6.78	13
VRD_152/3	1556.93	CE_326	319.54	20.52	32
VRD_152/4	5343.16	CE_327	478.26		48
VRD_152/4	5343.16	CE_328	679.45		68
				21.67	
VRD_76/1	4143.9	CE_323	360.06		36
VRD_76/1	4143.9	CE_324	526.68		53
				21.40	
VRD_77/1	2293.56	CE_66	195.22	8.51	20
VRD_77/2	3184.5	CE_65	525.24	16.49	53
VRD_77/3	2074.71	CE_64	475.52	22.92	48
VRD_78/1	2151.24	CE_329	64.27	2.99	6
VRD_79/2	**4864.34**	**CE_67**	**987.52**	**20.30**	**99**
VRD_79/3	**4773.27**	**CE_68**	**356.99**	**7.48**	**36**
VRD_79/4	**4475.13**	**CE_69**	**486.08**	**10.86**	**49**
		13 Kraals	Average	14.54	43
			Total		558

C12B

This sub-group has thirty-six homesteads, all located above 1500m with some above 1600m (Fig. 3.16). The C12B homesteads are grouped into twenty sub-clusters comprising 11 single homesteads through to 3 four-homestead sub-clusters (Table 3.37). The homesteads are located on the slope-break, but also and in contrast to C12A, they do scatter into the hills. They are located relatively close to modern cultivated lands and hence suitable soils (Fig. 3.17).

It is evident from Figure 3.16 that homesteads and sub-clusters are loosely scattered through this area and despite the presence of 3 four homestead sub-clusters it is not obvious which sub-cluster or homestead might be seen as dominant over others. A brief examination of the area calculations may provide more resolution.

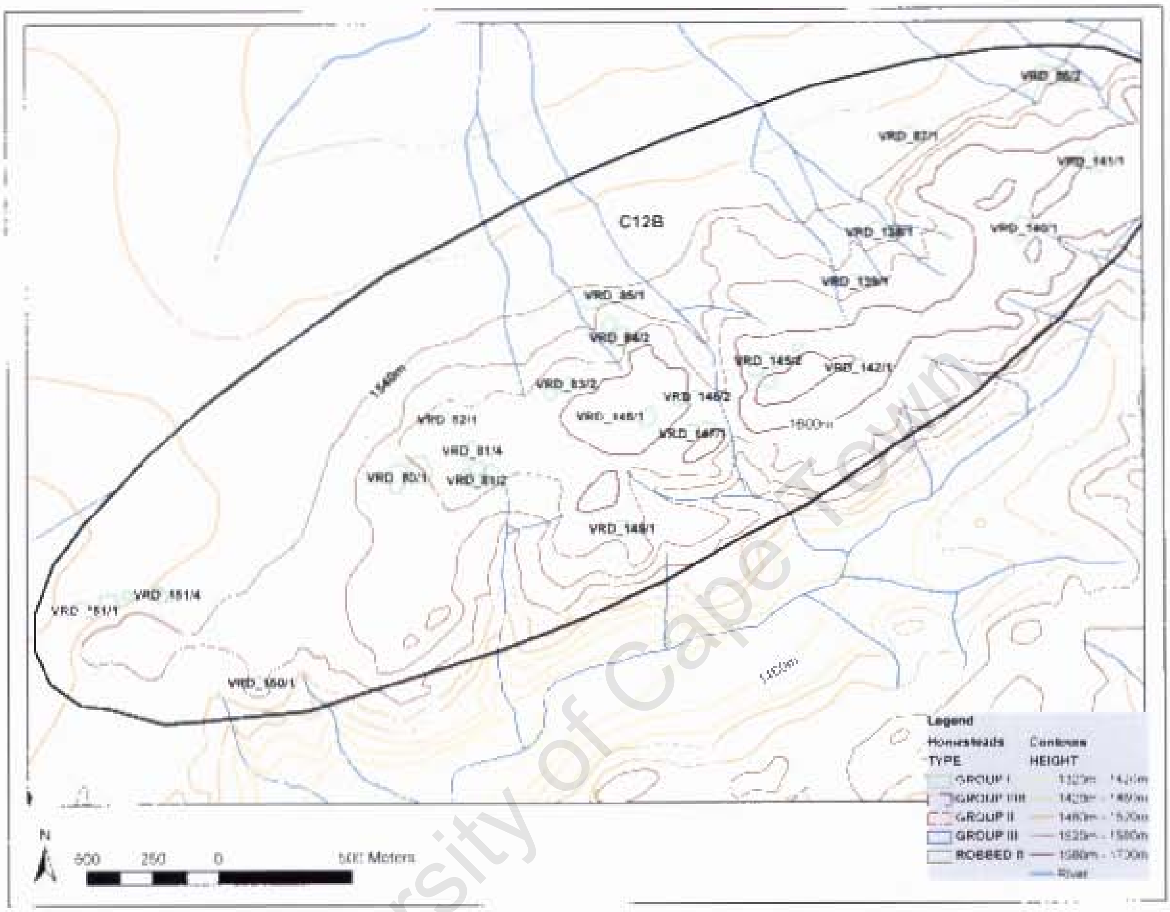

Figure 3.16: Group I homestead distribution of in cluster 12, sub-group B.

Table 3.37: Settlement aggregation in Cluster 12, sub-group B.

Settlement Units	Sub-Clusters	Homesteads
1	11	11
2	5	10
3	1	3
4	3	12
Total	**20**	**36**

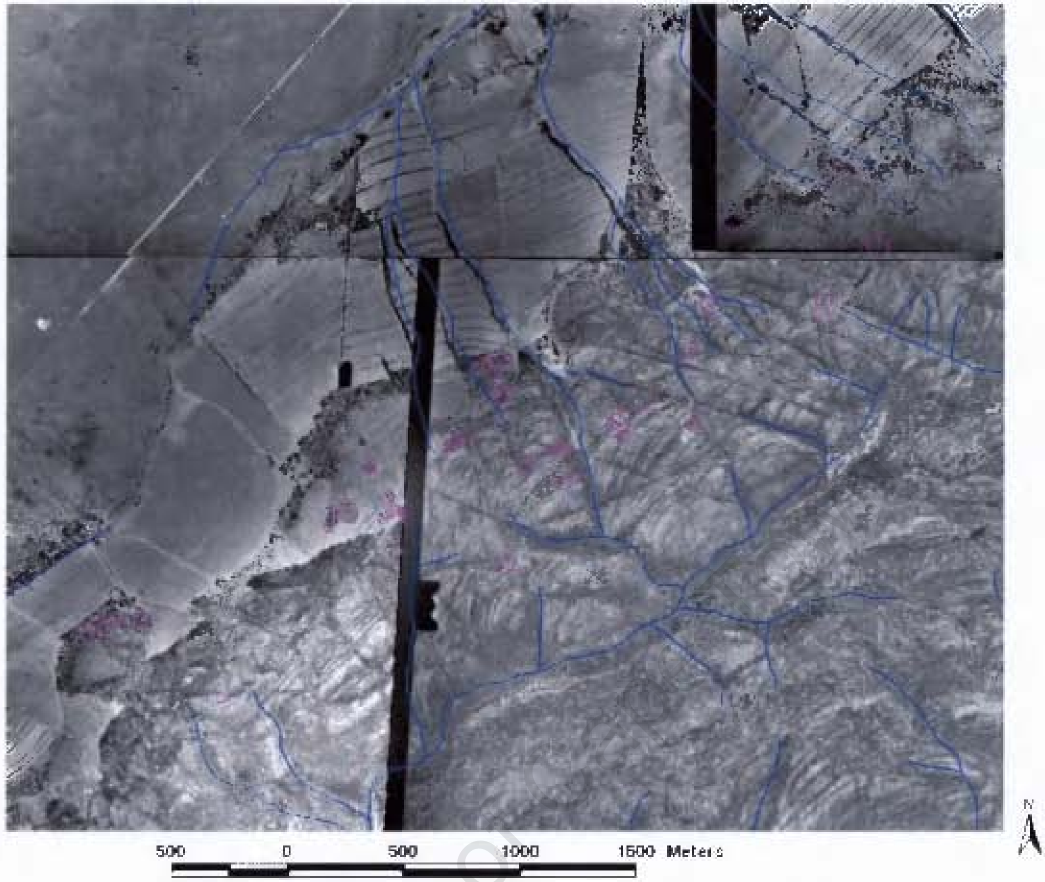

Figure 3.17: The location of sub-group C12B homesteads in relation to modern agriculture.

C12B (Fig.3.16) has 34 kraals that have a total estimated capacity of about 1582 cattle. On average, kraals can accommodate nearly 48 cattle with the kraal percentage of homestead area at 17.6% per homestead with a range between 3.8% (VRD_80/2) with 20 cattle, to 36.8% (VRD_147/2) with 81 cattle. The highest stock estimate for a single homestead is 121 cattle (VRD_145/2, kraal is 32% of homestead space). Of the 3 four-homestead sub-clusters, highlighted in Table 3.38, VRD_151 sub-cluster has the highest cattle capacity of 226 cattle. This cluster also has two homesteads with double kraal systems. On the basis of cattle stocking capacity this sub-cluster stands out as possibly dominant but the scatter of homesteads in this region makes this identity cautious.

Table 3.38: Analysis of stock capacity in C12B, representing homesteads whose kraals were measurable. (Different shades of grey highlight sub-clusters with high aggregation ranking).

Hom-ID	Hom-Area (m^2)	Kraal-ID	Kraal Area (m^2)	Kraal as a % of homestead	N0.of Cattle
VRD_138/1	4538.52	CE_90	940.37	20.72	94
VRD_139/1	2897.89	CE_89	228.59	7.89	23
VRD_140/1	4509.08	CE_91	1145.61	25.41	115
VRD_141/1	5539.67	CE_347	652.19		65
VRD_141/1	5539.67	CE_348	146.73		15
				14.42	
VRD_143/1	702.48	CE_87	108.98	15.51	11
VRD_144/1	1918.4	CE_88	419.86	21.89	42
VRD_145/2	3774.8	CE_86	1214.1	32.16	121
VRD_146/1	1788.63	CE_79	277.64	15.52	28
VRD_146/2	2308.23	CE_80	567.93	24.60	57
VRD_147/1	3722.88	CE_82	1026.69	27.58	103
VRD_147/2	2189.6	CE_81	805.64	36.79	81
VRD_148/1	3288.7	CE_78	777.32	23.64	78
VRD_149/1	3192.86	CE_77	680.37	21.31	68
VRD_151/1	**3704.65**	**CE_70**	**406.12**		**41**
VRD_151/1	**3704.65**	**CE_71**	**599.17**		**60**
				27.14	
VRD_151/2	**2868.21**	**CE_72**	**623.76**	**21.75**	**62**
VRD_151/3	**997.54**	**CE_75**	**116.77**	**11.71**	**12**
VRD_151/4	**2668.64**	**CE_73**	**181.56**		**18**
VRD_151/4	**2668.64**	**CE_74**	**332.5**		**33**
				19.26	
VRD_80/1	5857.19	CE_345			
VRD_80/2	5313.4	CE_76	199.5	3.75	20
VRD_81/1	**1414.11**	**CE_341**	**178.46**	**12.62**	**18**
VRD_81/3	**1659.01**	**CE_344**	**138.68**	**8.36**	**14**
VRD_81/4	**2975.33**	**CE_342**	**228**		**23**
VRD_81/4	**2975.33**	**CE_343**	**226.19**		**23**
				15.27	

VRD_82/1	1855.23	CE_346	91.67	4.94	9
[redacted]					
VRD_86/1	3060.94	CE_349	291.24	9.51	29
VRD_86/2	6339.81	CE_350	345.48		35
VRD_86/2	6339.81	CE_351	301.2		30
				10.20	
VRD_87/1	5036.29	CE_92	815.9	16.20	82
		34 Kraals	Average	17.59	48
			Total		1582

C12C

C12C has twenty-nine homesteads, located at a slightly higher altitude along the 1560m basal contour, compared to the A and B sub-groups (Fig. 3.18). The aerial photos (Fig. 3.19) once again neatly show that modern ploughing stops just short of the homesteads and that these homesteads were immediately adjacent to cultivatable soils.

There are ten sub-clusters in C12C, ranging from 3 single homestead sub-clusters through to 2 six-homestead sub-clusters (Table 3.39). It is again clear that the sub-clusters along the northern aspect are separated by small drainages, from this linear settlement arrangement. From the map these north facing sub-clusters are evenly distributed and there seems to be no one sub-cluster that stands out as dominant.

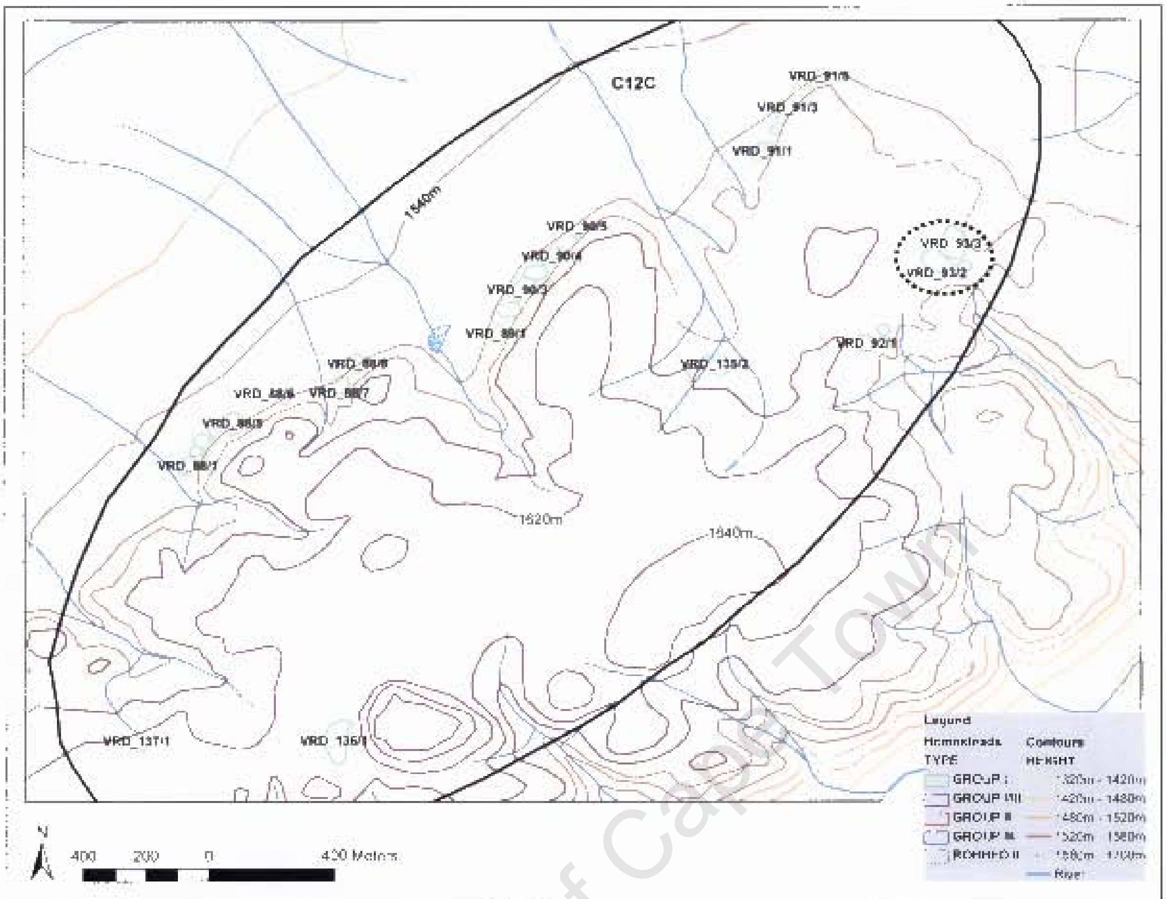

Figure 3.18: Group I homestead distribution of in cluster 12, sub-group C. The dotted oval highlights the sub-cluster with highest cattle stocking capacity.

Table 3.39: Settlement aggregation in Cluster 12, sub-group C.

Settlement Units	**Sub-Clusters**	**Homesteads**
1	3	3
2	3	6
3	1	3
4		
5	1	5
6	2	12
Total	**10**	**29**

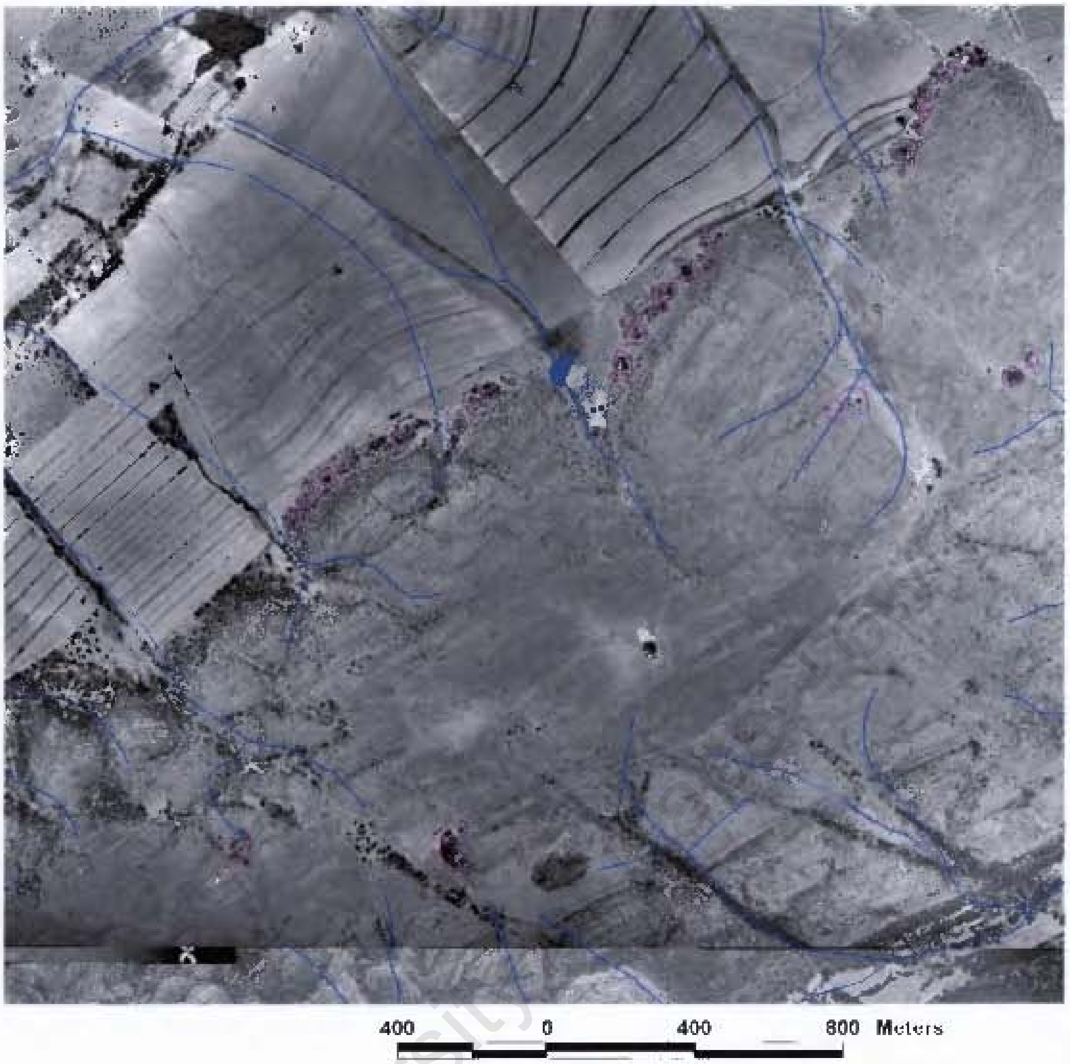

Figure 3.19: The location of sub-group C12C homesteads in relation to modern agriculture.

Sub-group C12C (Fig. 3.18) has 28 measurable kraals with an estimated capacity of about 965 cattle. On average each of these kraals can accommodate nearly 28 cattle with kraal /homestead ratio at about 17.4%. This ranges from 5.4% (VRD_135/2) with 23 cattle to 32.4% (VRD_93/2) with 150 cattle, which is also the homestead with highest estimated cattle capacity in this sub-group, followed by VRD_93/3 with 143 cattle, which takes up 23.7% of the homestead area (Table 3.40). Based on these calculations sub-cluster VRD_93 is obviously dominant compared to other sub-clusters in C12C. This might indicate that there was some degree of settlement hierarchy between these sub-clusters.

Table 3.40: Analysis of stock capacity in sub-group C12C, representing homesteads whose kraals were measurable. (Different shades of grey highlight sub-clusters with high aggregation ranking, Table 3.39).

Hom-ID	Hom-Area (m^2)	Kraal-ID	Kraal Area (m^2)	Kraal as a % of homestead	N0.of Cattle
VRD_135/2	4298.11	CE_106	233.33	5.43	23
VRD_137/1	2670.16	CE_93	192.85	7.22	19
VRD_88/1	2560.99	CE_94	329.98	12.88	33
VRD_88/2	900.86	CE_95	195.38	21.69	20
VRD_88/3	1600.35	CE_96	261.3	16.33	26
VRD_88/5	3405.57	CE_97	448.4	13.17	45
VRD_88/6	1946.8	CE_98	566.22	29.08	57
VRD_88/8	2664.18	CE_99	253.1	9.50	25
VRD_89/1	**2905.84**	**CE_100**	**635.69**	**21.88**	**64**
VRD_90/2	**2441.45**	**CE_101**	**203.04**		**20**
VRD_90/2	**2441.45**	**CE_102**	**381.57**		**38**
				23.95	
VRD_90/3	**4717.94**	**CE_103**	**146.34**		**15**
VRD_90/3	**4717.94**	**CE_104**	**936.57**		**94**
				22.95	
VRD_90/5	1840.21	CE_105	316.82	17.22	32
VRD_91/1	**3285.95**	**CE_108**	**546.03**	**16.62**	**55**
VRD_91/3	**1640.78**	**CE_111**	**195.96**	**11.94**	**20**
VRD_91/4	**1628.97**	**CE_112**	**235.37**	**14.45**	**24**
VRD_91/5	**1762.99**	**CE_113**	**203.28**		**20**
VRD_91/5	**1762.99**	**CE_114**	**109.1**		**11**
				17.72	
VRD_91/6	**482.32**	**CE_109**	**74.99**		**7**
VRD_91/6	**482.32**	**CE_110**	**72.28**		**7**
				30.53	
VRD_92/2	929.1	CE_107	82.75	8.91	8
VRD_93/1	1330.32	CE_120	97.17	7.30	10
VRD_93/2	4629.25	CE_115	430.08		43
VRD_93/2	4629.25	CE_119	1068.22		107
				32.37	

VRD_93/3	6023.34	CE_116	163.13		16
VRD_93/3	6023.34	CE_117	499.57		50
VRD_93/3	6023.34	CE_118	766.66		77
				23.73	
		28 Kraals	Average	17.37	34
			Total		965

C12D

The previous three sub-groups (Fig. 3.13) had only Group I homesteads. This last sub-group (Fig. 3.18) of cluster 12 has both Group I and Group III homesteads. This discussion focuses only on the Group I settlements. There are forty-nine Group I homesteads in C12D. They are also spread along the basal contour but at a lower altitude (Fig. 3.20) and there is again, a close association with modern agriculture within this locality (Fig. 3.21) and settlements could take advantage of the valley soils.

There are twenty-three sub-clusters in C12D. Most settlements in this linear arrangement form a tight string (Fig. 3.13), that suggests they were contemporary with the biggest sub-cluster, made up of seven homesteads, clearly dominant on the basis of aggregation complexity (Table 3.41).

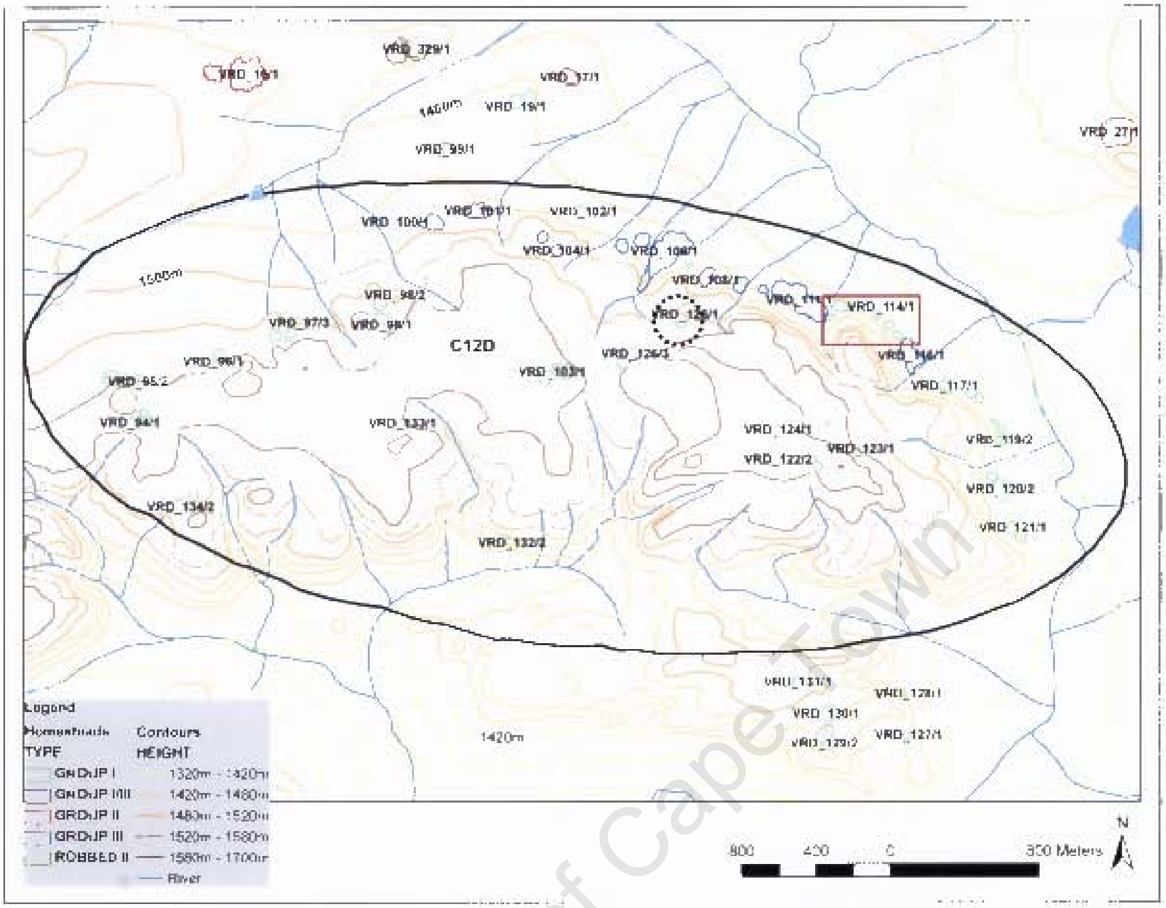

Figure 3.20: Group I homestead distribution of in cluster 12, sub-group D. The red box highlights the biggest sub-cluster; and the dotted oval shows a sub-cluster with highest number of cattle.

Table 3.41: Group I Settlement Density in Cluster 12, sub-group D.

Settlement Units	Sub-Clusters	Homesteads
1	8	8
2	8	16
3	6	18
4		
5		
6		
7	1	7
Total	**23**	**49**

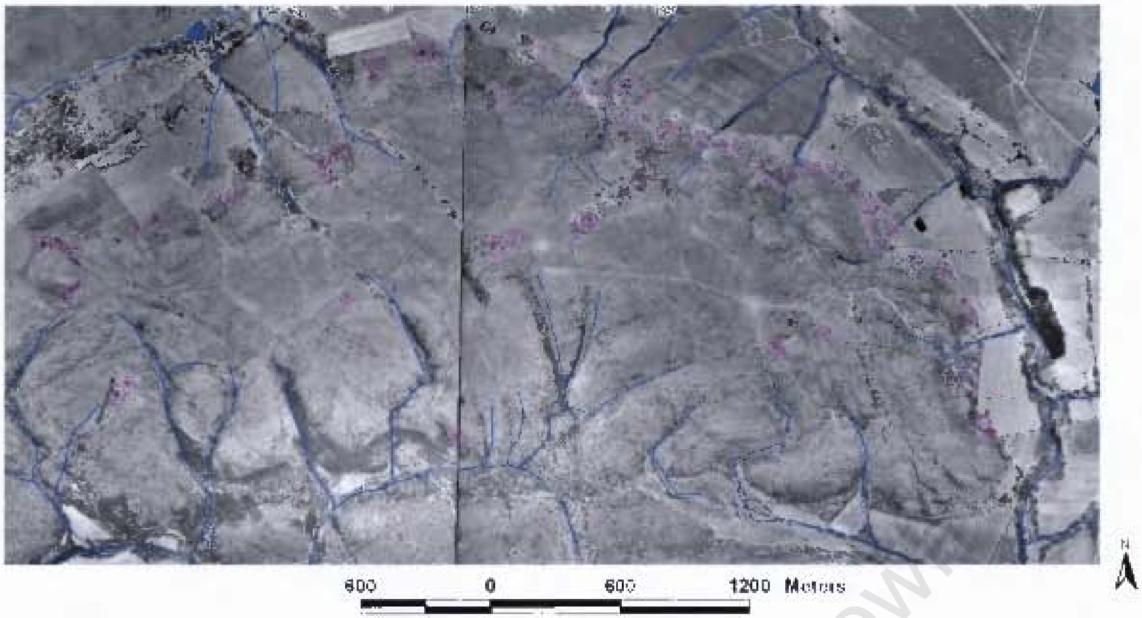

Figure 3.21: The location of sub-group C12D homesteads in relation to modern agriculture.

C12D has 46 kraals with an estimated stock capacity of about 1484 cattle. On average, each kraal could accommodate nearly 32 cattle with kraal percentage of homestead area at an average of 13.17%. This ranges from 4.06% (VRD_119/1) with 6 cattle to 28.46% (VRD_117/1) with 80 cattle. The highest figure is 172 cattle for homestead VRD_126/1, followed by VRD_98/1 with 116 cattle, and VRD_97/2 with 106. The seven-homestead sub-cluster (Table 3.42) has cattle capacity of 154, utilizing 9.71% of homestead area. In terms of cattle numbers this sub-cluster is second to VRD_126/1. On these separate criteria both are prominent.

Table 3.42: Cattle stocking capacity in sub-group D within Cluster 12. (The sub-cluster with high aggregation ranking (Table 3.41) is highlighted).

Hom-ID	Hom-Area (m^2)	Kraal-ID	Kraal Area (m^2)	Kraal as a % of homestead	N0.of Cattle
VRD_102/1	4004.28	CE_360	217.27	5.43	22
VRD_103/1	3144.14	CE_377	405.63	12.90	41
VRD_103/2	3139.52	CE_378	362.89	11.56	36
VRD_103/3	2881.81	CE_379	83.69		8

VRD_103/3	2881.81	CE_380	69.07		7
				5.30	
VRD_107/1	553.9	CE_445	49.16	8.88	5
VRD_112/1	**1039.56**	**CE_366**	**179.02**	**17.22**	**18**
VRD_113/1	**3065.62**	**CE_368**	**482.72**	**15.75**	**48**
VRD_113/2	**1682.96**	**CE_381**	**189.46**	**11.26**	**19**
VRD_114/1	**2126.22**	**CE_369**	**144.32**		**14**
VRD_114/1	**2126.22**	**CE_371**	**71.25**		**7**
				10.14	
VRD_114/2	**1283.56**	**CE_370**	**102.86**	**8.01**	**10**
VRD_115/1	**1708.63**	**CE_367**	**225.82**	**13.22**	**23**
VRD_115/2	**1486.01**	**CE_382**	**66.26**		**7**
VRD_115/2	**1486.01**	**CE_383**	**78.07**		**8**
				9.71	
VRD_117/1	2820.42	CE_132	474.45		47
VRD_117/1	2820.42	CE_395	328.23		33
				28.46	
VRD_118/1	1799.13	CE_133	107.04	5.95	11
VRD_118/2	1853.67	CE_134	173.87	9.38	17
VRD_119/1	1017.2	CE_396	41.26	4.06	4
VRD_120/1	1753.74	CE_139	217.08	12.38	22
VRD_120/2	7289.81	CE_140	472.88	6.49	47
VRD_121/1	3575.62	CE_141	227.58	6.36	23
VRD_121/2	2054.67	CE_142	324.54	15.80	32
VRD_122/1	1498.58	CE_137	184.82	12.33	18
VRD_123/1	1509.83	CE_138	247.02	16.36	25
VRD_124/1		CE_135	225.56		23
VRD_125/1		CE_136	180.64		18
VRD_126/1	9499.62	CE_365	1717.51	18.08	172
VRD_126/2	2904.34	CE_431	480.35	16.54	48
VRD_132/1	1415.92	CE_375	247.13	17.45	25
VRD_132/2	1924.96	CE_376	244.4	12.70	24
VRD_133/1	2517.29	CE_353	350.27	13.91	35
VRD_134/1	1541.37	CE_352	187.73	12.18	19
VRD_134/2	5343.98	CE_121	401.82	7.52	40
VRD_336/1	763.68	CE_397	193.18	25.30	19

VRD_94/1	2644.98	CE_122	353.05	13.35	35
VRD_94/2	1185.37	CE_123	136.93	11.55	14
VRD_95/1	3311.88	CE_124	341.35	10.31	34
VRD_95/3		CE_125	519.02		52
VRD_96/1	2581.39	CE_126	499.05	19.33	50
VRD_96/2	1919.46	CE_127	319.65	16.65	32
VRD_97/1	2699.1	CE_128	405.66	15.03	41
VRD_97/2		CE_129	1063.57		106
VRD_97/3	3510.6	CE_130	290.52	8.28	29
VRD_98/1	3282.08	CE_131	1156	35.22	116
		46 Kraals	Average	13.17	32
			Total		1484

As discussed above, Cluster 12 cannot be seen as a single unit, and the definition of the sub-groups is closer to the other Group clusters described so far. It is more realistic to summarise the estimates and compare between sub-groups, rather than compare C12 as a whole with other clusters. On the basis of this sub-group analysis (Table 3.43), C12D has the most complex sub-cluster aggregation (seven homesteads), but the highest cattle estimate is in C12B with 1582 or 34.47%, of the 4589 cattle estimate for the whole cluster. The average kraal area as a percentage of homestead area is 15.67% for the settlements in C12, and the average kraal space per homestead within sub-groups does not deviate significantly from this value.

Table 3.43: Summary table of cluster 12 sub-group cattle estimates.

Sub-group	**Highest aggregation ranking**	**N0. of kraals**	**N0. of cattle**		**Kraal area as a % of homestead area**
A	4	13	558	12.16%	14.54
B	4	34	1582	34.47%	17.59
C	6	28	965	21.03%	17.37
D	7	46	1484	32.34%	13.17
	Average	**30**	**1147**		**15.67**
	Total	**121**	**4589**		

Cluster 13

Like C08 and C11, cluster 13 (Fig. 3.13) contains both Group I and Group II settlement types, but the following discussion focuses only on Group I homesteads (Fig. 3.22). It is worth noting that in view of the discussion of where Group I sites are mainly located, the low density of C13 homesteads on the relatively flat landscape north of the Dome edge underlines the main Group I settlement preference to be close to the more varied terrain and higher ridges of the Dome.

The homesteads fall between 1440m and 1480m (Table 3.44). This is a small cluster with only five homesteads from which three sub-clusters have been defined (Table 3.45). While it hardly merits the term 'cluster' it has to be treated as such because it is physically separate from C08 to the east, and C12D to the south.

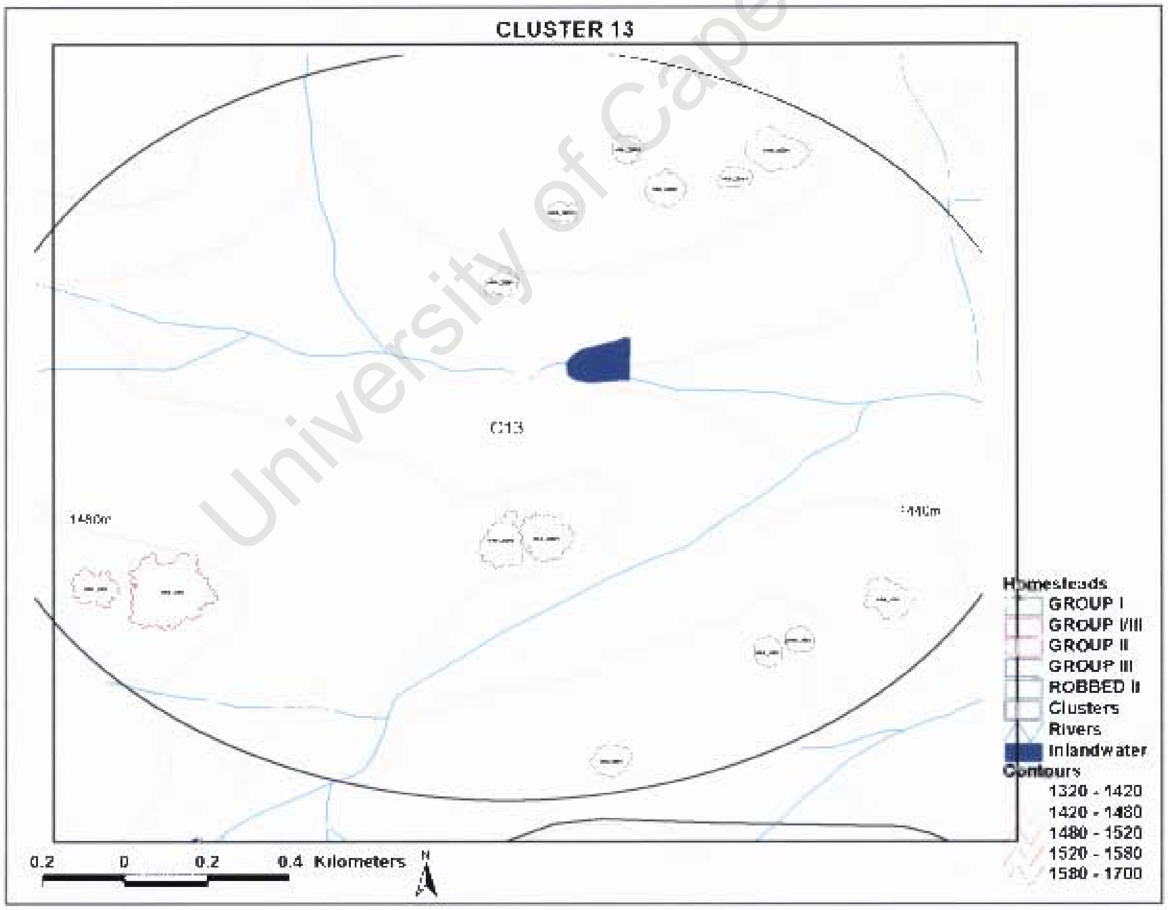

Figure 3.22: Homestead distribution in Cluster 13 (focus is on Group I sites).

The kraal sample is small, with a total estimate of only 98 cattle (Table 3.46) and the low variability between homesteads means that no one homestead or sub-cluster stands out.

Table 3.44: The altitudinal distribution of homesteads in Cluster 13

Altitude(+)	N0.of Homesteads	
1440m	2	14%
1460m	10	71%
1480m	2	14%
	14	

Table 3.45: Settlement Density in Cluster 13 (Group I)

Aggregation ranking	**Sub-Clusters**	**Homesteads**
1	1	1
2	2	4
TOTAL	**3**	**5**

Table 3.46: Analysis of stock capacity in C13 Group I homesteads

H-ID	**HArea (m^2)**	**Kraal-ID**	**Kraal Area (m^2)**	**Kraal as a % of homestead**	**N0.of Cattle**
VRD_327/1	2440.56	CE_56	428.35	17.55	43
VRD_324/1	3063.57	CE_58			
VRD_19/1	3450.18	CE_430	546.6	15.84	55
		3 Kraals	Average	16.70	49
			Total		98

3.1.1 Group I Preliminary Discussion

The Group I clusters as presented above are clearly variable in the way their boundaries have been defined. Some clusters are better defined than others that may be more arbitrary. For instance, C01, by virtue of its location south of the Vaal River, can be seen as a relatively well defined cluster, whereas C04 and C11 are somewhat loose, and as with C05 and C08, the proximity of sites to one another makes boundary delineation elastic. Furthermore, Cluster C12 is a distinctive linear arrangement of homesteads that must relate in part to a compromise between immediate access to cultivatable soils and variable terrain for wood and pasture. The C12 sub-groups more closely approximate the scale of the other Group I clusters. Despite these uncertainties, the clusters do provide a basis for sub-division of the regional Group I sample and comparison, and exploring relationships within clusters, and less securely, between clusters.

It is clear that many Group I sites fall between 1460m and 1560m contour levels, with outliers at 1340m and 1620m (Table 3.47 and Figure 3.23). This reflects the repeated preference of Group I settlements to select the more 'rumpled' terrain associated with the northern parts of the Dome. It is this general preference that is important and there is no significant difference between clusters in terms of altitude.

Table 3.47: Summary of altitudinal distribution of Group I homesteads.

Altitude(+)	N0.of Homesteads	
1340m	3	1%
1380m	14	3%
1400m	9	2%
1420m	23	5%
1440m	27	6%
1460m	46	10%
1480m	53	11%

1500m	77	16%
1520m	71	15%
1540m	55	11%
1560m	57	12%
1580m	29	6%
1600m	17	4%
1620m	3	1%
	484	

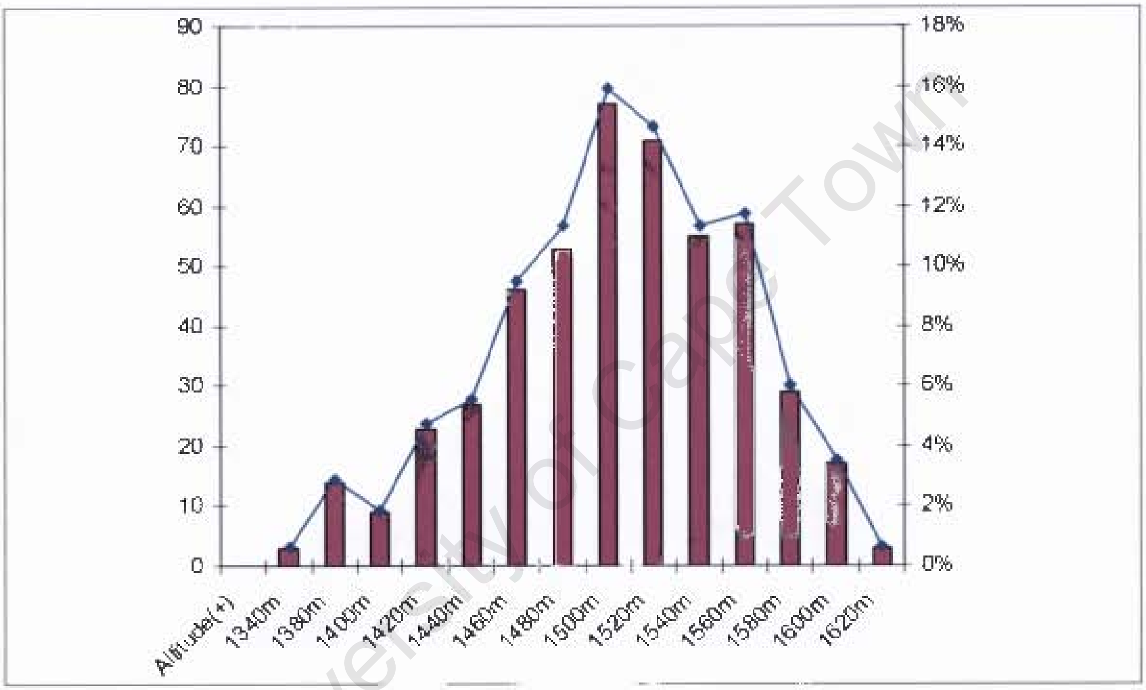

Figure 3.23: Summary of altitudinal distribution of Group I homesteads.

Additionally, there is no consistent pattern in slope and aspect between clusters, but the location of settlements on gentle interfluves adjacent to small drainages, that also separate sub-clusters, is a common feature. There is a contrast between the rather clumped nature of most of clusters, such as C01, and the very distinctive linear arrangement of the C12 sub-groups. Here homesteads are located close to the edges of modern cultivated land and this juxtaposition may underpin an important factor in location. It is not known whether the C12 sub-groups are more optimally located for both crop production and cattle pasturage and if so, had an agricultural advantage over clusters located within the ridges of the Dome, where soils tend to be shallow and gravely. If such agricultural potentials were significant, the specific location of the C12 sub-groups, need not represent a regional pecking order, but simply how the area was progressively filled with a growing Group I population

As discussed above, this uncertainty over chronology makes comparison between clusters uncertain, although it is suggested that the Group I clusters are not crowded and that the spread of the clusters suggests that settlement locations were made with appropriate spatial consideration to others. As shown in Table 3.48, all clusters together have an estimated cattle stock capacity of just over 14 000. This number excludes the capacity of the 'outliers', which are discussed below. It is emphasised that not too much absolute importance is given to this number and that the cattle figures simply provide a means of comparison. A crude calculation of stocking capacity over the whole area of Group I settlements, including a 6km border from the outer edge of clusters suggests that the number is too high if it is assumed that all homesteads were contemporary (Fig. 3.1). The Southern African Agricultural Geo-referenced Information System (**AGIS**) provides data on grazing capacity in and around the Vredefort Dome and this ranges between 8 and 17 hectares per animal unit (<u>http://www.agis.agric.za/agisweb/agis.html</u>). For the area delimited above, a midpoint of 12 hectares per animal unit gives a number of 7400 animal units and a more conservative number of just over 5000 cattle if 17 hectares per animal is used. If these numbers have any value then they would suggest that the assumption of a developmental Group I landscape in which all clusters were eventually contemporary was not the case. For this reason no weight can be given to any distinctions made from a comparison between clusters despite the big difference between the smallest and the largest cattle estimates between clusters (Fig. 3.24). It would be spurious to search for physically recognisable regional centre between these clusters.

Whatever the case, the consistent calculation of kraal area does provide a relative means of comparing between homesteads and sub-clusters. Before considering this an interesting aspect of estimating kraal size was the consistency of Group I kraals as a proportion of homestead area. The average kraal space per homestead area is about 15% (Fig. 3.24),. There are some extremes in the calculations but given the difficulties of using the aerial photos, the consistency in this proportion is encouraging. Irrespective of real differences in cattle wealth between homesteads, it is not surprising that there is a consistent cultural norm. Such proportions provide a means of comparing between Group I and Group II settlements.

However, there is more value in examining the evidence for physically dominant settlements within some clusters, (C01, C02, C05 and C06), but less certainty in others (C03, C04, C07, C08, C09, C11, C12 and C13). This comparison is also complicated by the issue of chronology. Additionally, two attributes of sub-clusters have been measured, being estimates of cattle holdings and the aggregation ranking. Both may reflect status but as frequently encountered in the data, some estimates of cattle numbers in single homesteads can be relatively high, while more complex Group I sub-clusters can have relatively low cattle holdings. When some ethnography is considered at the end of this section, it could be suggested that homesteads with large kraals could simply reflect the independent success of that homestead, just as much as authority, which is linked to a wider set of relationships within a cluster.

Table 3.48: Stock capacity in Group I per cluster.

Cluster	**N0. of kraals**	**Average kraal area as a % of homestead area**	**N0. of cattle**
C01	57	17.65	2404
C02	17	12.79	527
C03	21	12.04	725
C04	40	18.53	1810

C05	26		18.52	1043
C06	33		17.52	1162
C07	6		16.92	119
C08	33		17.49	1041
C09	17		11.64	484.5
C11	5		6.87	98
C12	121		15.67	4589
C13	3		16.7	98
Average	**34.18**		**15.06**	**1273**
Total	**379**			**14101**

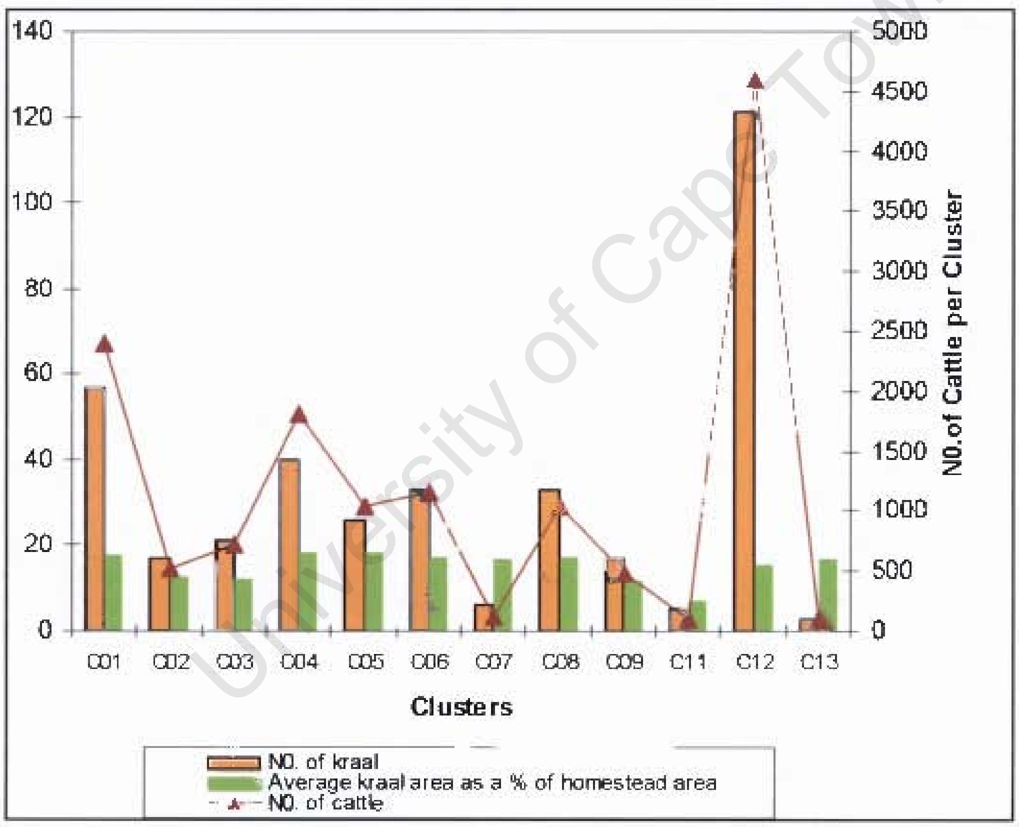

Figure 3.24: The distribution of cattle in Group I clusters in the Vredefort Dome.

The brief analysis of settlements listed as 'outliers' may add further to this discussion concerning the seemingly low level of political and economic differentiation within Group I.

3.2 Outliers

There are forty-four Group I homesteads that could not be included in any of the larger clusters. They are not obviously connected to any cluster and therefore the assumption is that they are isolated and independent settlements, and are here called 'outliers'. They are located within the ridges, and this is consistent with Group I settlements generally, with 66% of them distributed above the 1500m relief line (Table 3.49). These settlements potentially provide some control over identifying hierarchy within Group I clusters. This brief discussion assumes that by definition, 'outliers' are not linked to other homesteads and this expresses an absence of immediate kin relationships and on physical grounds, the absence of wider relationships. At face value such isolation may suggest that these homesteads were at a disadvantage because they are not tied into some kind of kin arrangement within a cluster. It is possible that estimates of homestead size and cattle holdings could reflect the status of these outliers.

Twenty-seven sub-clusters were counted, and 59% of them are single homestead sub-clusters. Clearly in the outlier group there are larger sub-clusters, and one sub-cluster, for example, was made of four homesteads (Table 3.50), but these are still isolated on the general landscape and distribution of Group I settlements.

A total of 31 kraals were measured with an estimated capacity of 1597 cattle, and on average, each kraal held 55 animals (Table 3.51). A comparison with other clusters shows that this is generally common, and as in Cluster 01. The 16.16% kraal average of total homestead area with a range between 5.35% (VRD_251/3) and 33.50% (VRD_129/2) is also prevalent. The estimates of cattle capacity for individual homesteads, equally, show the kind of range evident in the estimates of cattle holdings for homesteads within clusters. VRD_129/2, for example, has a capacity of 188 cattle, and other homesteads with large cattle numbers include

VRD_229/1 with 167 cattle, VRD_247/1 with 155 cattle, VRD_253/1 with 129 cattle and VRD_231/3 with 102 cattle (Table 3.51).

Table 3.49: Isolated homesteads altitudinal distribution.

Altitude(+)	N0.of Homesteads	
1380m	3	7%
1400m	3	7%
1420m	4	9%
1440m	13	30%
1460m	1	2%
1480m	5	11%
1500m	2	5%
1520m	6	14%
1540m	2	5%
1560m	5	11%
	44	

Table 3.50: Homestead aggregation among the isolated homesteads

Aggregation ranking	**Sub-clusters**	**Homesteads per rank**
1	16	16
2	6	12
3	4	12
4	1	4
Total	**27**	**44**

Table 3.51: Analysis of stock capacity within Group I isolated homesteads.

H-ID	**HArea (m^2)**	**Kraal-ID**	**Kraal Area (m^2)**	**Kraal as a % of homestead**	**N0.of Cattle**
VRD_1/2	5579.79	CE_63	800.69		80
VRD_1/2	5579.79	CE_251	350.21		35
				20.63	
VRD_128/1	2043.98	CE_146	173.49	8.49	17
VRD_129/1	1327.3	CE_145	168.11	12.67	17

VRD_129/2	5610.99	CE_144	1879.54	33.50	188
VRD_13/1	2404.37	CE_421	500.38	20.81	50
VRD_131/1	2293.72	CE_143	646.06	28.17	65
VRD_132/1	1415.92	CE_375	247.13	17.45	25
VRD_132/2	1924.96	CE_376	244.4	12.70	24
VRD_14/1	2710.71	CE_60	318.77	11.76	32
VRD_15/1	1356.23	CE_59	119.03	8.78	12
VRD_2/1	4307.15	CE_62	398.19	9.24	40
VRD_223/1		CE_416			
VRD_224/1	1631.61	CE_417	99.01	6.07	10
VRD_225/1	1597.89	CE_415	482.43	30.19	48
VRD_229/1	7245.43	CE_330	1671.57	23.07	167
VRD_231/1	2021.35	CE_331	165.29	8.18	17
VRD_231/2	1348.91	CE_333	120.58	8.94	12
VRD_231/3	3862.45	CE_332	1017.84	26.35	102
VRD_231/4	1364.75	CE_334	295.17	21.63	30
VRD_247/1		CE_203	1553.94		155
VRD_249/1	5385.43	CE_418	233.79		23
VRD_249/1	5385.43	CE_419	247.23		25
				8.93	
VRD_250/1		CE_420			
VRD_251/1	4650.74	CE_335	848.01	18.23	85
VRD_251/2	2867	CE_336	383.81	13.39	38
VRD_251/3	5857.09	CE_337	313.61	5.35	31
VRD_252/1	N/A	CE_339	443.23		44
VRD_252/1	N/A	CE_340	239.24		24
VRD_253/1	7518.41	CE_338	1286.44	17.11	129
VRD_3/1		CE_252	717.24		72
		31 Kraals	Average	16.16	55.07
			Total		1597

On the basis of these estimates the outliers do not deviate from the Group I homesteads within clusters. It seems being an outlier was no disadvantage in terms of economic production as indicated by cattle numbers. This implies that while variability in kraal sizes and cattle numbers within clusters may have something to do with political hierarchy, the outlier calculations suggest that this is not necessarily the case. To examine these observations further and to explain these attributes within ethnographic context.

As indicated earlier Group I is similar to Type N settlement pattern and these have been attributed to Sotho identity of Fokeng (Maggs, 1976). The archaeological evidence has suggested that the Fokeng identity is closely linked to Nguni-speakers (Huffman 2007) and as noted by Hall (et al. 2007) this resolves the distribution of Fokeng within the general context of Sotho/Tswana movements on the landscape (Hall et al. 2007). It is because of the Nguni background of Group I (Type N) occupants that Nguni ethnography is considered of relevance in this research. A basic model is provided by Hammond-Tooke (1991) who suggests that homesteads were economically independent and he emphasises the self contained and independent nature in pre-state Nguni systems, such as the Swazi and Zulu,

With 67% of the twelve Group I clusters with physically no recognisable political it seems reasonable to conclude that though there's some evidence for central control of resources within some clusters it is clear that there is no significant settlement stratification nor political hierarchy within or between clusters amongst Group I settlements in the Vredefort Dome.

4. GROUP II SETTLEMENT STRATIFICATION AND HIERARCHY

The objective in this chapter is to undertake the same analyses on Group II settlements that were discussed in the previous Group I chapter. This is to provide consistency in the development of a discussion of political authority around Group II settlements and their comparison with Group I. As in the previous chapter, this will be done through an assessment of homestead aggregation and estimates of central kraal enclosure size within clusters. The Askoppies Group II complex cannot be included in the Group II sample, and therefore the analysis is limited and incomplete. The reason for this is that because of vegetation and the extremely high degree of aggregation it was difficult to outline the boundary walls of individual homesteads from the aerial photographs. Additionally, the Group II kraal system is more complex than the single enclosures in Group I settlements, and consequently, most could not be measured with any degree of confidence. However, Askoppies is discussed in detail later in order to elaborate on aggregation in Group II settlements.

4.1 The Analysis of Group II Settlement Clusters

Group II settlements are located only on the northern side of the Vaal River. They can be described as widely spread 'nuclears', distributed on the north westerly outer ring of the Dome. These sites are located between the 1440m and 1540m contours, with 58% of all Group II homesteads (including Robbed II), located below 1500m and 42% above this altitude (Table 4.1).

With the sample available, it is clear that almost 90% of the 86 Group II homesteads plotted are in small sub-clusters and 55.3% are single homesteads. There are two 10 homestead sub-clusters, one sub-cluster of 9 homesteads and one of 6 homesteads (Table 4.2). Even though the sample is relatively small, it is notable that there are three significant Group II aggregations. At a regional scale, Group II settlements can be allocated to four clusters, namely C08, C10, C11 and C13 (Fig. 4.1 and Table 4.3). Clusters 08, 11 and 13 (Fig. 4.1) contain both Group I and Group II settlement types. C10 only has Group II settlements and this is not surprising given that the location is well outside Group I settlement preferences.

Table 4.1: The altitude of Group II homesteads in the Vredefort Dome (excluding Askoppies)

Altitude(+)	N0.of Homesteads	
1440m	4	5%
1460m	25	29%
1480m	21	24%
1500m	19	22%
1520m	11	13%
1540m	6	7%
	86	

Table 4.2: Aggregation frequency of Group II settlements in the Vredefort Dome.

GROUP II			
Aggregation ranking	**Sub-Clusters**	**Homesteads per rank**	**% of sub-clusters per rank**
1	21	21	55.3
2	9	18	23.7
3	4	12	10.5
4			
5			
6	1	6	2.6
7			
8			
9	1	9	2.6
10	2	20	5.3
TOTAL	**38**	**86**	

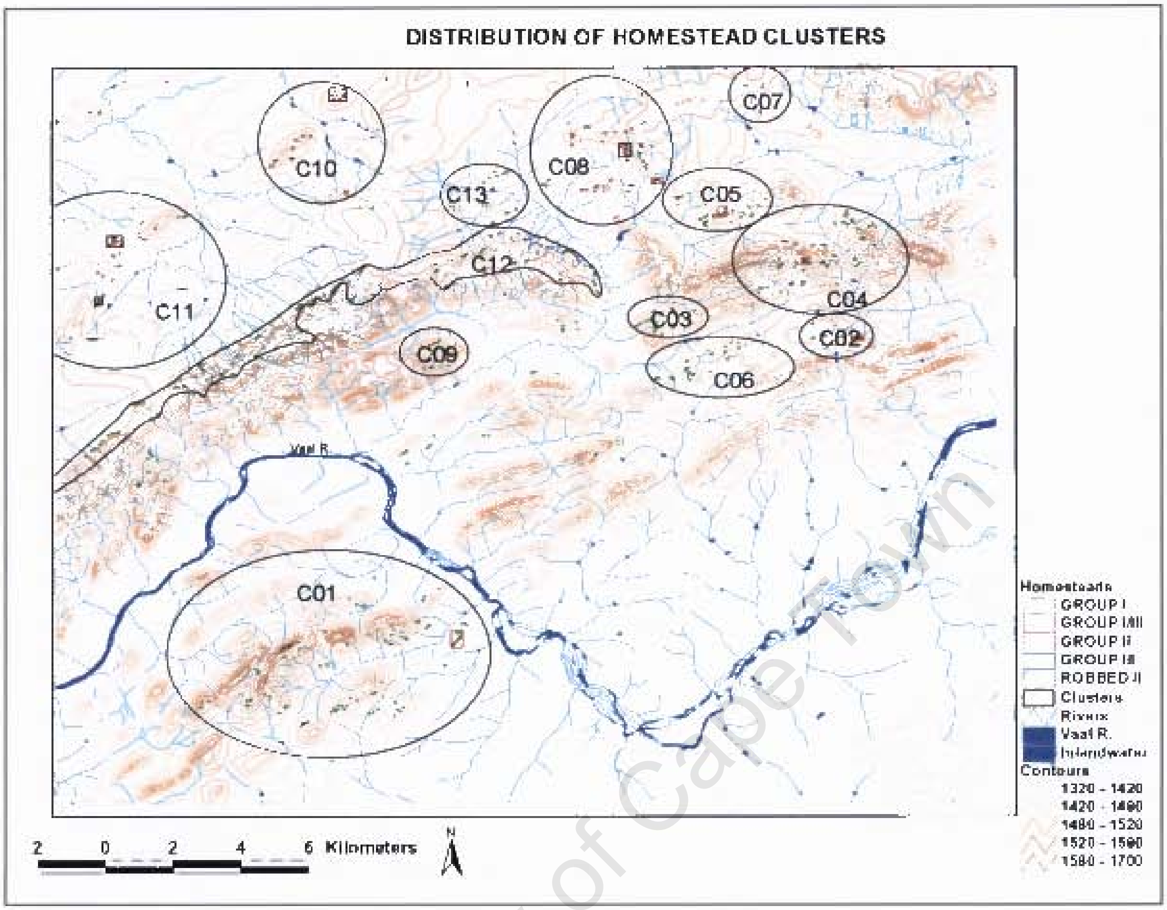

Figure 4.1: The distribution of settlements and clusters in the Vredefort Dome.

Table 4.3: Group II settlement aggregation within clusters

Aggregation ranking	C08	C10	C11	C13	Sub-clusters per rank
1	10	3	5	3	**21**
2	3	2	1	3	**9**
3	2	1	1		**4**
4					
5					
6			1		**1**
7					
8					

9		1			1
10	1		1		2
Sub-clusters	16	7	9	6	38
per cluster	42%	18%	24%	16%	

As mentioned above the lack of clarity of boundary walls make the measurement of Group II kraals is less secure than measuring the single Group I kraals. Group II kraal systems are more complex, comprising a series of linked enclosures around a central secondary enclosure. These tend to be smaller, often obscured by vegetation and sometimes difficult to separate from adjoining kraals. This limits the sample size and the value of the estimates for comparisons between Group II settlements as well as for comparison with the Group I estimates. In order to be consistent and to build in as much comparability with Group I kraals, it was ideal to measure all of the definite linked enclosures and not the central secondary enclosure. If the linked enclosures were where cattle were kept and the secondary enclosure a space for managing cattle, then area represented by the former would be comparable to Group I kraals. It is acknowledged that the Group II kraal system could relate to different ways of managing animals within homesteads as well as different kin structures. Compared to Group I, it is the total area of primary kraals in a single homestead that is comparable to the Group I estimates. However, there is considerable variation in the quality of Group II measurements. Some Group II homesteads were sufficiently visible to allow all the linked enclosures to be measured, in others only one or a few could be measured and in other homesteads, only the complete centre, including the secondary enclosure could be measured. The estimates, therefore, are not consistent between homesteads within sub-clusters or consistent between sub-clusters.

Cluster 08

This cluster has thirty-two Group II (including Robbed II) homesteads, mostly found within the 1440m and 1540m contours, and only two homesteads are located above 1540m (Table 4.4). It is notable that some of the homesteads are linearly distributed down gently sloping ridges and collectively, they form a crude arc in which the dominant aspect is towards the west (Fig. 4.2).

There are sixteen Group II sub-clusters in C08, and 62.5% of these are single-homestead sub-clusters. The biggest sub-cluster (VRD_33) is a ten-homestead aggregation and is situated centrally, with other homesteads arranged in a linear fashion to the north and south-east (Table 4.5). This sub-cluster clearly stands out, but as discussed above it is difficult to investigate this prominence further because of the invisibility of the kraals on the aerial photographs.

Table 4.4: The altitudinal distribution of homesteads in Cluster 08

Altitude(+)	N0.of Homesteads	
1440m	3	5%
1460m	18	30%
1480m	12	20%
1500m	19	31%
1520m	5	8%
1540m	4	7%
	61	

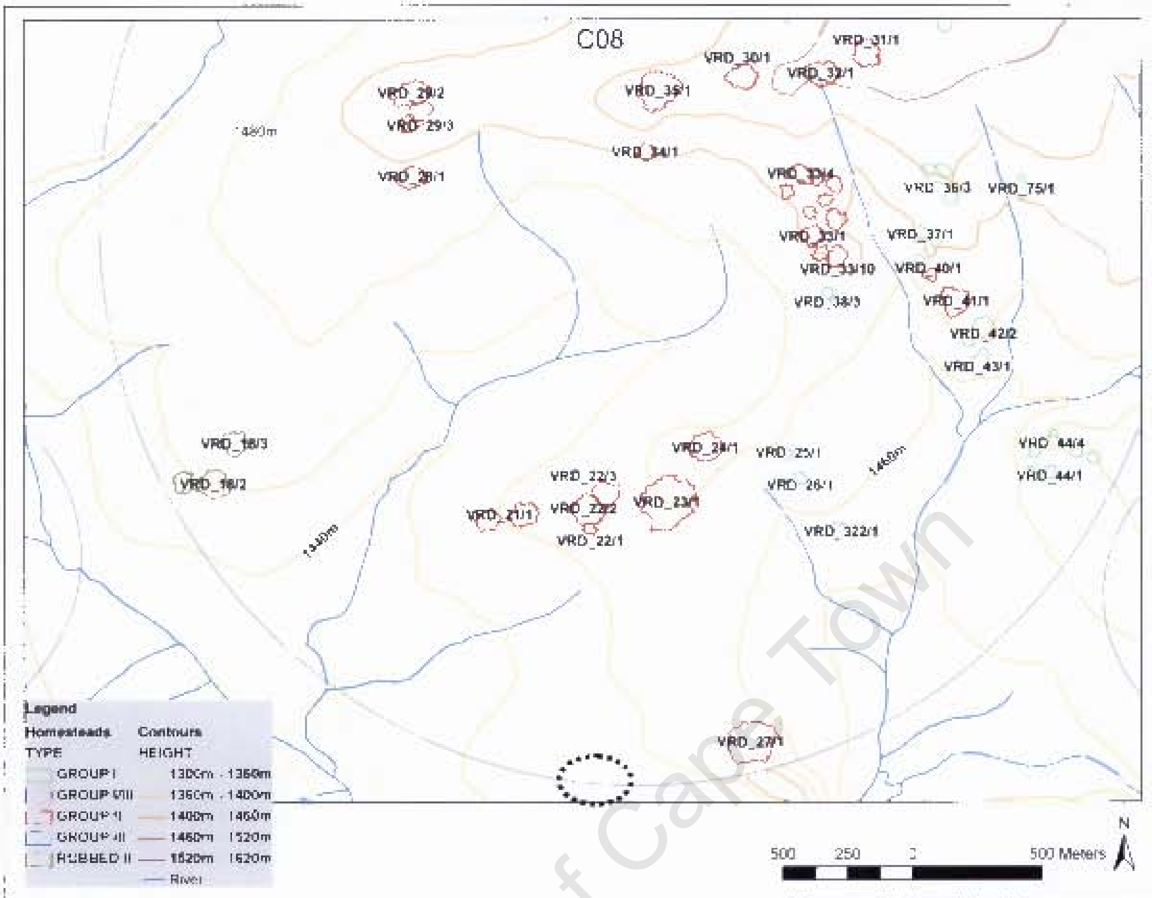

Figure 4.2: Group II homestead distribution in C08. The black box encloses the biggest sub-cluster, and the dotted oval highlights the sub-cluster with highest cattle estimate.

Table 4.5: Homestead density in C08 Group II settlements

Aggregation ranking	Sub-Clusters	Homesteads
1	10	10
2	3	6
3	2	6
10	1	10
TOTAL	**14**	**29**

Table 4.5: Analysis of stock capacity in C08, representing homesteads whose kraals were measurable

H-ID	HArea (sqm)	Kraal-ID	KraalArea (sqm)	Kraal as a % of homestead	N0.of Cattle	Cattle per sub-cluster
VRD_18/1	4236.17	CE_52	489.83	11.56	49	
VRD_18/2	8931.27	CE_53	1611.81	18.05	161	**210 Cattle**
VRD_20/1	4800.04	CE_521	58.35		6	
VRD_20/1	4800.04	CE_522	99		10	
VRD_20/1	4800.04	CE_523	56.56		6	
				4.46		
VRD_21/1	6963.3	CE_30	1834.08	26.34	183	**205 Cattle**
VRD_22/2	9759.28	CE_524	124.04		12	
VRD_22/2	9759.28	CE_525	53.02		5	
VRD_22/2	9759.28	CE_526	87.15		9	
VRD_22/2	9759.28	CE_527	28.58		3	
VRD_22/2	9759.28	CE_528	57.83		6	
VRD_22/2	9759.28	CE_529	245.01		25	
VRD_22/2	9759.28	CE_530	46.93		5	
				6.58		**65 Cattle**
VRD_22/3	6656.4	CE_531	110.51		11	
VRD_22/3	6656.4	CE_532	53.19		5	
VRD_22/3	6656.4	CE_533	110.97		11	
VRD_22/3	6656.4	CE_534	48.98		5	
VRD_22/3	6656.4	CE_535	119.13		12	
				6.65		**109 Cattle**
VRD_23/1	28028.06	CE_536	96.48		10	
VRD_23/1	28028.06	CE_537	85.8		9	
VRD_23/1	28028.06	CE_538	162.14		16	
VRD_23/1	28028.06	CE_539	308.83		31	
VRD_23/1	28028.06	CE_540	81.61		8	
VRD_23/1	28028.06	CE_541	93.13		9	
VRD_23/1	28028.06	CE_542	199.79		20	
VRD_23/1	28028.06	CE_543	57.11		6	
VRD_23/1	28028.06	CE_544	115.3		12	
VRD_23/1	28028.06	CE_545	63.68		6	

VRD_23/1	28028.06	CE_546	106.92		11	
VRD_23/1	28028.06	CE_547	138.59		14	
VRD_23/1	28028.06	CE_548	231.85		23	
VRD_23/1	28028.06	CE_549	86.4		9	
VRD_23/1	28028.06	CE_550	83.31		8	
VRD_23/1	28028.06	CE_55	87.03		9	
VRD_23/1	28028.06	CE_552	173.15		17	
				7.75		**218 Cattle**
VRD_24/1	9813.07	CE_553	113.57		11	
VRD_24/1	9813.07	CE_554	84.71		8	
VRD_24/1	9813.07	CE_555	149.56		15	
VRD_24/1	9813.07	CE_556	142.12		14	
VRD_24/1	9813.07	CE_557	88.84		9	
				5.90		**57 Cattle**
VRD_27/1	20721.03	CE_41	4939.67	23.84	494	**494 Cattle**
VRD_28/1	6417.54	CE_29	1861.53	29.01	186	**186 Cattle**
VRD_29/1	3398.43	CE_28	452.68	13.32	45	
VRD_29/2	9538.71	CE_27	1045.25	10.96	105	
VRD_29/3	4838.64	CE_508	58.32		6	
VRD_29/3	4838.64	CE_509	47.43		5	
VRD_29/3	4838.64	CE_510	77.57		8	
				3.79		**169 Cattle**
VRD_31/1	7386.48	CE_511	132.65		13	
VRD_31/1	7386.48	CE_512	93.33		9	
VRD_31/1	7386.48	CE_513	56.86		6	
VRD_31/1	7386.48	CE_514	107.59		11	
VRD_31/1	7386.48	CE_515	42.89		4	
VRD_31/1	7386.48	CE_516	129.58		13	
VRD_31/1	7386.48	CE_517	34.55		3	
				8.09		**59 Cattle**
VRD_32/1	8302.26	CE_518	211.75		21	
VRD_32/1	8302.26	CE_519	87.29		9	
VRD_32/1	8302.26	CE_520	39.18		4	
				4.07		**34 Cattle**
VRD_33/2	**4091.23**	**CE_12**	**747.96**	**18.28**	**75**	**75 Cattle**

VRD_34/1	2683.81	CE_17	182.73	6.81	18	**18 Cattle**
VRD_40/1	1844.65	CE_14	360.73	19.56	36	
VRD_41/1	8062.28	CE_558	167.97		17	
VRD_41/1	8062.28	CE_559	128.18		13	
VRD_41/1	8062.28	CE_560	63.14		6	
VRD_41/1	8062.28	CE_561	71.55		7	
VRD_41/1	8062.28	CE_562	69.7		7	
VRD_41/1	8062.28	CE_563	50		5	
VRD_41/1	8062.28	CE_564	61.78		6	
VRD_41/1	8062.28	CE_565	72.74		7	
VRD_41/1	8062.28	CE_566	54.1		5	
VRD_41/1	8062.28	CE_567	84.9		8	
				10.22		**117 Cattle**
		70 Kraals	Average	12.38	27.87	
			Total		1951	

There are 70 kraals that could be measured in Group II homesteads within C08. Most of the estimates of cattle per sub-cluster and the total stock figure of 1951 for the whole cluster are therefore obviously incomplete values and have little comparative significance (Table 4.5). Only one measurement from the largest sub-cluster VRD 33/2 could be made, and so its apparent aggregation status cannot be elaborated in relation to kraal sizes and cattle estimates. It can be expected that the total cattle number for the complete VRD 33 sub-cluster would be high, but no particular homesteads within the cluster are particularly large and no one of them stands-out (Fig. 4.2, Table 4.5).

It may be that VRD 27/1 had the highest cattle numbers, but this estimate is based on a single measurement of the complete kraal complex including the secondary enclosure. The estimate of 494 cattle for VRD 27/1 seems high and this would be reduced if it was possible to subtract the secondary enclosure area from the calculation. It is of interest that the complete kraal space in VRD 27/1 accounts for about 24% of the total homestead area (Table 4.5). These numbers can be evaluated against VRD 23/1 which is a single homestead sub-cluster that is similar in size to VRD 27/1 but from which a near total sample of 17 linked central enclosures were measured. It should be noted that individual kraals in these linked complexes are relatively small and the incomplete measurements of kraals from other homesteads support this (Table 4.5).

The estimate of VRD 23/1 total kraal area is 2171m^2 which is only about 8% of the homestead area. It should be kept in mind that not all 17 measured kraals served the primary purpose of keeping adult cattle, and that some of the smaller enclosures may have served as weaning pens for juveniles and therefore were not always in use, or could have been used probably for sheep and goats. Other homesteads where the kraals could be separately measured such as VRD 41/1 (10%), 31/1 (8%), 22/2 and 22/3 (both around 6%), are reasonably consistent, and together suggest that the VRD 27/1 estimate is far too high. Additionally, other homesteads in which only a single measurement of the central complex was taken, such as 21/1 and 28/1 also give a high estimate of 26% and 29% respectively of kraal to total homestead area, and the secondary enclosure again accounts for some of this possible inflation.

Based on these calculations VRD_33 is the biggest sub-cluster, but only one central enclosure was measurable in it, therefore cattle number do not reflect the correct stocking capacity of this sub-cluster. VRD_27 is prominent in terms of cattle numbers but this could be an over-estimate. Additionally VRD_27 is isolated from the rest of the homesteads in the cluster on the basal contour of the small hill to south of the main cluster. VRD_33, on other hand, is situated close to other homesteads. On the basis of stocking capacity, the incompleteness of the data makes it difficult to objectively identify a dominant homestead. On the basis of aggregation, however, VRD 33 is clearly the most prominent sub-cluster in the general cluster 08 region

Cluster 10

This cluster consists only of Group II settlements. All sites are located in close proximity to water sources. All nineteen homesteads are located between the 1500m and 1540m contour lines (Table 4.6). The biggest sub-cluster (VRD 10) is made up of nine homesteads perched on the small hill at the northern edge of the cluster, and is in fact the most northerly Group II settlement unit in the Dome (Fig. 4.3). It is a good example of a tight Group II cluster and because of this I have inserted the aerial view (Fig. 4.4). There are other sub-clusters in this cluster that are also associated with hills. Although these hills are relatively low in terms of altitude, the hilltop preference of Group II settlements, does contrast with Group I settlements. This cluster is also made up of three single homesteads, two sub-clusters consist of two-homestead units, and one settlement is a three-homestead unit (Table 4.7 and Fig. 4.3). While it is clear from this settlement arrangement that VRD_10 is the biggest aggregated sub-cluster and is physically dominant, this observation can be tested through cattle stocking estimates (Table 4.8).

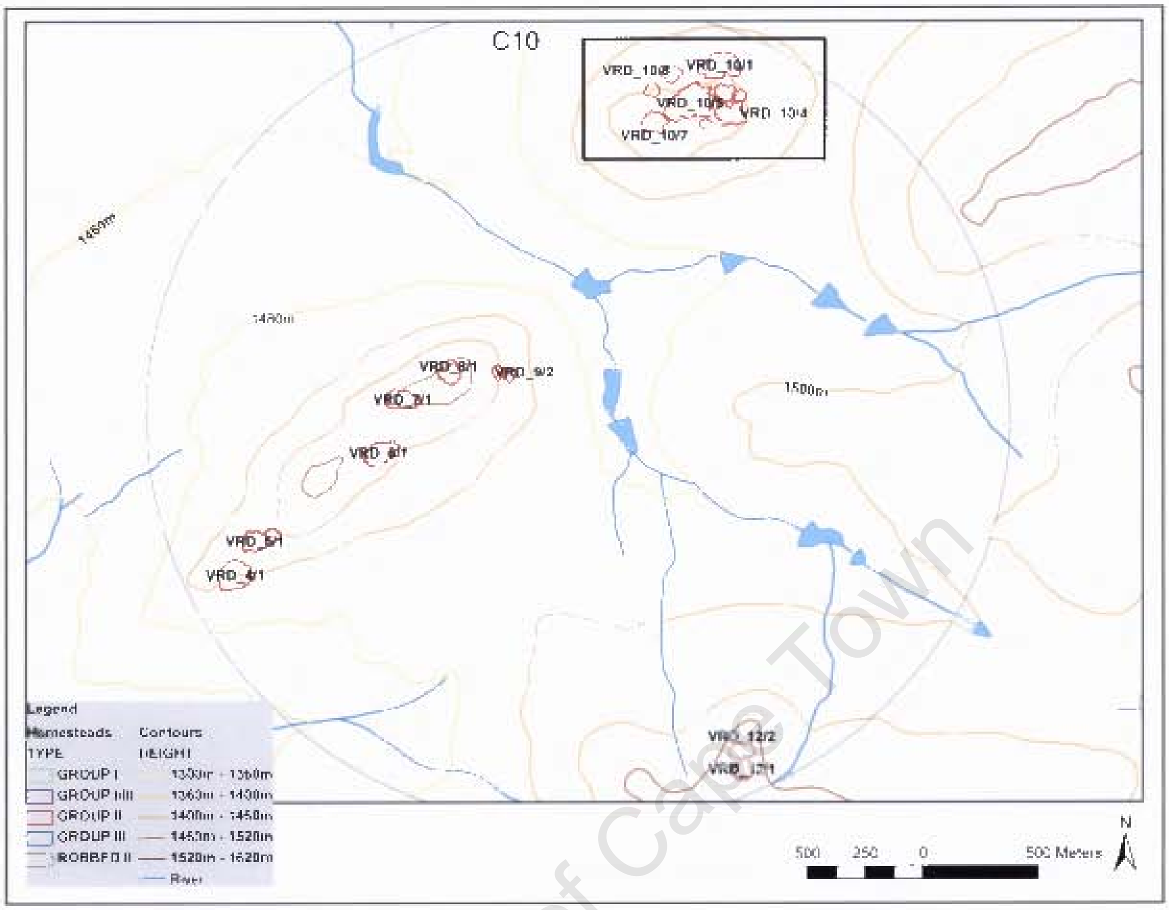

Figure 4.3: Group II homestead distribution in C10. The black box encloses the biggest sub-cluster.

Table 4.6: The altitudinal distribution of homesteads in Cluster 10

Altitude(+)	N0.of Homesteads	
1500m	6	32%
1520m	9	47%
1540m	4	21%
	19	

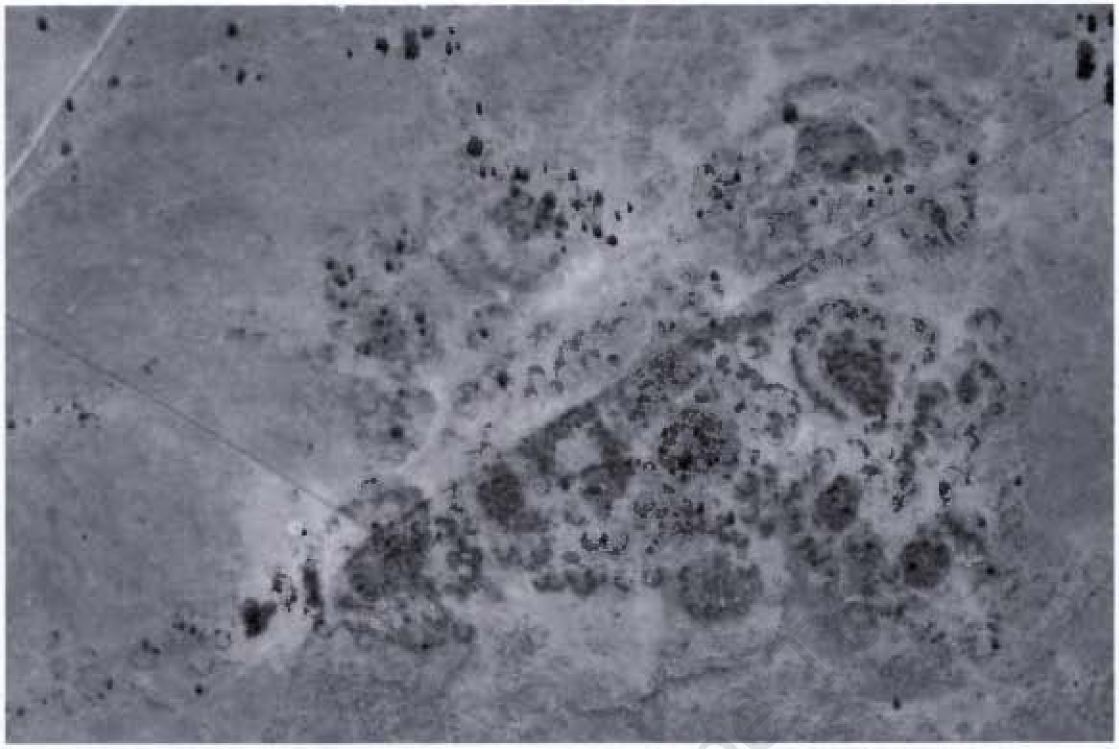

Figure 4.4: Aerial photograph of the nine-homestead sub-cluster (VRD_10) in C10.

Table 4.7: Settlement Density in Cluster 10

Aggregation ranking	Sub-Clusters	Homesteads	
1	3	3	16%
2	2	4	21%
3	1	3	16%
9	1	9	47%
TOTAL	**7**	**19**	100%

Cluster 10 has 44 measurable kraals that have the total stocking capacity of 1220 cattle. On average each of these kraals could have held 28 cattle. Where an estimate can be made, kraals take up about 9.8% of total homestead area, with average kraal space ranging between 5.11% (VRD_5/1) with 33 cattle, and 10.23% (VRD_6/1) with 105 cattle. The largest sub-cluster, VRD_10, has an estimated capacity of 770 cattle with the average kraal space of 7.61% per homestead area. This sub-cluster clearly has the highest estimated number of cattle in this cluster. The next highest is the estimate of 127 cattle for VRD_8. The lowest cattle stocking estimate is 57 cattle for VRD_5 (Table 4.8).

Based on these estimates VRD_10 has the highest number of cattle. No other homesteads or sub-clusters can match this, and it is clearly the dominant Group II sub-cluster in C10.

Table 4.8: Analysis of stock capacity in C10, representing homesteads whose kraals were measurable

H-ID	HArea (sqm)	Kraal-ID	KraalArea (sqm)	Kraal as a % of homestead	N0.of Cattle	Cattle per sub-cluster
VRD_10/1	13567.55	CE_477	81.25		8	
VRD_10/1	13567.55	CE_478	56.76		6	
VRD_10/1	13567.55	CE_479	56.2		5	
VRD_10/1	13567.55	CE_480	84.43		8	
VRD_10/1	13567.55	CE_481	75.83		8	
				2.61		
VRD_10/2	4269.89	CE_482	51.46		5	
VRD_10/2	4269.89	CE_483	50.34		5	
VRD_10/2	4269.89	CE_484	79.05		8	
VRD_10/2	4269.89	CE_485	60.6		6	
VRD_10/2	4269.89	CE_486	47.78		5	
				6.77		
VRD_10/3	1789.13	CE_490	164.13	9.17	16	
VRD_10/4	8380.69	CE_487	715.9		72	
VRD_10/4	8380.69	CE_488	461.22		46	
VRD_10/4	8380.69	CE_489	660.76		66	
				21.93		
VRD_10/5	21489.03	CE_491	1280.12		128	
VRD_10/5	21489.03	CE_492	1917.08		192	
VRD_10/5	21489.03	CE_493	573.99		57	
				17.55		

VRD_10/7	**6834.91**	**CE_494**	**984.84**	**14.41**	**98**	
VRD_10/8	**4037.05**	**CE_472**	**70.25**		**7**	
VRD_10/8	**4037.05**	**CE_473**	**52.68**		**5**	
VRD_10/8	**4037.05**	**CE_474**	**45.22**		**5**	
VRD_10/8	**4037.05**	**CE_475**	**67.84**		**7**	
VRD_10/8	**4037.05**	**CE_476**	**71.38**		**7**	
				7.61		**770 Cattle**
VRD_4/1	13517.38	CE_453	191.3		19	
VRD_4/1	13517.38	CE_454	155.49		16	
VRD_4/1	13517.38	CE_455	183.86		18	
VRD_4/1	13517.38	CE_456	125.55		13	
VRD_4/1	13517.38	CE_457	211.96		21	
VRD_4/1	13517.38	CE_458	134.5		13	
				7.42		**100 Cattle**
VRD_5/1	6556.77	CE_459	220.42		22	
VRD_5/1	6556.77	CE_460	50.96		5	
VRD_5/1	6556.77	CE_461	63.98		6	
				5.11		
VRD_5/2	3170.12	CE_202	263.02	8.30	26	**57Cattle**
VRD_6/1	10282.36	CE_462	91.95		9	
VRD_6/1	10282.36	CE_463	112.7		11	
VRD_6/1	10282.36	CE_464	67.03		7	
VRD_6/1	10282.36	CE_465	68.09		7	
VRD_6/1	10282.36	CE_466	113.21		11	
VRD_6/1	10282.36	CE_467	116.24		12	
VRD_6/1	10282.36	CE_468	482.82		48	
				10.23		**105 Cattle**
VRD_7/1	8168.77	CE_469	288.09		29	
VRD_7/1	8168.77	CE_470	74.24		7	
VRD_7/1	8168.77	CE_471	231.37		23	
				7.27		**59 Cattle**
VRD_8/1	5696.56	CE_61	1266.22		127	**127 Cattle**
		44 Kraals	Average	9.87	27.73	
			Total		1220	

Cluster 11

This cluster consists of both Group I and Group II settlements. However the following discussion only focuses on Group II homesteads. This cluster has twenty-six homesteads, mostly distributed below the 1500m relief line. The homesteads are generally located upslope away from the more flat landscape below. They are within 500m of water sources (Fig. 4.5).There are twenty six homesteads that make up nine sub-clusters in C11, and 38.46% of these are found in one sub-cluster (VRD 65, 67, 68, 69), which is also the biggest sub-cluster in C11 (Table 4.9). This sub-cluster, made-up of ten-homestead units, is situated on and around a small hill (Fig. 4.5).

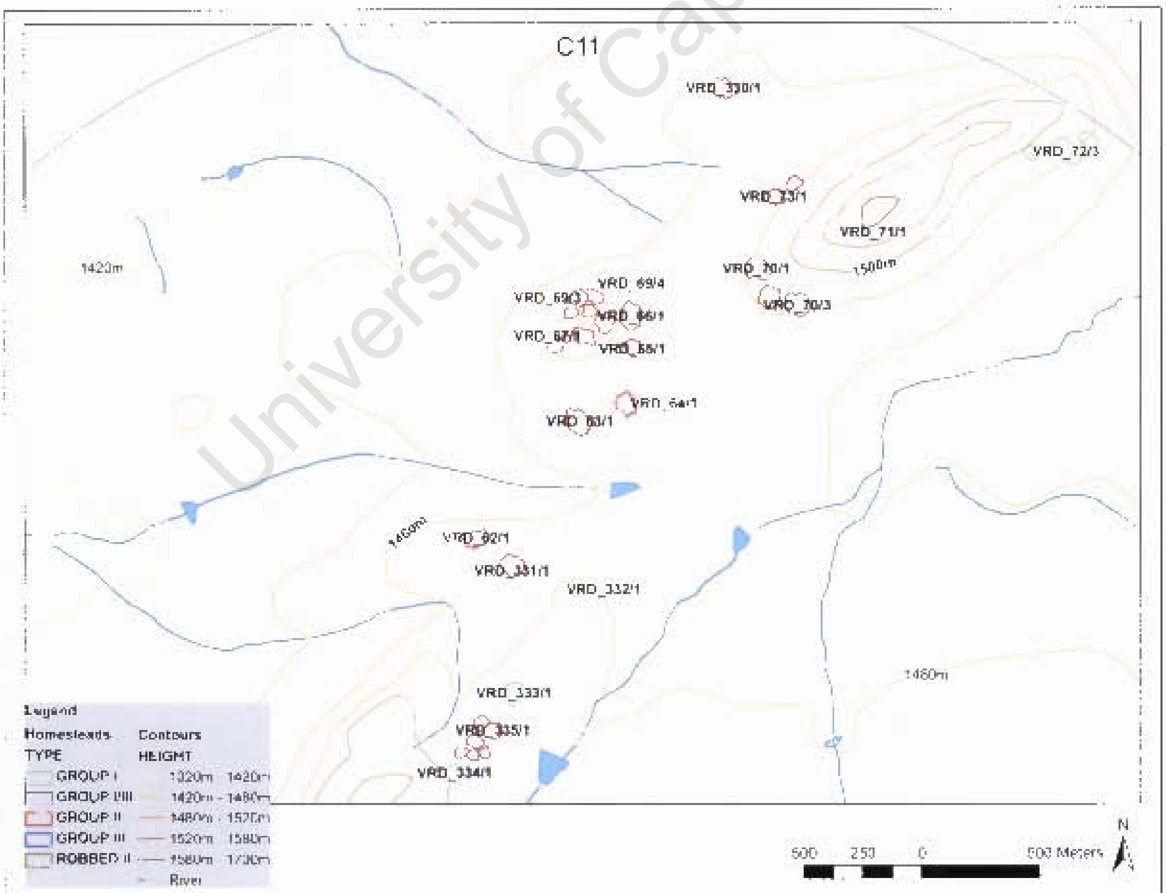

Figure 4.5: Cluster 11 Group II homesteads.

From this settlement arrangement, the aggregation of these ten homesteads stand out and one may suggest that it was the dominant settlement in C11. This possibility was tested through estimates of cattle stocking capacity (Table 4.10).

Table 4.9: Settlement Density in Cluster 11 Group II settlements

Aggregation ranking	**Sub-Clusters**	**Homesteads**
1	5	5
2	1	2
3	1	3
6	1	6
10	1	10
TOTAL	**9**	**26**

Cluster 11 has 28 measurable kraals with a total stocking capacity of 479 cattle. On average each of these kraals can accommodate 17 cattle with kraal percentage of homestead area at 11.73% per homestead. This ratio of kraal to homestead area ranges from 1.50% (VRD_64/1) with 35 cattle, to 26.89% (VRD_69/1) with 53 Cattle. VRD_69/1 is one of the homesteads in the biggest sub-cluster. This sub-cluster has a stocking capacity of 258 cattle. That is 53.86% of all the cattle in this cluster (Table 4.10).

On the basis of these calculations, the highest number of cattle and largest aggregation both make this the prominent sub-cluster and provides a basis for a recognisable settlement hierarchy within Group II C11 settlements.

Table 4.10: Analysis of stock capacity in C11, representing homesteads whose kraals were measurable. (Homesteads making up the biggest sub-cluster are highlighted)

H-ID	HArea (sqm)	Kraal-ID	KraalArea (sqm)	Kraal as a % of homestead	N0.of Cattle	Cattle per sub-cluster
VRD_330/1	6061.53	CE_320	238.95		24	
VRD_330/1	6061.53	CE_321	59.4		6	
VRD_330/1	6061.53	CE_322	72.38		7	
				6.12		**37 Cattle**
VRD_63/1	8333.63	CE_584	94.75		9	
VRD_63/1	8333.63	CE_585	72.04		7	
VRD_63/1	8333.63	CE_586	126.88		13	
VRD_63/1	8333.63	CE_587	95.83		10	
VRD_63/1	8333.63	CE_588	111.78		11	
VRD_63/1	8333.63	CE_589	63.69		6	
VRD_63/1	8333.63	CE_590	95.24		10	
VRD_63/1	8333.63	CE_591	65.89		7	
VRD_63/1	8333.63	CE_592	49.28		5	
				9.30		**78 Cattle**
VRD_64/1	5433.44	CE_574	98.96		10	
VRD_64/1	5433.44	CE_575	164.4		16	
VRD_64/1	5433.44	CE_576	89.75		9	
				6.50		**35 Cattle**
VRD_65/1	**3067.31**	**CE_577**	**173.94**		**17**	
VRD_65/1	**3067.31**	**CE_578**	**84.59**		**8**	
VRD_65/1	**3067.31**	**CE_579**	**108.93**		**11**	
VRD_65/1	**3067.31**	**CE_580**	**92.26**		**9**	
				14.99		
VRD_66/1	**7259.25**	**CE_569**	**136.02**		**14**	
VRD_66/1	**7259.25**	**CE_570**	**144.53**		**14**	
VRD_66/1	**7259.25**	**CE_571**	**90.79**		**9**	
VRD_66/1	**7259.25**	**CE_572**	**106.62**		**11**	
VRD_66/1	**7259.25**	**CE_573**	**63.75**		**6**	
				7.46		
VRD_67/1	**4608.5**	**CE_583**	**681.5**	**14.79**	**68**	

VRD_69/1	**1974.71**	**CE_581**	**530.92**	**26.89**	**53**	
VRD_69/5	**4069.43**	**CE_582**	**380.39**	**9.35**	**38**	**258 Cattle**
VRD_70/1	6945.04	CE_568	706.62	10.17	71	**71 Cattle**
		28 Kraals	Average	11.73	17.11	
			Total		479	

Cluster 13

This cluster has nine homesteads, mostly distributed on gentle slopes without any specific aspect. They are within 500m of small drainages (Fig. 4.6). The homestead frequency given here includes the Group II settlement identified as ‘Robbed II’. There are six sub-clusters with a maximum homestead ranking of two (Table 4.11). Therefore, from this settlement arrangement, there is no physically recognisable political centre in this cluster. This observation was tested through cattle stocking capacity calculations (Table 4.12).

Table 4.11: Group II settlement density in C13

Aggregation ranking	**Sub-Clusters**	**Homesteads**
1	3	3
2	3	6
TOTAL	**6**	**9**

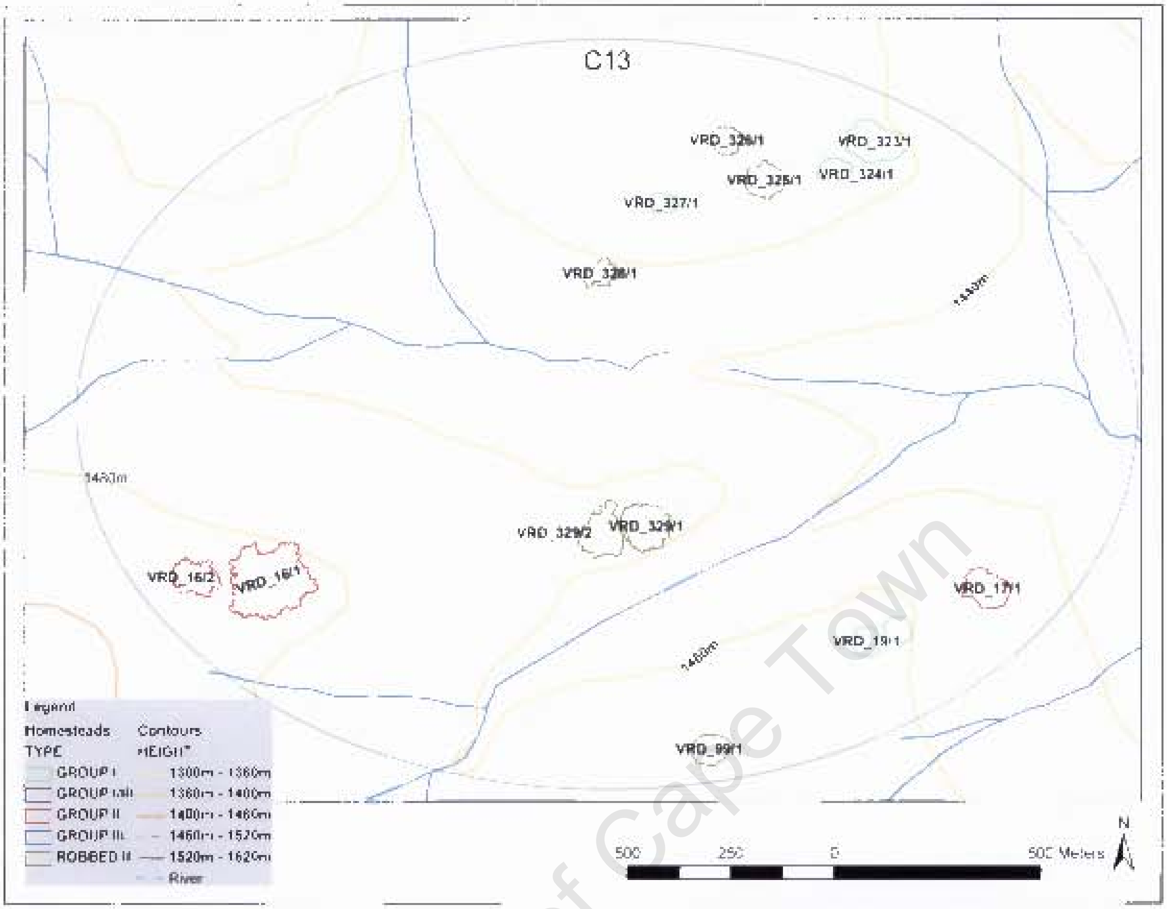

Figure 4.6: Cluster 13 Group II homesteads which here include Robbed II sites.

Cluster 13 has 22 kraals that have a total estimated stocking capacity of 659 cattle. On average each of these kraals can accommodate 30 cattle with a kraal percentage of homestead area of 10.33%. This ratio of kraal to homestead area ranges from 4.241% (VRD_16/1) with 103 cattle, to 23.29% (VRD_326/1) with 255 cattle. This is the highest stocking capacity in C13, taking up 38.69% of the total stock. Another sub-cluster with large cattle numbers is VRD_328 with 143 cattle, and the rest range in the 50 cattle mark. The largest sub-cluster on the basis of cattle capacity is VRD_326. Since this is the only variable we can use in assessing this cluster, I suggest that VRD_326 can be considered as the dominating settlement in this cluster, thus, providing us with the reasonable degree of settlement hierarchy.

Table 4.12: Analysis of stock capacity in C13, representing homesteads whose kraals were measurable. (Highlighted are the homesteads making up the sub-cluster with largest number of cattle).

H-ID	**HArea (sqm)**	**Kraal-ID**	**KraalArea (sqm)**	**Kraal as a % of homestead**	**N0.of Cattle**	Cattle per sub-cluster
VRD_16/1	24508.88	CE_495	181.26		18	
VRD_16/1	24508.88	CE_496	168.15		17	
VRD_16/1	24508.88	CE_497	331.22		33	
VRD_16/1	24508.88	CE_498	94.64		9	
VRD_16/1	24508.88	CE_499	132.75		13	
VRD_16/1	24508.88	CE_500	130.34		13	
			1038.36	4.24		**103 Cattle**
VRD_17/1	7115.01	CE_504	165.15		17	
VRD_17/1	7115.01	CE_505	100.45		10	
VRD_17/1	7115.01	CE_506	78.97		8	
VRD_17/1	7115.01	CE_507	156.05		16	
				7.04		**51 Cattle**
VRD_325/1		**CE_55**	**1732.1**		**173**	
VRD_326/1	**3540.78**	**CE_54**	**824.65**	**23.29**	**82**	**255 Cattle**
VRD_328/1		CE_57	1432.29		143	**143 Cattle**
VRD_329/2	8712.78	CE_501	260.39		26	
VRD_329/2	8712.78	CE_502	98.34		10	
VRD_329/2	8712.78	CE_503	160.22		16	
				5.96		**52 Cattle**
VRD_99/1	4981.69	CE_354	188.5		19	
VRD_99/1	4981.69	CE_355	120.64		12	
VRD_99/1	4981.69	CE_356	89		9	
VRD_99/1	4981.69	CE_357	38.96		4	
VRD_99/1	4981.69	CE_358	43.72		4	
VRD_99/1	4981.69	CE_359	73.23		7	
				11.12		**55 Cattle**
		22 Kraals	Average	10.33	29.95	
			Total		659	

4.1.1 Group II Preliminary Discussion

The Group II settlements in the Vredefort Dome are associated more with hilltop localities. They are distributed outside the rugged ridges in northwest of corner of the Dome. They are mostly located at the altitude of 1460m with the homesteads density decreasing as altitude increases above this height (Fig. 4.7). There is, however, no repeated aspect or orientation pattern.

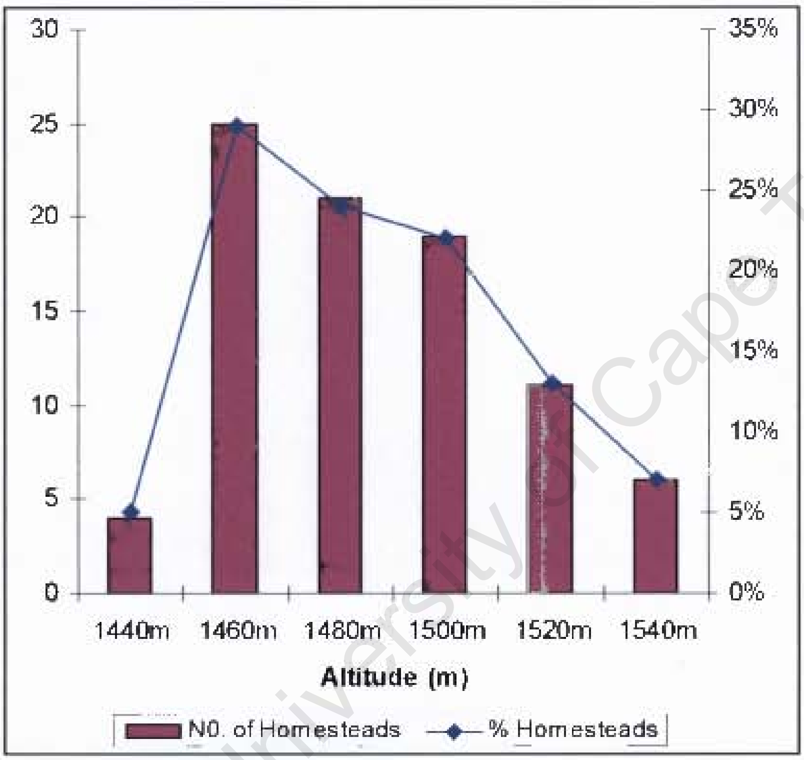

Figure 4.7: The summary of Group I homesteads relief location

Of all the thirty-eight sub-clusters in Group II, there were three that clearly stood out in terms of homestead aggregation. These are the nine-homestead sub-cluster in C10 and the two ten-homestead sub-clusters in C08 and C11 respectively. Even though there are these big sub-clusters within the clusters, the greater percentage of homesteads fall within the low aggregation ranks, and specifically, 89.5% of the sub-clusters are within 1 to 3 aggregation ranking (Table 4.13), which is a similar pattern observed for Group I settlements. On the basis of homestead aggregation, there may be a more recognisable dominant centre within clusters C08, C10 and C11, and as shown by the cattle stocking capacity calculations, this is backed up by large cattle capacities. However, the average kraal space per homestead within a cluster appears to be fairly even, relative to the mean average of 11.08% within a cluster (Table 4.14 and Fig. 4.8). While the homestead aggregation and cattle capacity have pointed to some degree of political hierarchy within the clusters, the average kraal space per homestead area showed that there is physically no regionally dominant centre amongst the Group II settlements in the Vredefort Dome discussed so far.

These data could be treated in two ways. One is that the area of linked kraal space (as outlined above) reflects an estimate of actual cattle numbers. The higher percentage that obviously results when the central secondary enclosure is added suggest that considerable space is given to the management of cattle, and that as is obvious from the aerial photos, the combined central kraal area contributes to the prominence of the Group II central kraal complex.

Table 4.13: Group II sub-clusters in the Vredefort Dome.

Aggregation ranking	**C08**	**C10**	**C11**	**C13**	**Sub-clusters per rank**
1	10	3	5	3	**21**
2	3	2	1	3	**9**
3	2	1	1		**4**
4					
5					
6			1		**1**
7					
8					
9		1			**1**
10	1		1		**2**
Sub-clusters per cluster	**16**	**7**	**9**	**6**	**38**

Table 4.14: Group II clusters summary of cattle stocking capacity

Cluster	Highest aggregation Ranking	Largest cattle Capacity	N0. of kraal	Average kraal area as a % of homestead area	N0. of cattle
C08	10	494	70	12.38	1951
C10	9	770	44	9.87	1220
C11	10	258	28	11.73	479
C13	2	255	22	10.33	659
		Average	**41**	**11.08**	**1077**
		Total	**164**		**4309**

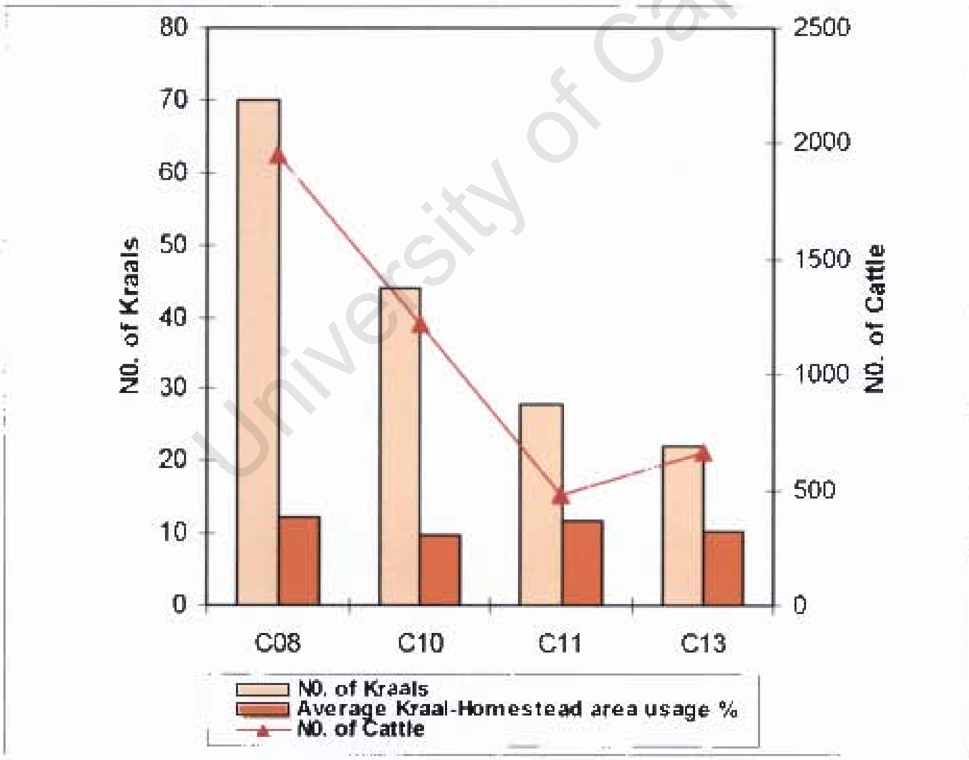

Figure 4.8: Summary of cattle stocking capacity in Group II clusters.

In order to add to the discussion concerning the seemingly low level of political and economic differentiation within Group II, I now turn to the Askoppies Group II complex.

4.2 Settlement Aggregation: Askoppies

Askoppies (Fig. 4.9) is situated on the south-western end of the stone wall distribution. It has by far the largest aggregation of Group II settlements in the Vredefort Dome. The tight concentration of homesteads and intersection of the walls on the aerial photograph made it difficult to outline the distinct homesteads boundaries. However, by identifying the central enclosures, most of which were not measurable, one-hundred and four homesteads were counted. As shown in the Table 4.15, about 85% of the homesteads at Askoppies are Group II settlements, but 13% are Group I. However, some homesteads could not be distinctively classified, due to blurred boundaries, and they appeared to be either of the types, and are labelled as Group II/III. There were no positively identified Group III settlements in the distribution (Fig 4.10). The Askoppies homesteads are located between the 1420m and 1520m contours. This is a raised and expansive gentle slope that allowed the growth of the settlement. This settlement is also located at a higher attitude relative to the low lying agricultural lands in its vicinity (Fig. 4.9). While there is an abundance of water, wood may have been in short supply in this locality as the flatter parts of the Vredefort Dome are predominantly grasslands (Taylor 1979; Balkwill 2005).

Table 4.15: The frequency of settlement types at Askoppies.

	GROUP I	**GROUP II**	**GROUP III**	**GROUP I/III**	**GROUP II/III**	**ROBBED II**	**Total**
Askoppies	14	88		0	2	0	104
Homesteads	13%	85%	0%	0%	2%	0%	100%

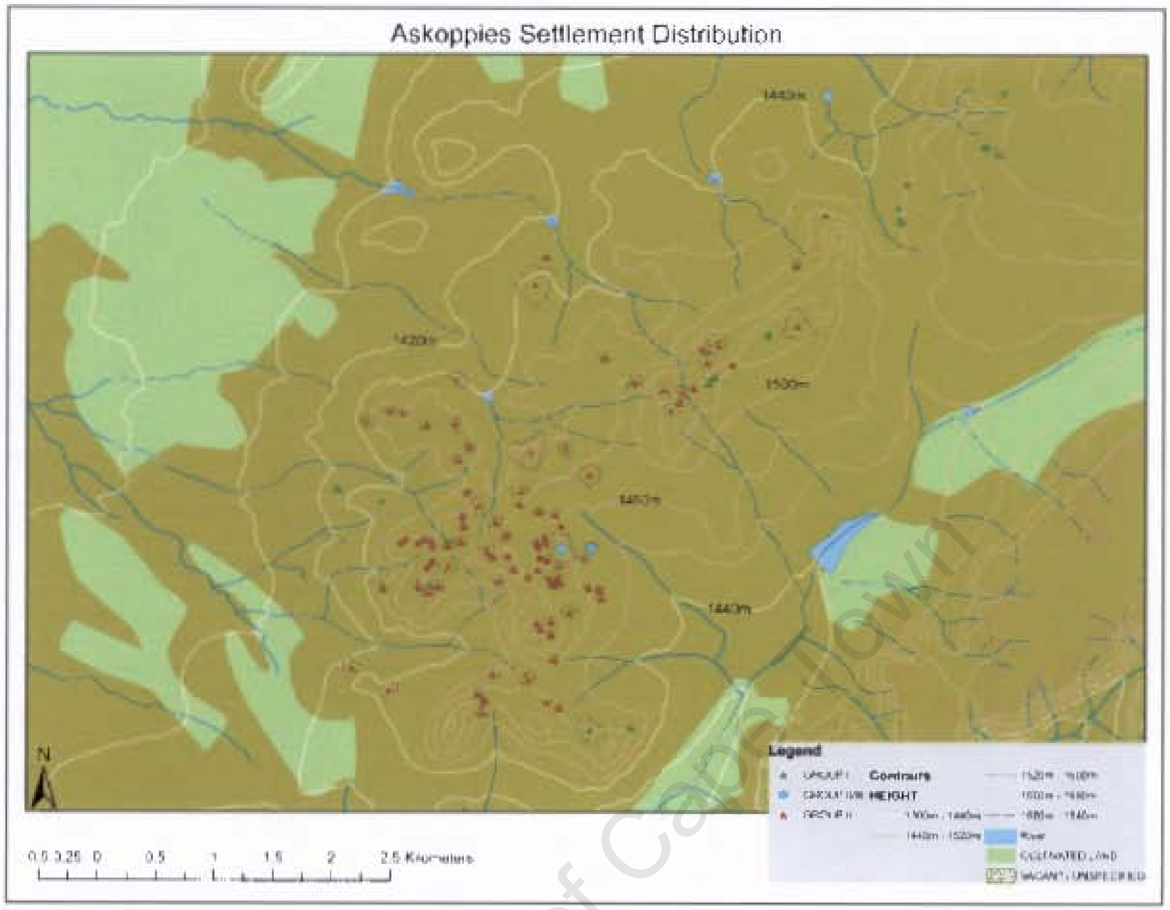

Figure 4.9: Askoppies settlement distribution.

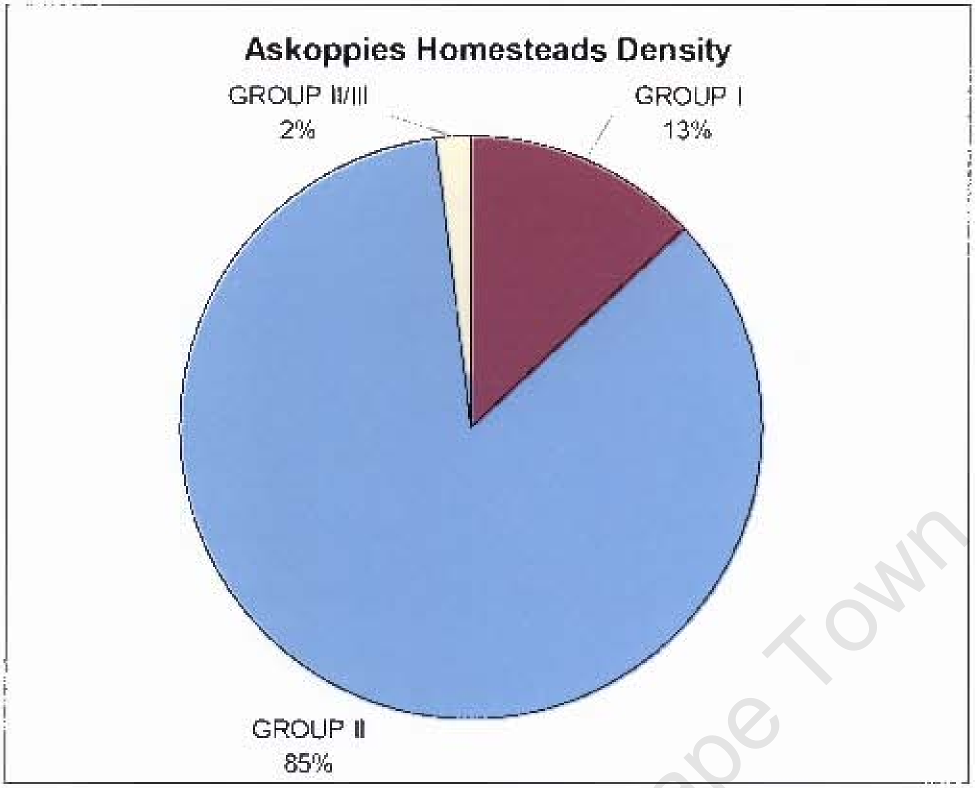

Figure 4.10: The proportion of Askoppies homesteads in the Vredefort Dome.

With the high degree of homestead clustering in this settlement, measuring these areas was unrealistic and no representative sample equivalent to those given above could be obtained. Based on what I could see of homestead size, there does not seem to be a significant difference in homestead size across the whole aggregation. I therefore used Pelser's (2003) maps as points of reference. From the spatial plan of Settlement Units A and B that Pelser excavated, I calculated the homestead area and the area of the central enclosures so that I could make a comparison between Askoppies and the similar calculations of Group II and Group I settlements in the main Vredefort Dome. This is important and fortunate, because Settlement Unit B is identified by Pelser as the Chief's homestead, and this homestead and central kraals would be expected to be large and have high cattle stocking capacity if there is significant political hierarchy within the settlement. Settlement Unit A has 4 kraals, which take up about 5% of the homestead area. The value does not deviate much from the 5.2% used by the five kraals in the Chief's homestead. There is however a significant difference in the cattle stocking estimates of the two settlements. The Chief's kraals could have held about 57 cattle while only 13 were calculated for settlement Unit A (Tables 4.17. and 4.19). The average kraal space to homestead area in Group II clusters is about 11% (Table 4.14). This is almost double the value for the measured Askoppies homesteads.

Table 4.16: The size of Settlement Unit A (calculated from Pelser 2003:16). (C=circumference; D=diameter)

Map Scale: 1.5cm=5m	C(cm)	D(cm)	Radius (cm)	Radius (m)	Area (m^2)
Unit A	49	17	8.500	28.331	2521.496
Kraal a	7.6	3	1.500	5.000	78.524
Kraal b	4	1.5	0.750	2.500	19.631
Kraal c	3	1	0.500	1.667	8.725
Kraal d	3	1.5	0.750	2.500	19.631

Table 4.17: Cattle stocking capacity in Settlement Unit A

HArea (m^2)	Kraal-ID	Kraal Area (m^2)	Kraal area as a % of homestead area	N0. of Cattle
2521.496	Kraal a	78.524		8
2521.496	Kraal b	19.631		2
2521.496	Kraal c	8.725		1
2521.496	Kraal d	19.631		2
	4 Kraals	Average	5.017	
			Total	13

Table 4.18: The size of Settlement Unit B (calculated from Pelser 2003:17). (D=diameter)

Map Scale: 0.7cm = 5m	D(cm)	Radius (cm)	Radius (m)	Area (m2)
Unit B, Chief's kraal	16.5	8.25	58.92975	10909.86
Kraal a	2.4	1.2	8.5716	230.8201

Kraal b	1.4	0.7	5.0001	78.54296
Kraal c	1.8	0.9	6.4287	129.8363
Kraal d	1.5	0.75	5.35725	90.16411
Kraal e	1	0.5	3.5715	40.07294

Table 4.19: Cattle stocking capacity in Settlement Unit B

HArea (m^2)	Kraal-ID	Kraal Area (m^2)	Kraal area as a % of homestead area	N0. of Cattle
10909.857	Kraal a	230.820		23
10909.857	Kraal b	78.543		8
10909.857	Kraal c	129.836		13
10909.857	Kraal d	90.164		9
10909.857	Kraal e	40.073		4
	5 Kraals	Average	5.219	
			Total	57

These numbers are suggestive, but the sample size is far too small. It does however, raise the issue of sequence within Group II settlements. If Askoppies does date to the *difaqane* of the early 19th century, stress on resources such as cattle may have been greater and numbers per homestead generally lower. More work on the ground is needed to raise the value of these comparisons. Overall, the scale of Askoppies indicates that while homestead cattle numbers may be lower, the overall numbers for the whole aggregation must have been extremely high.

While the locality of Askoppies is generally consistent with the rest of Group II settlements in the Vredefort Dome, it is the magnitude of this aggregation that distinguishes this settlement. The stone-wall sites of Askoppies provide a classic example of an exceedingly large Sotho/Tswana aggregation. But on the basis of this brief discussion of Pelser's (2003) identifications, and using the criteria of homestead and kraal size, the political hierarchy is not explicitly expressed using these attributes. This is in sharp contrast to Tswana towns such as Marothodi (Anderson, 2005), Molokwane (Pistorius, 1992) and Kaditshwene (Boeyens, 2000), where really big central homesteads are clearly visible and which completely dominate and standout from the other commoners' homesteads in these Tswana towns.

Comparison between Group I and Group II settlements.

From the general stone wall distribution in this area, Group I settlements dominate. Even if the estimate of homesteads at Askoppies was included in the frequencies, Group I settlements would still dominate. Another contrast between these settlement types is their topographical location. Group I sites are associated more with the rugged terrain of the Dome while Group II settlements tend to be found on the undulating landscape outside the Dome ridges. The suggestion is that Group I settlements are optimally located to access and manage a range of resources. Group II settlements could obviously gain access to these same resources but the preferred locations are away from the Dome and associated more with discrete hills.

The dominance of Group I sites against Group II is more pronounced when the raw frequencies of homesteads are compared. There are 484 Group I homesteads and 86 Group II across the region. This is a fair contrast because the large regional coverage in this research. On the basis of aggregation ranking, it appears that, even though the Group II sample is smaller, high level aggregations are common within this sample. However, there is a degree of similarity for both Group I and Group II sub-clusters to have a high percentage of homesteads that are single or related to others in low aggregation ranks. Specifically, about 90% and 89.5% of Group I and Group II respectively, are within aggregation ranks 1, 2 and 3. The degree of homestead aggregation and cattle capacity indicated that Group II settlements present a more obvious hierarchy than Group I settlements at the cluster level. However, at a regional scale there is no certainty about cluster ranking. On the part of Group I, the problem of chronological control makes this discussion speculative in the extreme. This problem also applies to Group II clusters and it not known whether the large Askoppies aggregation was contemporary with the other Group II clusters. If so, it clearly dominates the landscape. While the size of Askoppies must have been under a more central chief, on the criteria used to compare between homesteads, this is not obvious and on the basis of qualitative observation and the small sample analysed, the average kraal space per homestead area was similar in both the identified Chief's homestead and a commoner settlement Unit.

5. CONCLUDING DISCUSSION

One of the objectives of this research was to identify stone-wall settlements over a much wider area of the Vredefort Dome than that covered by Taylor (1979). Although three types of stone-wall types were identified I focused mainly on Group I and Group II sites, and paid little attention to Group III. At this larger scale of coverage the number of Group II settlements is small compared to Group I settlements. On the basis of Geographical Information Systems (GIS) generated maps, the following distribution was found:

Group I settlements:

$$\frac{\text{(Main Vredefort Dome sites)} + \text{(Askoppies sites)}}{\text{Total Homestead frequency in the study area}} \times 100$$

$$= \frac{484 + 14}{582 + 104} \times 100 = 73\%$$

Group II settlements:

$$\frac{\text{(Main Vredefort Dome sites)} + \text{(Robbed II)} + \text{(Askoppies sites)}}{\text{Total Homestead frequency in the study area}} \times 100$$

$$= \frac{77 + 9 + 88}{686} \times 100 = 25\%$$

Compared to the larger sample area covered in this research, Taylor's Buffelshoek Group I sites make up only 10.6% of the total and account for only 4% of the total Group II sample. With this significant increase in the sample size, the domination of Group I settlements in the region rises to 73%, while Group II contributed 25% of the settlements. Group III and other indistinguishable types made up the remaining 2%. These frequencies do generally confirm Taylor's frequencies from the smaller Buffelshoek sample where he identified 64% of the sites as Group I, and 23% as Group II sites.

All of the stone-wall settlements in the Dome are generally distributed in the north-western section of the Dome. Within this locality Group I settlements tend to be found on the higher hilly, rugged terrain, while Group II sites, though located on hilltops were found on low lying area on the outer 'collar' of the Dome. It seems that the distribution of Group I sites was geared more to a compromise between different resources. As demonstrated in the Chapter 3 discussion of the clusters, Group I homesteads locations satisfy immediate agricultural needs, wood for fuel and a general and easy access to grazing areas further afield. In contrast, the Group II homesteads, and particularly Askoppies, selected relatively extensive, but more isolated hills away from the main Dome, but with large areas that could accommodate more extensive aggregations. To a certain extent the character of Group II locations allowed them an extensive view over the surrounding lower land in all directions, which could have served as a defence strategy. This appears not to have being a concern in the way the Group I settlements are located. As indicated, Group I sites were generally found across the different geological formations but it was terrain that seems to be the generally important factor. Equally, while Group II sites, as Taylor noted, were confined to open lava (Andesite), it was the typography that was important.

When investigating the nature of aggregation in Late Iron Age communities of the Vredefort Dome it is appropriate that these communities are examined within the bounds of known identities. Additionally, and as far as can be reconstructed, one also has to consider the historical circumstances. With the early stone walling found in the KwaZulu-Natal midlands, coupled with ceramic analysis, Huffman (2007) identifies Group I (Type N) as originating from Nguni-speaking communities. These settlements were occupied between AD 1450 and AD 1650 (Huffman, 2007:167). The majority of Group I settlements in the Dome are single homestead sub-clusters, and this relative dispersion supports the nature of

Nguni-speakers' settlements. Therefore on the basis of settlement locality and location the Nguni origins of the Group I settlements in the Dome is supported.

Group II (Type Z) settlements were occupied between AD 1700 and AD 1840 (Huffman 2007:203), which is obviously after, and much later than the Group I sites. It is most likely, as suggested by Pelser (2003), that the Vredefort Dome Group II settlements, especially Askoppies, date to the early 19th century, and date to the specific historical circumstances of the *difaqane*. They were occupied by Rolong Sotho/Tswana speakers (Taylor 1979, Pelser 2003, and Huffman 2007). Time and historical context are important because the Group I distribution could simply reflect the cultural preferences of Nguni-speakers on this landscape. In contrast, Group II, Southwestern Sotho/Tswana, are responding to both fulfilling basic agricultural needs but also seeking out more defensive positions because of the early 19th century turmoil of the *difaqane.*

While the distribution and aggregation of Group II sites can be related to historical events to do with the *difaqane*, it has been appropriate that the nature of Group I clusters be assessed with the aid of Nguni-speaking ethnography. In order to understand what the distribution of Group I settlements in the Vredefort Dome might mean in terms of ethnographic reality, I use Hammond-Tooke's (1991) ethnographic work to explain the relatively dispersed nature of Group I settlements.

The Vredefort Dome settlements, which are predominantly Group I sites are clearly not stratified, and on the basis of the homestead and kraal analysis it is , at this stage imprudent, to read too much into differences in Group I settlement size and estimated cattle numbers. Higher levels of aggregation among Group I homesteads must relate to more complex kin relations, and it is at such sub-clusters that future archaeological work could be directed. On the basis of estimated cattle capacity and homesteads size, there is no apparent physical regional political stratification. However some degree of social hierarchy is possible at a cluster level, between sub-clusters, and within homesteads. According to Hammond-Tooke (1991) the organisation of the Vredefort Dome Group I settlements can be explained as depicting kinship and descent relations where political power is not necessarily involved. And it would not be realistic to identify any regional hierarchy between Group I clusters within "the exiguous, and consensually-based" (Hammond-Tooke, 1991: 194) Nguni system, hence very little differentiation can be expected within these clusters. As noted among the Cape Nguni the kinship groups, small "agnatic cluster" (Hammond-Tooke 1991: 191), can develop a social structure in which a genealogical senior men, "the *intloko* and the *inkulu*" (Hammond-Tooke 1991: 192) could exercise authority which was administrative rather than political in nature.

As described by Hammond-Tooke, this relatively dispersed pattern of autonomous homesteads and sub-clusters is the Nguni preference, and it supports Huffman's suggestion that Group I settlements are Nguni-speakers. On the basis of cattle stock capacity there are clear distinctions between some homesteads and sub-clusters in terms of cattle holdings and the degree of aggregation, but the archaeology does not show radical differences. It was also noted that, irrespective of the size of the homestead, the percentage of Group I kraal space to overall homestead space is very consistent. According to Huffman this social organisation can be due to the cultural and male dominated emphasis on pastoralism among Nguni-speakers, as described in this quote:

> "Because of the volatility of cattle wealth, and the exaggerated emphasis on cattle, Nguni place a high value on political independence. As a result, most political affiliations before the nineteenth century were limited to low-level units, such as neighbourhoods, or at best small-scale chiefdoms" (Huffman 2007: 441).

It is this general pattern and preference that explains the Group I settlement patterns and the relatively even archaeologically measured estimates of cattle wealth, homestead size and low levels of aggregation.

Where there was some Group I aggregation this was not political but rather socially authoritative. Group II settlements, and in particular Askoppies, provides a stark contrast in the scale of aggregation in the Vredefort Dome, and this can be tied to the needs of political centralisation in the context of the *difaqane*. Although Askoppies is the significantly large aggregation in the Dome, it is however, different from the large classic agglomerations such as Molokwane (Pistorius, 1992), Kaditshwene (Boeyens, 2000) and Marothodi (Anderson, 2005). As discussed in the previous chapters, on the basis of the size of the homesteads and kraals sizes of the homesteads identified by Pelser (2003) as being elite, these do not really stand out from the rest of the homesteads in the aggregation. Indeed, most of the Group II homesteads in the main Vredefort Dome area had larger central enclosures compared to Askoppies. Although there might be centralised leadership at Askoppies, this leadership does not seem to be expressed through homestead and cattle kraal size. Furthermore, the Askoppies aggregation may be seen more as a low level political hierarchy in which, the strategy of the aggregation focuses on safety in numbers. While the safety in numbers strategy is clearly evident at towns such as Molokwane Kaditshwene and Marothodi, it is relatively easy to identify the elite and political centres at these sites. Large central homesteads with extensive cattle kraal systems stand out from the many commoner homesteads that make up the rest of these towns. If it is correct to draw a distinction between different kinds of aggregation, in which there is variability in the scale of political power, what might this variability be attributed to? Obviously particular historical conditions during the late 18^{th} and early 19^{th} century are relevant, particularly as it relates to the longevity of chiefdom in a region. The final form of Molokwane and Marothodi in the Magaliesberg and Pilanesberg areas, are based upon relatively long lived chiefdoms through the 18^{th} century, and in the second half in particular.

Furthermore, these chiefdoms grew within habitats in which productivity may have been higher, compared to the Vredefort Dome. This may have contributed to greater wealth differences as is clearly expressed in the organisation of these large towns. The conclusion is that the nature and expression of aggregated Sotho/Tswana settlements need to be examined on a case-by-case basis. There was clearly a common set of general causes driving this process in the late 18th and early 19th centuries, but the details of each case require separate archaeological, historical and ecological consideration.

The advantage of this study is that it has covered a large area. This has 'captured' most if not all of the settlements, and provided a start for thinking about regional organisation. This research has clearly been 'remote' but it provides a basis upon which to select particular sites in order to try and investigate through excavations some of the subdued hierarchies that may exist between some homesteads and sub-clusters in Group I settlements. Also, it is likely that Group I settlements are not all occupied at the same time but represent a sequence of settlement growth through time. It would, therefore, be important to try and refine the chronology of this Group I sequence. Furthermore, even though we have suggested, along with Pelser (2003), that Askoppies dates to the difaqane period of the early 19th century, the chronology of Group II sites also needs to be more confidently refined. Another issue in this chronology and for the dynamics of regional settlement, would be to address the question of when exactly can the archaeology identify the first appearance of maize, following on from Huffman's (2006) work on maize grindstones and the suggestion of an earlier uptake of maize agriculture in certain areas of the interior, perhaps from the mid-17th century (Huffman 2007:456). The added advantage of maize agriculture for supporting larger populations has been implicated in the rise of large Sotho/Tswana aggregations towards the end of the 18th century. Pelser (2003) however suggested that there was an absence of maize at Askoppies because the lower grindstones are small and morphologically unlike those used for maize. However, Taylor (1979) described grindstones from his Group II sites which on the basis of Huffman's grindstone analysis, would have been classified as maize grindstones. If this is taken into consideration it would appear that the evidence for the presence or absence of maize grindstones at this stage is equivocal due to sample size. Given this uncertainty, this is an important question for future research in the Dome, and for Askoppies in particular.

Lastly, having a relatively complete record of settlements for the Vredefort Dome allows one, as indicated above, to start asking more archaeological questions and design research questions that require excavated data. This record also has implications for the future of this cultural landscape and the practicalities of managing, preserving and presenting these settlements can also drive and prioritise research. Hopefully, this record will contribute greater understanding about the history of Nguni and Sotho/Tswana communities who lived there, as well as contributing to the status of the Vredefort Dome as a World Heritage Site.

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APPENDIX A

A.1 Central Enclosures: Stock Capacity

In order to establish the degree of settlement stratification as expressed by cattle wealth, the areas central enclosures within homesteads were measured to determine the cattle stock capacity in the study area. The results are presented in Tables below by settlement type.

A.1.1 Group I

Kraal_ID	Perimeter (m)	Kraal_ Area(sqm)	Stock Capacity	Hom_ID	Hom_ Area(sqm)	Subcluster	Cluster_ ID
CE_1	97.06	680.59	68	VRD_36/3	2487.07	VRD_36	C08
CE_10	84.36	442.55	44	VRD_75/1	3737.86	VRD_75	C08
CE_100	97.88	635.69	63	VRD_89/1	2905.84	VRD_89	C12
CE_101	53.04	203.04	20	VRD_90/2	2441.45	VRD_90	C12
CE_102	70.73	381.57	38	VRD_90/2	2441.45	VRD_90	C12
CE_103	45.06	146.34	15	VRD_90/3	4717.94	VRD_90	C12
CE_104	140.32	936.57	94	VRD_90/3	4717.94	VRD_90	C12
CE_105	64.55	316.82	32	VRD_90/5	1840.21	VRD_90	C12
CE_106	56.16	233.33	23	VRD_135/2	4298.11	VRD_135	C12
CE_107	33.29	82.75	83	VRD_92/2	929.1	VRD_92	C12
CE_108	94.39	546.03	55	VRD_91/1	3285.95	VRD_91	C12
CE_109	32.94	74.99	75	VRD_91/6	482.32	VRD_91	C12
CE_11	53.11	208.32	21	VRD_37/1	2704.03	VRD_37	C08
CE_110	33.2	72.28	72	VRD_91/6	482.32	VRD_91	C12
CE_111	50.76	195.96	19	VRD_91/3	1640.78	VRD_91	C12
CE_112	55.56	235.37	23	VRD_91/4	1628.97	VRD_91	C12
CE_113	52.51	203.28	20	VRD_91/5	1762.99	VRD_91	C12
CE_114	37.92	109.10	11	VRD_91/5	1762.99	VRD_91	C12
CE_115	75.67	430.08	43	VRD_93/2	4629.25	VRD_93	C12
CE_116	46.92	163.13	16	VRD_93/3	6023.34	VRD_93	C12
CE_117	83.22	499.57	50	VRD_93/3	6023.34	VRD_93	C12
CE_118	108.65	766.66	77	VRD_93/3	6023.34	VRD_93	C12
CE_119	128.32	1068.22	107	VRD_93/2	4629.25	VRD_93	C12
CE_120	37.33	97.17	97	VRD_93/1	1330.32	VRD_93	C12
CE_121	91.77	401.82	40	VRD_134/2	5343.98	VRD_134	C12
CE_122	72.91	353.05	35	VRD_94/1	2644.98	VRD_94	C12
CE_123	42.39	136.93	14	VRD_94/2	1185.37	VRD_94	C12
CE_124	70.96	341.35	34	VRD_95/1	3311.88	VRD_95	C12
CE_125	84.8	519.02	52	VRD_95/3	615.18	VRD_95	C12
CE_126	82.3	499.05	50	VRD_96/1	2581.39	VRD_96	C12
CE_127	72.08	319.65	32	VRD_96/2	1919.46	VRD_96	C12
CE_128	85.62	405.66	40	VRD_97/1	2699.1	VRD_97	C12

CE_129	132.63	1063.57	106	VRD_97/2	2171.89	VRD_97	C12
CE_13	46.25	157.77	16	VRD_39/1	1016.34	VRD_39	C08
CE_130	63.72	290.52	29	VRD_97/3	3510.6	VRD_97	C12
CE_131	127.56	1156.00	116	VRD_98/1	3282.08	VRD_98	C12
CE_132	93.38	474.45	5	VRD_117/1	2820.42	VRD_117	C12
CE_133	37.11	107.04	11	VRD_118/1	1799.13	VRD_118	C12
CE_134	48.43	173.87	17	VRD_118/2	1853.67	VRD_118	C12
CE_135	54.82	225.56	22	VRD_124/1	182.09	VRD_124	C12
CE_136	48.9	180.64	18	VRD_125/1	159.96	VRD_125	C12
CE_137	50.15	184.82	18	VRD_122/1	1498.58	VRD_122	C12
CE_138	58.82	247.02	25	VRD_123/1	1509.83	VRD_123	C12
CE_139	54.05	217.08	22	VRD_120/1	1753.74	VRD_120	C12
CE_140	83.03	472.88	47	VRD_120/2	7289.81	VRD_120	C12
CE_141	56.91	227.58	22	VRD_121/1	3575.62	VRD_121	C12
CE_142	68.36	324.54	32	VRD_121/2	2054.67	VRD_121	C12
CE_143	94.22	646.06	65	VRD_131/1	2293.72	VRD_131	Outlier
CE_144	162.41	1879.54	188	VRD_129/2	5610.99	VRD_129	Outlier
CE_145	48.49	168.11	17	VRD_129/1	1327.3	VRD_129	Outlier
CE_146	49.66	173.49	17	VRD_128/1	2043.98	VRD_128	Outlier
CE_147	149.21	1020.40	102	VRD_207/1	4011.89	VRD_207	C04
CE_148	100.24	702.63	70	VRD_207/2	3365.64	VRD_207	C04
CE_149	99.53	618.50	62	VRD_207/3	2992	VRD_207	C04
CE_15	52.77	197.48	20	VRD_42/1	1504.95	VRD_42	C08
CE_150	104.76	723.70	72	VRD_205/1	3023.32	VRD_205	C04
CE_151	64.77	297.76	30	VRD_205/2	4645.72	VRD_205	C04
CE_152	160.76	1525.87	152	VRD_206/1	4245.74	VRD_206	C04
CE_153	93.95	620.27	62	VRD_211/1	5604.31	VRD_211	C04
CE_154	128.8	921.20	92	VRD_210/1	5812.64	VRD_210	C04
CE_155	39.43	110.83	11	VRD_200/1	4702.01	VRD_200	C04
CE_156	72.74	301.27	30	VRD_200/1	4702.01	VRD_200	C04
CE_157	27.55	55.31	5	VRD_200/1	4702.01	VRD_200	C04
CE_158	35.68	90.15	9	VRD_200/1	4702.01	VRD_200	C04
CE_159	128.26	1125.02	112	VRD_198/1	7996.36	VRD_198	C04
CE_16	61.96	297.44	30	VRD_43/1	4175.34	VRD_43	C08
CE_160	58.07	203.73	20	VRD_202/1	1763.35	VRD_202	C04
CE_161	90.31	504.95	50	VRD_202/2	1768.93	VRD_202	C04
CE_162	90.58	535.42	53	VRD_203/2	2385.34	VRD_203	C04
CE_163	43.05	133.42	13	VRD_203/2	2385.34	VRD_203	C04
CE_164	66.3	269.38	27	VRD_203/1	2022.92	VRD_203	C04
CE_165	45.82	139.00	14	VRD_184/1	1537.63	VRD_184	C04
CE_166	21.46	31.87	3	VRD_184/1	1537.63	VRD_184	C04
CE_167	44.43	137.21	14	VRD_184/2	2042.62	VRD_184	C04
CE_168	71.41	360.15	36	VRD_184/4	1588.95	VRD_184	C04
CE_169	41.55	120.65	12	VRD_183/1	709.92	VRD_183	C04
CE_170	52.24	173.20	17	VRD_182/1	1113.95	VRD_182	C04
CE_171	34.22	77.30	8	VRD_181/1	852.88	VRD_181	C04
CE_172	67.73	330.60	33	VRD_179/1	2064.41	VRD_179	C04
CE_173	52.73	206.41	21	VRD_190/1	2456.07	VRD_190	C04

CE_174	79.22	469.83	47	VRD_190/1	2456.07	VRD_190	C04
CE_175	54.09	215.95	21	VRD_187/1	2260.66	VRD_187	C04
CE_176	124.37	1030.85	103	VRD_187/2	3342.5	VRD_187	C04
CE_177	99.43	683.83	68	VRD_187/3	3250.19	VRD_187	C04
CE_178	113.31	804.96	80	VRD_186/2	1937.7	VRD_186	C04
CE_179	91.99	561.88	56	VRD_186/1	2824.17	VRD_186	C04
CE_18	149.98	1437.58	144	VRD_312/1	5628.29	VRD_312	C08
CE_180	118.37	589.48	59	VRD_186/3	2089.96	VRD_186	C04
CE_181	93.39	594.32	59	VRD_171/1	2862.07	VRD_171	C04
CE_182	91.92	660.16	66	VRD_172/2	6682.53	VRD_172	C04
CE_183	62.07	267.42	27	VRD_191/1	2649.72	VRD_191	C02
CE_184	99.52	591.62	59	VRD_191/2	3576.4	VRD_191	C02
CE_185	83.74	532.63	53	VRD_213/1	1352.31	VRD_213	C02
CE_186	49.19	185.58	18	VRD_214/1	1646.12	VRD_214	C02
CE_187	50.76	177.58	18	VRD_192/1	5169.81	VRD_192	C02
CE_188	71.87	342.98	34	VRD_193/2	4550.22	VRD_193	C02
CE_189	53.86	225.54	22	VRD_194/1	3144.95	VRD_194	C02
CE_19	47.8	169.15	17	VRD_314/2	1316.69	VRD_314	C08
CE_190	66.01	318.69	32	VRD_195/1	2787.81	VRD_195	C02
CE_191	66.96	330.81	33	VRD_195/1	2787.81	VRD_195	C02
CE_192	59.53	275.77	27	VRD_195/1	2787.81	VRD_195	C02
CE_193	102.34	794.30	79	VRD_197/5	3306.82	VRD_197	C02
CE_194	61.13	286.32	29	VRD_197/4	2389.77	VRD_197	C02
CE_195	59.37	266.15	27	VRD_197/3	2595.42	VRD_197	C02
CE_196	66.94	348.93	35	VRD_197/2	2461.57	VRD_197	C02
CE_197	95.06	686.47	69	VRD_197/1	5173.07	VRD_197	C02
CE_198	111.95	835.65	83	VRD_168/1	862.99	VRD_168	C06
CE_199	96.71	625.98	62	VRD_166/1	2417.03	VRD_166	C06
CE_2	71.79	316.97	32	VRD_36/4	1860.61	VRD_36	C08
CE_20	68.24	343.72	34	VRD_314/1	3681.19	VRD_314	C08
CE_200	78.19	406.16	41	VRD_167/1	2386.46	VRD_167	C06
CE_201	56.78	220.71	22	VRD_169/1	1927.4	VRD_169	C06
CE_203	159.21	1553.94	155	VRD_247/1	4460.39	VRD_247	Outlier
CE_204	38.09	110.97	11	VRD_44/6	1570.9	VRD_44	C08
CE_205	91.65	591.76	59	VRD_45/3	1828.91	VRD_45	C05
CE_206	61.55	283.90	28	VRD_45/4	1857.37	VRD_45	C05
CE_207	99.07	728.02	73	VRD_302/1	717.53	VRD_302	C01
CE_208	72.72	348.75	35	VRD_301/1	2935.61	VRD_301	C01
CE_209	90.84	628.85	63	VRD_300/2	6940.1	VRD_300	C01
CE_21	41.39	124.30	12	VRD_314/1	3681.19	VRD_314	C08
CE_210	41.41	130.47	13	VRD_300/1	2129.82	VRD_300	C01
CE_211	80.79	401.41	40	VRD_298/6	3446.27	VRD_298	C01
CE_212	75.08	356.00	36	VRD_298/1	3285.84	VRD_298	C01
CE_213	86.61	561.05	56	VRD_298/2	7413.12	VRD_298	C01
CE_214	95.07	618.85	62	VRD_298/2	7413.12	VRD_298	C01
CE_215	69.02	305.00	30	VRD_298/3	1573.19	VRD_298	C01
CE_216	53.24	197.04	20	VRD_298/4	1012.9	VRD_298	C01
CE_217	106.95	874.45	87	VRD_298/5	6245.09	VRD_298	C01

CE_218	69.96	372.84	37	VRD_298/5	6245.09	VRD_298	C01
CE_219	66.56	284.80	28	VRD_297/1	5247.78	VRD_297	C01
CE_22	73.31	390.39	39	VRD_317/1	2437.61	VRD_317	C07
CE_220	51.93	180.80	18	VRD_297/1	5247.78	VRD_297	C01
CE_221	90.05	419.78	42	VRD_293/2	4634.89	VRD_293	C01
CE_222	82.85	498.77	50	VRD_293/1	3893.45	VRD_293	C01
CE_223	82.88	424.77	42	VRD_292/1	2171.31	VRD_292	C01
CE_224	43.24	141.01	14	VRD_291/1	4060.32	VRD_291	C01
CE_225	88.56	584.13	58	VRD_290/1	3452.16	VRD_290	C01
CE_226	129.91	1285.72	128	VRD_288/1	1369.5	VRD_288	C01
CE_227	147.03	1320.84	132	VRD_283/1	3933.22	VRD_283	C01
CE_228	132.64	1226.81	123	VRD_284/1	1355.01	VRD_284	C01
CE_229	81.04	469.50	47	VRD_282/1	4498.42	VRD_282	C01
CE_23	52.83	210.26	21	VRD_316/1	1499.9	VRD_316	C07
CE_230	76.02	399.29	40	VRD_279/1	2090.42	VRD_279	C01
CE_231	58.29	263.49	26	VRD_277/1	4050.67	VRD_277	C01
CE_232	57.67	256.08	26	VRD_277/1	4050.67	VRD_277	C01
CE_233	40.39	125.61	12	VRD_277/1	4050.67	VRD_277	C01
CE_234	97.32	690.68	69	VRD_274/1	4938.79	VRD_274	C01
CE_235	56.15	244.24	24	VRD_265/1	14761.47	VRD_265	C01
CE_236	112.42	838.60	84	VRD_266/1	7017.93	VRD_266	C01
CE_237	206.25	2428.41	243	VRD_270/1	6235.31	VRD_270	C01
CE_238	165.4	1742.98	174	VRD_269/1	4922.72	VRD_269	C01
CE_239	61	229.17	23	VRD_268/2	3970.09	VRD_268	C01
CE_24	27.62	55.40	5	VRD_316/1	1499.9	VRD_316	C07
CE_240	63.49	280.04	28	VRD_268/1	2345.97	VRD_268	C01
CE_241	86.83	481.71	48	VRD_268/3	2075.32	VRD_268	C01
CE_242	109.16	685.38	68	VRD_268/4	1857.18	VRD_268	C01
CE_243	147.98	1114.38	111	VRD_261/1	2366.35	VRD_261	C01
CE_244	123.84	1001.19	100	VRD_260/1	4181.5	VRD_260	C01
CE_245	131.5	1190.81	119	VRD_257/1	5469.38	VRD_257	C01
CE_246	142.69	1214.12	121	VRD_263/1	5675.42	VRD_263	C01
CE_247	91.42	608.51	61	VRD_263/2	2797.23	VRD_263	C01
CE_248	107.7	898.02	90	VRD_254/1	6698.99	VRD_254	C01
CE_249	117.45	996.23	100	VRD_255/1	2983.94	VRD_255	C01
CE_25	57.13	203.34	20	VRD_315/1	1211.29	VRD_315	C07
CE_250	76.49	426.18	43	VRD_255/2	1880.3	VRD_255	C01
CE_251	68.32	350.21	35	VRD_1/2	5579.79	VRD_1	Outlier
CE_252	98.5	717.24	72	VRD_3/1	692.65	VRD_3	Outlier
CE_253	41.64	130.72	13	VRD_317/1	2437.61	VRD_317	C07
CE_254	67.62	341.30	34	VRD_57/1	1044.76	VRD_57	C05
CE_255	57.67	248.86	25	VRD_56/1	2291.27	VRD_56	C05
CE_256	42.26	138.83	14	VRD_50/7	1137.82	VRD_50	C05
CE_257	117.3	1050.84	105	VRD_50/6	3167.42	VRD_50	C05
CE_258	39.99	122.00	12	VRD_50/5	2850.72	VRD_50	C05
CE_259	79.49	464.73	46	VRD_50/5	2850.72	VRD_50	C05
CE_26	53.61	202.01	20	VRD_320/1	1709.62	VRD_320	C07
CE_260	51.91	207.89	21	VRD_50/3	4150.76	VRD_50	C05

CE_261	41.05	127.24	13	VRD_50/1	1293.52	VRD_50	C05
CE_262	40.11	123.61	12	VRD_48/1	1566.6	VRD_48	C05
CE_263	74.3	394.19	39	VRD_48/2	1901.08	VRD_48	C05
CE_264	75.4	439.23	43	VRD_48/3	1005.58	VRD_48	C05
CE_265	100.4	583.01	58	VRD_208/1	3529.83	VRD_208	C04
CE_266	124.63	1011.73	101	VRD_172/2	6682.53	VRD_172	C04
CE_267	44.5	151.78	15	VRD_172/2	6682.53	VRD_172	C04
CE_268	122.04	1017.00	102	VRD_193/1	4046.68	VRD_193	C02
CE_269	44.96	150.75	15	VRD_193/2	4550.22	VRD_193	C02
CE_270	56.26	226.73	23	VRD_164/1	2690.65	VRD_164	C03
CE_271	62.68	268.02	27	VRD_163/3	1830.39	VRD_163	C03
CE_272	39.34	104.85	10	VRD_161/1	1934.15	VRD_161	C03
CE_273	45.46	144.82	14	VRD_162/1	1094.77	VRD_162	C03
CE_274	49.95	178.24	18	VRD_162/2	1956.19	VRD_162	C03
CE_275	48.25	154.65	15	VRD_162/3	1775.85	VRD_162	C03
CE_276	52.9	188.07	19	VRD_158/2	2384.84	VRD_158	C03
CE_277	55.41	183.48	18	VRD_158/2	2384.84	VRD_158	C03
CE_278	53.42	192.66	19	VRD_158/1	1412.97	VRD_158	C03
CE_279	88.21	552.42	55	VRD_157/1	5357.87	VRD_157	C03
CE_280	89.09	560.28	56	VRD_157/1	5357.87	VRD_157	C03
CE_281	97.16	613.43	61	VRD_157/2	5968.63	VRD_157	C03
CE_282	47.62	145.22	14	VRD_156/1	2821.85	VRD_156	C03
CE_283	74.27	342.00	34	VRD_156/2	4261.59	VRD_156	C03
CE_284	72.7	355.57	35	VRD_155/2	11268.07	VRD_155	C03
CE_285	67.72	317.57	32	VRD_153/2	4560.22	VRD_153	C03
CE_286	110.18	857.72	86	VRD_153/2	4560.22	VRD_153	C03
CE_287	132.86	1065.37	106	VRD_153/1	4352.74	VRD_153	C03
CE_288	78.24	431.58	43	VRD_159/1	3814.16	VRD_159	C03
CE_289	44.72	142.50	14	VRD_159/1	3814.16	VRD_159	C03
CE_290	56.37	228.00	23	VRD_156/3	7118.85	VRD_156	C03
CE_291	36.45	101.10	10	VRD_165/1	2595.51	VRD_165	C06
CE_292	26.32	51.96	5	VRD_165/1	2595.51	VRD_165	C06
CE_293	27.09	51.40	5	VRD_165/1	2595.51	VRD_165	C06
CE_294	37.51	102.60	10	VRD_165/1	2595.51	VRD_165	C06
CE_295	31.37	71.85	7	VRD_165/1	2595.51	VRD_165	C06
CE_296	**21.03**	**32.66**	**3**	**VRD_165/1**	**2595.51**	**VRD_165**	**C06**
CE_297	64.44	263.78	26	VRD_215/1	2542.89	VRD_215	C06
CE_298	59.81	244.74	24	VRD_243/1	1046.48	VRD_243	C06
CE_299	63.15	257.95	26	VRD_243/2	1693.37	VRD_243	C06
CE_3	55.3	233.78	23	VRD_36/1	1690.69	VRD_36	C08
CE_300	53.73	218.74	22	VRD_244/1	3602.04	VRD_244	C06
CE_301	26.18	50.75	5	VRD_244/1	3602.04	VRD_244	C06
CE_302	58.26	231.19	23	VRD_242/1	1521	VRD_242	C06
CE_303	29.33	62.45	62	VRD_242/1	1521	VRD_242	C06
CE_304	87.01	558.43	56	VRD_220/1	3821.58	VRD_220	C06
CE_305	82.02	507.04	51	VRD_219/1	3039.63	VRD_219	C06
CE_306	71.25	378.43	38	VRD_219/2	2772.2	VRD_219	C06
CE_307	88.63	521.37	52	VRD_217/1	2320.89	VRD_217	C06

CE_308	57.37	244.39	24	VRD_216/1	2686.03	VRD_216	C06
CE_309	54.84	205.87	20	VRD_216/1	2686.03	VRD_216	C06
CE_31	63.4	292.96	29	VRD_25/1	2365.08	VRD_25	C08
CE_310	65.91	320.58	32	VRD_217/2	2610.15	VRD_217	C06
CE_311	112.64	869.65	87	VRD_218/1	3314.34	VRD_218	C06
CE_312	81.3	501.88	50	VRD_221/3	1837.27	VRD_221	C06
CE_313	138.45	1454.28	145	VRD_221/2	6354.74	VRD_221	C06
CE_314	71.13	378.47	38	VRD_217/3	5140.55	VRD_217	C06
CE_315	110.93	681.50	68	VRD_220/1	3821.58	VRD_220	C06
CE_316	50.14	184.79	18	VRD_221/1	1363.42	VRD_221	C06
CE_317	52.71	210.83	21	VRD_222/1	2543.81	VRD_222	C06
CE_318	63.14	300.69	30	VRD_222/2	4577.81	VRD_222	C06
CE_319	88.49	492.95	49	VRD_222/3	2407.1	VRD_222	C06
CE_32	61.6	233.39	23	VRD_26/1	1513.37	VRD_26	C08
CE_323	71.47	360.06	36	VRD_76/1	4143.9	VRD_76	C12
CE_324	84.57	526.68	53	VRD_76/1	4143.9	VRD_76	C12
CE_325	40.93	126.95	13	VRD_152/2	1871.96	VRD_152	C12
CE_326	64.99	319.54	32	VRD_152/3	1556.93	VRD_152	C12
CE_327	81.21	478.26	48	VRD_152/4	5343.16	VRD_152	C12
CE_328	99.29	679.45	68	VRD_152/4	5343.16	VRD_152	C12
CE_329	29.19	64.27	6	VRD_78/1	2151.24	VRD_78	C12
CE_33	90.01	508.17	51	VRD_322/1	2933.68	VRD_322	C08
CE_330	156.41	1671.57	17	VRD_229/1	7245.43	VRD_229	Outlier
CE_331	47.02	165.29	16	VRD_231/1	2021.35	VRD_231	Outlier
CE_332	131.71	1017.84	102	VRD_231/3	3862.45	VRD_231	Outlier
CE_333	41.31	120.58	12	VRD_231/2	1348.91	VRD_231	Outlier
CE_334	67.15	295.17	29	VRD_231/4	1364.75	VRD_231	Outlier
CE_335	106.3	848.01	85	VRD_251/1	4650.74	VRD_251	Outlier
CE_336	72.71	383.81	38	VRD_251/2	2867	VRD_251	Outlier
CE_337	64.92	313.61	31	VRD_251/3	5857.09	VRD_251	Outlier
CE_338	144.44	1286.44	129	VRD_253/1	7518.41	VRD_253	Outlier
CE_339	81.9	443.23	44	VRD_252/1	1313.17	VRD_252	Outlier
CE_34	66.34	271.18	27	VRD_44/1	1599.7	VRD_44	C08
CE_340	57.49	239.24	24	VRD_252/1	1313.17	VRD_252	Outlier
CE_341	49.69	178.46	18	VRD_81/1	1414.11	VRD_81	C12
CE_342	55.49	228.00	23	VRD_81/4	2975.33	VRD_81	C12
CE_343	57.03	226.19	23	VRD_81/4	2975.33	VRD_81	C12
CE_344	43.65	138.68	14	VRD_81/3	1659.01	VRD_81	C12
CE_345	32.59	75.76	8	VRD_80/1	5857.19	VRD_80	C12
CE_346	35.83	91.67	9	VRD_82/1	1855.23	VRD_82	C12
CE_347	94.32	652.19	65	VRD_141/1	5539.67	VRD_141	C12
CE_348	44.03	146.73	15	VRD_141/1	5539.67	VRD_141	C12
CE_349	62.64	291.24	29	VRD_86/1	3060.94	VRD_86	C12
CE_35	54.44	230.63	23	VRD_44/4	2909.67	VRD_44	C08
CE_350	67.65	345.48	34	VRD_86/2	6339.81	VRD_86	C12
CE_351	64.96	301.20	30	VRD_86/2	6339.81	VRD_86	C12
CE_352	49.65	187.73	19	VRD_134/1	1541.37	VRD_134	C12
CE_353	67.91	350.27	35	VRD_133/1	2517.29	VRD_133	C12

CE_36	37.42	106.20	11	VRD_44/2	1145.41	VRD_44	C08
CE_360	53.87	217.27	22	VRD_102/1	4004.28	VRD_102	C12
CE_365	160.08	1717.51	172	VRD_126/1	9499.62	VRD_126	C12
CE_366	48.97	179.02	18	VRD_112/1	1039.56	VRD_112	C12
CE_367	54.95	225.82	22	VRD_115/1	1708.63	VRD_115	C12
CE_368	83.15	482.72	48	VRD_113/1	3065.62	VRD_113	C12
CE_369	43.16	144.32	14	VRD_114/1	2126.22	VRD_114	C12
CE_37	38.57	113.40	11	VRD_44/7	681.29	VRD_44	C08
CE_370	36.59	102.86	10	VRD_114/2	1283.56	VRD_114	C12
CE_371	30.56	71.25	7	VRD_114/1	2126.22	VRD_114	C12
CE_375	56.96	247.13	25	VRD_132/1	1415.92	VRD_132	Outlier
CE_376	57.04	244.40	24	VRD_132/2	1924.96	VRD_132	Outlier
CE_377	73.65	405.63	40	VRD_103/1	3144.14	VRD_103	C12
CE_378	68.53	362.89	36	VRD_103/2	3139.52	VRD_103	C12
CE_379	33.1	83.69	8	VRD_103/3	2881.81	VRD_103	C12
CE_38	75.12	418.95	42	VRD_45/1	3465.48	VRD_45	C05
CE_380	30.42	69.07	7	VRD_103/3	2881.81	VRD_103	C12
CE_381	54.34	189.46	19	VRD_113/2	1682.96	VRD_113	C12
CE_382	30.09	66.26	7	VRD_115/2	1486.01	VRD_115	C12
CE_383	31.86	78.07	8	VRD_115/2	1486.01	VRD_115	C12
CE_39	64.98	323.41	32	VRD_45/2	2650.85	VRD_45	C05
CE_395	65.42	328.23	32	VRD_117/1	2820.42	VRD_117	C12
CE_396	23.44	41.26	4	VRD_119/1	1017.2	VRD_119	C12
CE_397	49.96	193.18	19	VRD_336/1	763.68	VRD_336	C12
CE_398	37.94	109.21	11	VRD_238/3	3363.06	VRD_238	C09
CE_399	77.02	458.09	46	VRD_238/3	3363.06	VRD_238	C09
CE_4	78.75	350.70	35	VRD_36/2	1783.54	VRD_36	C08
CE_40	71.8	333.27	33	VRD_46/1	1950.99	VRD_46	C05
CE_400	39.89	121.51	12	VRD_238/1	1545.97	VRD_238	C09
CE_401	55.59	218.62	22	VRD_236/1	2253.19	VRD_236	C09
CE_402	73.14	399.33	40	VRD_237/1	1572.61	VRD_237	C09
CE_403	95.55	663.29	66	VRD_235/1	6542.07	VRD_235	C09
CE_404	54.29	214.04	21	VRD_235/2	2990.52	VRD_235	C09
CE_405	71.58	392.83	39	VRD_240/1	4720.8	VRD_240	C09
CE_406	45.3	156.51	16	VRD_240/1	4720.8	VRD_240	C09
CE_407	66.9	332.12	33	VRD_234/1	3457	VRD_234	C09
CE_408	86.03	534.90	53	VRD_234/2	3476.59	VRD_234	C09
CE_409	47.55	176.70	18	VRD_241/1	2572.67	VRD_241	C09
CE_410	33.8	87.65	9	VRD_239/1	2865.97	VRD_239	C09
CE_411	35.3	95.87	9	VRD_232/1	4978.15	VRD_232	C09
CE_412	53.25	219.29	22	VRD_233/1	2176.78	VRD_233	C09
CE_413	63.62	276.91	28	VRD_233/3	334.94	VRD_233	C09
CE_414	50.96	200.35	20	VRD_233/2	1139.61	VRD_233	C09
CE_415	80.1	482.43	48	VRD_225/1	1597.89	VRD_225	Outlier
CE_416	**202.87**	**2575.09**	**257**	**VRD_223/1**	**33542.36**	**VRD_223**	**Outlier**
CE_417	35.77	99.01	10	VRD_224/1	1631.61	VRD_224	Outlier
CE_418	55.24	233.79	23	VRD_249/1	5385.43	VRD_249	Outlier
CE_419	56.58	247.23	25	VRD_249/1	5385.43	VRD_249	Outlier

CE_42	132.2	979.16	98	VRD_47/1	3018.44	VRD_47	C05
CE_420	125.28	1162.98	116	VRD_250/1	1365.25	VRD_250	Outlier
CE_421	81.53	500.38	50	VRD_13/1	2404.37	VRD_13	Outlier
CE_422	47.91	173.90	17	VRD_36/2	1783.54	VRD_36	C08
CE_423	136.73	1257.27	126	VRD_42/2	4513.32	VRD_42	C08
CE_424	64.53	309.51	31	VRD_337/1	1887.5	VRD_337	C08
CE_425	80.72	481.25	48	VRD_37/1	2704.03	VRD_37	C08
CE_426	35.39	96.78	10	VRD_332/1	2266.92	VRD_332	C11
CE_427	50.25	195.03	19	VRD_60/1	5150.98	VRD_60	C11
CE_428	31.72	78.36	78	VRD_60/1	5150.98	VRD_60	C11
CE_429	55.07	203.62	20	VRD_61/1	3773.99	VRD_61	C11
CE_43	81.18	423.01	42	VRD_49/1	1705.75	VRD_49	C05
CE_430	83.99	546.60	55	VRD_19/1	3450.18	VRD_19	C13
CE_431	79.35	480.35	48	VRD_126/2	2904.34	VRD_126	C12
CE_432	46.1	164.98	16	VRD_308/1	2166.47	VRD_308	C01
CE_433	44.94	154.28	15	VRD_306/1	1828.19	VRD_306	C01
CE_434	71.11	391.85	39	VRD_305/1	2988	VRD_305	C01
CE_435	76.37	452.43	45	VRD_304/1	2166.93	VRD_304	C01
CE_436	58.63	249.32	25	VRD_340/1	3972.92	VRD_340	C01
CE_437	67.08	310.19	31	VRD_339/1	1245.6	VRD_339	C01
CE_438	57.32	214.99	21	VRD_341/2	5219.23	VRD_341	C01
CE_439	42.84	141.58	14	VRD_339/2	4421.6	VRD_339	C01
CE_44	75.79	414.48	41	VRD_49/4	3147.74	VRD_49	C05
CE_440	80.88	470.46	47	VRD_341/2	5219.23	VRD_341	C01
CE_441	63.52	301.44	30	VRD_338/1	2358.78	VRD_338	C01
CE_442	55.11	231.44	23	VRD_269/2	1298.39	VRD_269	C01
CE_443	70.43	326.25	33	VRD_269/3	1407.65	VRD_269	C01
CE_444	50.8	199.99	20	VRD_259/2	2010.46	VRD_259	C01
CE_445	25.34	49.16	5	VRD_107/1	553.9	VRD_107	C12
CE_448	45.68	144.67	14	VRD_44/5	1082.76	VRD_44	C08
CE_449	39.35	119.76	12	VRD_44/8	899.94	VRD_44	C08
CE_45	111.24	804.67	80	VRD_49/2	5073.14	VRD_49	C05
CE_450	45.13	154.74	15	VRD_44/8	899.94	VRD_44	C08
CE_451	55.77	237.55	24	VRD_170/1	3309	VRD_170	C04
CE_452	72.12	395.89	39	VRD_72/1	3161.91	VRD_72	C11
CE_46	124.74	910.04	91	VRD_49/3	2531.6	VRD_49	C05
CE_47	65.81	314.82	31	VRD_51/1	1503.75	VRD_51	C05
CE_48	57.86	237.52	24	VRD_52/1	2076.81	VRD_52	C05
CE_49	49.63	191.30	19	VRD_53/1	2016.22	VRD_53	C05
CE_5	43.27	142.30	14	VRD_38/1	727.72	VRD_38	C08
CE_50	105.74	768.19	77	VRD_54/1	2889.71	VRD_54	C05
CE_51	56.72	245.50	24	VRD_54/2	2083.87	VRD_54	C05
CE_56	90.77	428.35	43	VRD_327/1	2440.56	VRD_327	C13
CE_58	125.55	926.10	93	VRD_324/1	3063.57	VRD_324	C13
CE_59	40.5	119.03	12	VRD_15/1	1356.23	VRD_15	Outlier
CE_6	48.69	178.95	18	VRD_38/2	805.21	VRD_38	C08
CE_60	67.18	318.77	32	VRD_14/1	2710.71	VRD_14	Outlier
CE_62	72.44	398.19	34	VRD_2/1	4307.15	VRD_2	Outlier

CE_63	104.19	800.69	80	VRD_1/2	5579.79	VRD_1	Outlier
CE_64	84.07	475.52	47	VRD_77/3	2074.71	VRD_77	C12
CE_65	84.36	525.24	52	VRD_77/2	3184.5	VRD_77	C12
CE_66	51.64	195.22	19	VRD_77/1	2293.56	VRD_77	C12
CE_67	116.58	987.52	99	VRD_79/2	4864.34	VRD_79	C12
CE_68	70.88	356.99	36	VRD_79/3	4773.27	VRD_79	C12
CE_69	80.81	486.08	49	VRD_79/4	4475.13	VRD_79	C12
CE_7	62.36	234.32	23	VRD_38/3	1404.28	VRD_38	C08
CE_70	75.58	406.12	41	VRD_151/1	3704.65	VRD_151	C12
CE_71	90.85	599.17	60	VRD_151/1	3704.65	VRD_151	C12
CE_72	97.47	623.76	62	VRD_151/2	2868.21	VRD_151	C12
CE_73	49.44	181.56	18	VRD_151/4	2668.64	VRD_151	C12
CE_74	71.48	332.50	33	VRD_151/4	2668.64	VRD_151	C12
CE_75	39.77	116.77	12	VRD_151/3	997.54	VRD_151	C12
CE_76	51.19	199.50	20	VRD_80/2	5313.4	VRD_80	C12
CE_77	104.77	680.37	68	VRD_149/1	3192.86	VRD_149	C12
CE_78	111.88	777.32	78	VRD_148/1	3288.7	VRD_148	C12
CE_79	62.53	277.64	28	VRD_146/1	1788.63	VRD_146	C12
CE_8	53.74	210.76	21	VRD_75/1	3737.86	VRD_75	C08
CE_80	87.64	567.93	57	VRD_146/2	2308.23	VRD_146	C12
CE_81	109.27	805.64	80	VRD_147/2	2189.6	VRD_147	C12
CE_82	129.24	1026.69	103	VRD_147/1	3722.88	VRD_147	C12
CE_83	128.55	1121.07	112	VRD_84/2	4118.47	VRD_84	C12
CE_84	76.85	426.81	43	VRD_85/1	3948.61	VRD_85	C12
CE_85	52.92	200.59	20	VRD_85/2	3202.59	VRD_85	C12
CE_86	138.03	1214.10	121	VRD_145/2	3774.8	VRD_145	C12
CE_87	39.67	108.98	11	VRD_143/1	702.48	VRD_143	C12
CE_88	77.3	419.86	42	VRD_144/1	1918.4	VRD_144	C12
CE_89	55.16	228.59	23	VRD_139/1	2897.89	VRD_139	C12
CE_9	51.77	198.04	20	VRD_75/1	3737.86	VRD_75	C08
CE_90	111.45	940.37	94	VRD_138/1	4538.52	VRD_138	C12
CE_91	132.13	1145.61	115	VRD_140/1	4509.08	VRD_140	C12
CE_92	109.74	815.90	81	VRD_87/1	5036.29	VRD_87	C12
CE_93	50.1	192.85	19	VRD_137/1	2670.16	VRD_137	C12
CE_94	71.14	329.98	33	VRD_88/1	2560.99	VRD_88	C12
CE_95	51.58	195.38	19	VRD_88/2	900.86	VRD_88	C12
CE_96	59.81	261.30	26	VRD_88/3	1600.35	VRD_88	C12
CE_97	79.19	448.40	45	VRD_88/5	3405.57	VRD_88	C12
CE_98	95.13	566.22	57	VRD_88/6	1946.8	VRD_88	C12
CE_99	58.35	253.10	25	VRD_88/8	2664.18	VRD_88	C12
TOTAL	**29549.20**	**171929.57**	**17376**				
Minimum	**21.03**	**31.87**	**3**				
Maximum	**206.25**	**2575.09**	**257**				
Average	**72.425**	**421.40**	**43**				

A.1.2 Group II

Kraal_ID	Perimeter (m)	Kraal_ Area(sqm)	Stock Capacity	Hom_ID	Hom_ Area(sqm)	Subcluster	Cluster_ ID
CE_12	115.15	747.96	75	VRD_33/2	4091.23	VRD_33	C08
CE_14	70.04	360.73	36	VRD_40/1	1844.65	VRD_40	C08
CE_17	52.29	182.73	18	VRD_34/1	2683.81	VRD_34	C08
CE_202	58.72	263.02	26	VRD_5/2	3170.12	VRD_5	C10
CE_27	130.73	1045.25	104	VRD_29/2	9538.71	VRD_29	C08
CE_28	80.06	452.68	45	VRD_29/1	3398.43	VRD_29	C08
CE_29	187.56	1861.53	186	VRD_28/1	6417.54	VRD_28	C08
CE_30	185.86	1834.08	183	VRD_21/1	6963.3	VRD_21	C08
CE_320	55.7	238.95	24	VRD_330/1	6061.53	VRD_330	C11
CE_321	28.03	59.4	6	VRD_330/1	6061.53	VRD_330	C11
CE_322	30.7	72.38	7	VRD_330/1	6061.53	VRD_330	C11
CE_41	**317.29**	**4939.67**	**494**	**VRD_27/1**	**20721.03**	**VRD_27**	**C08**
CE_453	50.86	191.3	19	VRD_4/1	13517.38	VRD_4	C10
CE_454	45.11	155.49	15	VRD_4/1	13517.38	VRD_4	C10
CE_455	48.51	183.86	18	VRD_4/1	13517.38	VRD_4	C10
CE_456	40.49	125.55	12	VRD_4/1	13517.38	VRD_4	C10
CE_457	52.16	211.96	21	VRD_4/1	13517.38	VRD_4	C10
CE_458	42.54	134.5	13	VRD_4/1	13517.38	VRD_4	C10
CE_459	53.19	220.42	22	VRD_5/1	6556.77	VRD_5	C10
CE_460	25.8	50.96	5	VRD_5/1	6556.77	VRD_5	C10
CE_461	28.84	63.98	6	VRD_5/1	6556.77	VRD_5	C10
CE_462	34.56	91.95	9	VRD_6/1	10282.36	VRD_6	C10
CE_463	38.33	112.7	11	VRD_6/1	10282.36	VRD_6	C10
CE_464	29.47	67.03	7	VRD_6/1	10282.36	VRD_6	C10
CE_465	29.73	68.09	7	VRD_6/1	10282.36	VRD_6	C10
CE_466	38.25	113.21	11	VRD_6/1	10282.36	VRD_6	C10
CE_467	39.02	116.24	12	VRD_6/1	10282.36	VRD_6	C10
CE_468	78.58	482.82	48	VRD_6/1	10282.36	VRD_6	C10
CE_469	60.59	288.09	29	VRD_7/1	8168.77	VRD_7	C10
CE_470	31.04	74.24	7	VRD_7/1	8168.77	VRD_7	C10
CE_471	54.33	231.37	23	VRD_7/1	8168.77	VRD_7	C10
CE_472	30.45	70.25	7	VRD_10/8	4037.05	VRD_10	C10
CE_473	26.21	52.68	5	VRD_10/8	4037.05	VRD_10	C10
CE_474	24.51	45.22	4	VRD_10/8	4037.05	VRD_10	C10
CE_475	29.63	67.84	7	VRD_10/8	4037.05	VRD_10	C10
CE_476	30.35	71.38	7	VRD_10/8	4037.05	VRD_10	C10
CE_477	32.34	81.25	8	VRD_10/1	13567.55	VRD_10	C10
CE_478	27.11	56.76	6	VRD_10/1	13567.55	VRD_10	C10
CE_479	27.21	56.2	6	VRD_10/1	13567.55	VRD_10	C10
CE_480	32.91	84.43	8	VRD_10/1	13567.55	VRD_10	C10
CE_481	31.79	75.83	7	VRD_10/1	13567.55	VRD_10	C10
CE_482	26	51.46	5	VRD_10/2	4269.89	VRD_10	C10
CE_483	25.61	50.34	5	VRD_10/2	4269.89	VRD_10	C10
CE_484	32.16	79.05	8	VRD_10/2	4269.89	VRD_10	C10

CE_485	27.95	60.6	6	VRD_10/2	4269.89	VRD_10	C10
CE_486	24.8	47.78	5	VRD_10/2	4269.89	VRD_10	C10
CE_487	97.29	715.9	71	VRD_10/4	8380.69	VRD_10	C10
CE_488	79.06	461.22	46	VRD_10/4	8380.69	VRD_10	C10
CE_489	92.82	660.76	66	VRD_10/4	8380.69	VRD_10	C10
CE_490	46.58	164.13	16	VRD_10/3	1789.13	VRD_10	C10
CE_491	128.88	1280.12	128	VRD_10/5	21489.03	VRD_10	C10
CE_492	158.21	1917.08	192	VRD_10/5	21489.03	VRD_10	C10
CE_493	85.84	573.99	57	VRD_10/5	21489.03	VRD_10	C10
CE_494	111.71	984.84	98	VRD_10/7	6834.91	VRD_10	C10
CE_495	48.48	181.26	18	VRD_16/1	24508.88	VRD_16	C13
CE_496	46.57	168.15	17	VRD_16/1	24508.88	VRD_16	C13
CE_497	65.74	331.22	33	VRD_16/1	24508.88	VRD_16	C13
CE_498	35.3	94.64	9	VRD_16/1	24508.88	VRD_16	C13
CE_499	41.49	132.75	13	VRD_16/1	24508.88	VRD_16	C13
CE_500	41.16	130.34	13	VRD_16/1	24508.88	VRD_16	C13
CE_504	46.3	165.15	16	VRD_17/1	7115.01	VRD_17	C13
CE_505	36.03	100.45	10	VRD_17/1	7115.01	VRD_17	C13
CE_506	32.01	78.97	79	VRD_17/1	7115.01	VRD_17	C13
CE_507	46.23	156.05	16	VRD_17/1	7115.01	VRD_17	C13
CE_508	27.59	58.32	6	VRD_29/3	4838.64	VRD_29	C08
CE_509	24.87	47.43	5	VRD_29/3	4838.64	VRD_29	C08
CE_510	31.93	77.57	77	VRD_29/3	4838.64	VRD_29	C08
CE_511	41.6	132.65	13	VRD_31/1	7386.48	VRD_31	C08
CE_512	34.68	93.33	9	VRD_31/1	7386.48	VRD_31	C08
CE_513	27.02	56.86	6	VRD_31/1	7386.48	VRD_31	C08
CE_514	37.66	107.59	11	VRD_31/1	7386.48	VRD_31	C08
CE_515	23.93	42.89	4	VRD_31/1	7386.48	VRD_31	C08
CE_516	41.93	129.58	13	VRD_31/1	7386.48	VRD_31	C08
CE_517	21.37	34.55	3	VRD_31/1	7386.48	VRD_31	C08
CE_518	52.27	211.75	21	VRD_32/1	8302.26	VRD_32	C08
CE_519	33.44	87.29	9	VRD_32/1	8302.26	VRD_32	C08
CE_520	22.76	39.18	4	VRD_32/1	8302.26	VRD_32	C08
CE_521	27.58	58.35	9	VRD_20/1	4800.04	VRD_20	C08
CE_522	36.41	99	10	VRD_20/1	4800.04	VRD_20	C08
CE_523	27.45	56.56	6	VRD_20/1	4800.04	VRD_20	C08
CE_524	40.61	124.04	12	VRD_22/2	9759.28	VRD_22	C08
CE_525	26.22	53.02	5	VRD_22/2	9759.28	VRD_22	C08
CE_526	33.6	87.15	9	VRD_22/2	9759.28	VRD_22	C08
CE_527	**19.5**	**28.58**	**3**	**VRD_22/2**	**9759.28**	**VRD_22**	**C08**
CE_528	27.86	57.83	6	VRD_22/2	9759.28	VRD_22	C08
CE_529	56.63	245.01	24	VRD_22/2	9759.28	VRD_22	C08
CE_530	24.97	46.93	5	VRD_22/2	9759.28	VRD_22	C08
CE_531	38.12	110.51	11	VRD_22/3	6656.4	VRD_22	C08
CE_532	26.44	53.19	5	VRD_22/3	6656.4	VRD_22	C08
CE_533	38.09	110.97	11	VRD_22/3	6656.4	VRD_22	C08
CE_534	25.29	48.98	5	VRD_22/3	6656.4	VRD_22	C08
CE_535	40.36	119.13	12	VRD_22/3	6656.4	VRD_22	C08

CE_536	35.23	96.48	10	VRD_23/1	28028.06	VRD_23	C08
CE_537	33.36	85.8	8	VRD_23/1	28028.06	VRD_23	C08
CE_538	45.61	162.14	16	VRD_23/1	28028.06	VRD_23	C08
CE_539	65.05	308.83	31	VRD_23/1	28028.06	VRD_23	C08
CE_540	33.01	81.61	8	VRD_23/1	28028.06	VRD_23	C08
CE_541	34.73	93.13	9	VRD_23/1	28028.06	VRD_23	C08
CE_542	51.16	199.79	20	VRD_23/1	28028.06	VRD_23	C08
CE_543	27.6	57.11	6	VRD_23/1	28028.06	VRD_23	C08
CE_544	39.04	115.3	11	VRD_23/1	28028.06	VRD_23	C08
CE_545	28.63	63.68	6	VRD_23/1	28028.06	VRD_23	C08
CE_546	37.44	106.92	11	VRD_23/1	28028.06	VRD_23	C08
CE_547	42.82	138.59	14	VRD_23/1	28028.06	VRD_23	C08
CE_548	55.76	231.85	23	VRD_23/1	28028.06	VRD_23	C08
CE_549	33.75	86.4	9	VRD_23/1	28028.06	VRD_23	C08
CE_55	33.92	87.03	9	VRD_23/1	28028.06	VRD_23	C08
CE_550	32.92	83.31	8	VRD_23/1	28028.06	VRD_23	C08
CE_552	47.28	173.15	17	VRD_23/1	28028.06	VRD_23	C08
CE_553	38.68	113.57	11	VRD_24/1	9813.07	VRD_24	C08
CE_554	33.24	84.71	8	VRD_24/1	9813.07	VRD_24	C08
CE_555	44.09	149.56	15	VRD_24/1	9813.07	VRD_24	C08
CE_556	43.03	142.12	14	VRD_24/1	9813.07	VRD_24	C08
CE_557	34.1	88.84	9	VRD_24/1	9813.07	VRD_24	C08
CE_558	47.47	167.97	17	VRD_41/1	8062.28	VRD_41	C08
CE_559	41.65	128.18	13	VRD_41/1	8062.28	VRD_41	C08
CE_560	28.84	63.14	6	VRD_41/1	8062.28	VRD_41	C08
CE_561	30.37	71.55	7	VRD_41/1	8062.28	VRD_41	C08
CE_562	29.99	69.7	7	VRD_41/1	8062.28	VRD_41	C08
CE_563	25.35	50	5	VRD_41/1	8062.28	VRD_41	C08
CE_564	28.44	61.78	6	VRD_41/1	8062.28	VRD_41	C08
CE_565	30.61	72.74	7	VRD_41/1	8062.28	VRD_41	C08
CE_566	26.64	54.1	5	VRD_41/1	8062.28	VRD_41	C08
CE_567	33.16	84.9	8	VRD_41/1	8062.28	VRD_41	C08
CE_568	96.42	706.62	71	VRD_70/1	6945.04	VRD_70	C11
CE_569	42.29	136.02	14	VRD_66/1	7259.25	VRD_66	C11
CE_570	43.57	144.53	14	VRD_66/1	7259.25	VRD_66	C11
CE_571	34.36	90.79	9	VRD_66/1	7259.25	VRD_66	C11
CE_572	37.24	106.62	11	VRD_66/1	7259.25	VRD_66	C11
CE_573	28.6	63.75	6	VRD_66/1	7259.25	VRD_66	C11
CE_574	36.14	98.96	10	VRD_64/1	5433.44	VRD_64	C11
CE_575	45.99	164.4	16	VRD_64/1	5433.44	VRD_64	C11
CE_576	36.04	89.75	9	VRD_64/1	5433.44	VRD_64	C11
CE_577	48.54	173.94	17	VRD_65/1	3067.31	VRD_65	C11
CE_578	33.02	84.59	8	VRD_65/1	3067.31	VRD_65	C11
CE_579	37.31	108.93	11	VRD_65/1	3067.31	VRD_65	C11
CE_580	34.66	92.26	9	VRD_65/1	3067.31	VRD_65	C11
CE_581	82.7	530.92	53	VRD_69/1	1974.71	VRD_69	C11
CE_582	70.11	380.39	38	VRD_69/5	4069.43	VRD_69	C11
CE_583	96.82	681.5	68	VRD_67/1	4608.5	VRD_67	C11

CE_584	35.58	94.75	9	VRD_63/1	8333.63	VRD_63	C11
CE_585	30.61	72.04	7	VRD_63/1	8333.63	VRD_63	C11
CE_586	41.28	126.88	13	VRD_63/1	8333.63	VRD_63	C11
CE_587	35.49	95.83	9	VRD_63/1	8333.63	VRD_63	C11
CE_588	38	111.78	11	VRD_63/1	8333.63	VRD_63	C11
CE_589	29.19	63.69	6	VRD_63/1	8333.63	VRD_63	C11
CE_590	35.07	95.24	9	VRD_63/1	8333.63	VRD_63	C11
CE_591	29.1	65.89	6	VRD_63/1	8333.63	VRD_63	C11
CE_592	25.08	49.28	5	VRD_63/1	8333.63	VRD_63	C11
CE_61	151.81	1266.22	127	VRD_8/1	5696.56	VRD_8	C10
TOTAL	**7160.43**	**35978.02**	**3725**				
Minimum	**19.5**	**28.58**	**3**				
Maximum	**317.29**	**4939.67**	**494**				
Average	**47.74**	**239.85**	**25**				

A.1.3 Other Settlement types

Robbed II

Kraal_ID	**Perimeter (m)**	**Kraal Area(sqm)**	**Stock Capacity**	**Hom_ID**	**Hom_ Area(sqm)**	**Subcluster**	**Cluster ID**
CE_52	92.46	489.83	49	VRD_18/1	4236.17	VRD_18	C08
CE_53	171	1611.81	161	VRD_18/2	8931.27	VRD_18	C08
CE_54	125.07	824.65	82	VRD_326/1	3540.78	VRD_326	C13
CE_55	188.35	1732.1	173	VRD_325/1	5548.69	VRD_325	C13
CE_57	172.05	1432.29	143	VRD_328/1	3421.36	VRD_328	C13
CE_354	50.18	188.5	19	VRD_99/1	4981.69	VRD_99	C13
CE_355	40.03	120.64	12	VRD_99/1	4981.69	VRD_99	C13
CE_356	34.41	89	9	VRD_99/1	4981.69	VRD_99	C13
CE_357	23.06	38.96	4	VRD_99/1	4981.69	VRD_99	C13
CE_358	24.08	43.72	4	VRD_99/1	4981.69	VRD_99	C13
CE_359	31.38	73.23	7	VRD_99/1	4981.69	VRD_99	C13
CE_501	58.29	260.39	26	VRD_329/2	8712.78	VRD_329	C13
CE_502	36.86	98.34	10	VRD_329/2	8712.78	VRD_329	C13
CE_503	45.98	160.22	16	VRD_329/2	8712.78	VRD_329	C13
TOTAL	**1093.2**	**7163.68**	**715**				
Minimum	**23.06**	**38.96**	**4**				
Maximum	**188.35**	**1732.1**	**173**				
Average	**78.09**	**511.69**	**51.07**				

Group III

Kraal_ID	Perimeter (m)	Kraal_ Area(sqm)	Stock Capacity	Hom_ID	Hom_ Area(sqm)	Subcluster	Cluster ID
CE_362	142.42	1371.41	137	VRD_105/2	4678.36	VRD_105	C12
CE_363	108.77	709.56	71	VRD_105/1	3632.94	VRD_105	C12
CE_384	69.21	361.3	36	VRD_116/1	12353.16	VRD_116	C12
CE_385	44.07	141.38	14	VRD_116/1	12353.16	VRD_116	C12
CE_386	84.37	500.17	50	VRD_116/1	12353.16	VRD_116	C12
CE_387	51.09	187.7	19	VRD_116/1	12353.16	VRD_116	C12
CE_388	24.78	46.41	5	VRD_116/1	12353.16	VRD_116	C12
CE_389	37.22	104.93	10	VRD_116/1	12353.16	VRD_116	C12
CE_390	47.84	168.46	17	VRD_116/1	12353.16	VRD_116	C12
CE_391	33.11	84.29	8	VRD_116/1	12353.16	VRD_116	C12
CE_392	40.73	114.52	11	VRD_116/1	12353.16	VRD_116	C12
CE_393	71.6	375.55	37	VRD_116/1	12353.16	VRD_116	C12
CE_394	46.53	159.04	16	VRD_116/1	12353.16	VRD_116	C12
TOTAL	**801.74**	**4324.72**	**431**				
Minimum	**24.78**	**46.41**	**5**				
Maximum	**142.42**	**1371.41**	**137**				
Average	**61.67**	**332.67**	**33**				

Group I/III

Kraal_ID	Perimeter (m)	Kraal_ Area(sqm)	Stock Capacity	Hom_ID	Hom_ Area(sqm)	Subcluster	Cluster ID
CE_361	82.12	460.22	46	VRD_104/1	2810.6	VRD_104	C12
CE_364	92.48	621.41	62	VRD_108/1	5073.05	VRD_108	C12
CE_372	51.92	204.22	20	VRD_108/1	5073.05	VRD_108	C12
CE_373	40.69	125.68	12	VRD_108/1	5073.05	VRD_108	C12
CE_374	35.07	86.54	9	VRD_108/1	5073.05	VRD_108	C12
CE_446	61.67	292.4	29	VRD_101/1	8127.99	VRD_101	C12
CE_447	37.29	106.59	11	VRD_101/1	8127.99	VRD_101	C12
TOTAL	**401.24**	**1897.06**	**189**				
Minimum	**35.07**	**86.54**	**9**				
Maximum	**92.48**	**621.41**	**62**				
Average	**57.32**	**271.01**	**27**				