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For the degree of Masters of Science

A Landscape Approach to the Archaeology of the Vredefort Dome

A dissertation submitted to the Faculty of Science, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Master of Science

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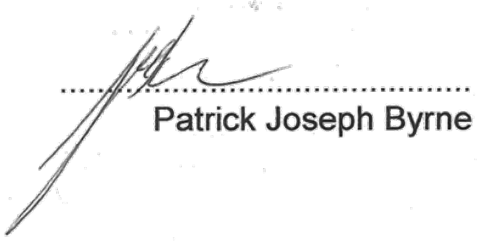
2012

Declaration

I, Patrick Joseph Byrne, declare that this is my own original work. It has been submitted for a Master of Science degree at the University of the Witwatersrand. It has not been submitted to any other academic institution.



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Patrick Joseph Byrne

Abstract

New technologies are continuously being developed that can aid us in archaeological research. The purpose of this project is to revisit an area containing Late Iron Age (LIA) Stone Walled Structures (SWS) that have received sporadic archaeological research over time, and employ new techniques and technologies to test/re-evaluate previous findings. This involves developing new mapping techniques, which involve the use of Geographical Positioning Systems (GPS), which allowed for a wide survey/mapping exercise in a time effective and budget conscious manner. From these data, a new typology was created in order to reflect new types as well as further segregate exiting types. The resulting data was analysed in a Geographic Information Systems (GIS) environment, allowing us to tackle issues such as spatial distribution and landscape patterns in a digital environment. This analysis allowed us to re-evaluate the original spatial distribution, looking at possible reasons for the inaccuracies in the original study. We then explore the implications of these new data. We tested the results of these analyses based on proposed scenarios for the location of these sites, in order to try better understand the positioning, as we as identify possible diagnostic sites that can undergo further examination.

Acknowledgements

I would like to thank my supervisor Karim Sadr for his invaluable assistance and patience over the course of the last two years. His supervision has kept this project on track and moving forward despite my best efforts at the contrary. My co-supervisor, Devlyn Hardwick, helped resolve various technical issues that I ran into. I would further like to thank the van der Merwe family, who provided unlimited access to their farm, as well as comfortable accommodation. In particular, Ruan, for his assistance in the field. Thanks to Tim Forssman and the honours class of 2010 for their aid in mapping out sites, despite the abundance of thorn bushes. Finally, to friends and family, for putting up with me during this period of time, many thanks.

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1. Introduction

The Vredefort Dome is located in the Free State and North West provinces, in the South African Highveld. It is one the oldest and largest meteorite impact sites in the world. It is believed that the Vredefort impact structure was created roughly two billion years ago (Bakker *et al* 2004). This geological significance made it a potential candidate for World Heritage status, administered by the United Nations Educational, Scientific and Cultural Organisation (UNESCO). Added to the geological significance is the cultural significance, with human interaction dating back to the Middle Stone Age (MSA), through the Late Iron Age to more recent historical periods such as the Anglo Boer War (Reimond & Gibson 2005). The South African Heritage Agency (SAHRA) announced that the Vredefort Dome would be declared a National Heritage Site in 2002, under the conditions that a cultural heritage survey be conducted and a management plan drafted (Bakker *et al.* 2004).

A National Heritage Site is a category defined by the National Heritage Resources Act (NHRA) of 1999, which describes such a site as having the highest level of significance. As such, it has the highest level of protection under section 27(18) of the act, which requires permits for any disruptive activities within the conservation area. Following the declaration of the site as a National Heritage Site, it was declared a world heritage site by UNESCO on the 15 July 2005.

The Vredefort Structure describes the entire impact structure, which is massive. Its epicentre is near the town of Vredefort in the Free State, and runs as far away as Johannesburg and Welkom (Reimond & Gibson 2005). For the sake of this project we shall focus on what is known as the Vredefort Dome, which is delimitated by a collar of quartzite hills circling the impact site as far as 45 km away from the impact site. The area of interest is properly known as the Vredefort Mountain Land, and consists of the aforementioned ring of hills to the north and north west of the actual crater. For the sake of simplicity, the terms Vredefort Dome and Vredefort Mountain Lands are interchangeable.



Figure 1.1 Satellite view of the Vredefort Dome

Image Courtesy of Microsoft Bing Maps. Research area is near Venterskroon.

For the purposes of this study, the Vredefort Dome consists of three sections (Reimond & Gibson 2005). There is the inner circle of the impact crater, consisting of a featureless plain of eroded granite. The quartzite hills of the Witwatersrand supergroup circling this crater, our area of interest. The third area is the Potchefstroom plain to the north/north west of the hills, comprising of Ventersdorp Lava. This final region is composed of low, undulating hills that graduate to flat land. The project area is in the northwestern hills of the Vredefort Dome. The area chosen for this study is the farm Thabela Thabeng, which fell originally within the farm Buffelskloof (Figure 1.2).

Thabela Thabeng was chosen due to the rich archaeological potential in this region. Initial surveys revealed an abundance of Late Iron Age (LIA) Stone Walled Structures (SWS) within the hilly region of the farm. Early observations of these SWS didn't conform to expectations generated by earlier research, which largely oversimplified the SWS of the quartzite hills and

played more attention to the surrounding areas. It was therefore decided to focus attention on these hills. The details of this problem are discussed in more detail later in this chapter, as well as the next.

Buffelskloof lies roughly 17 km west of the Free State town of Parys. It spans from the hills of the Vredefort dome in the north west, down to the valley created by the Vaal River, terminating at the water's edge. The history of the farm tied closely to the promise of gold in the area and the subsequent establishment in 1887 of the town Venterskroon, situated on the neighbouring farm Nooitgedacht (Naudė 2005). Whilst little remains of the town, it was briefly a hub of activity for early prospectors in the region. The later discovery of gold in Johannesburg led to the rapid depopulation of Venterskroon. The establishment of the farm Buffelskloof predates the 1860's, with the first documented evidence in the transferral of the farm from a Maria Bekker to Pieter Venter (after whom the town was named) in 1864 (Naudė 2005). Signs of this mining activity are still abundant on the farm, with the presence of old mine shafts as well as claim blocks used by prospectors to stake their claim.

Plan of Presentation

This project is divided into six chapters. The introduction chapter outlines the research area, including information on the environment, climate as well as sets up the research question this project seeks to answer. This is followed by a literature survey, comprised of topics relevant to the project. Chapter 3 outlines the method used to data collection. It goes through the process of developing this method as well as how these data were then converted into a useful format. This is followed by a chapter on what was found, and how these findings were classified. Chapter 5 is an analysis chapter, in which we examine our data in reference to the original research question. The significance of these findings are discussed in the final chapter. Raw data that are not specifically displayed in Chapter 4 or 5, but are required for clarification or checking, can be found in the appendix section at the end of this thesis. There is also a large scale map that accompanies this project with all the site maps.

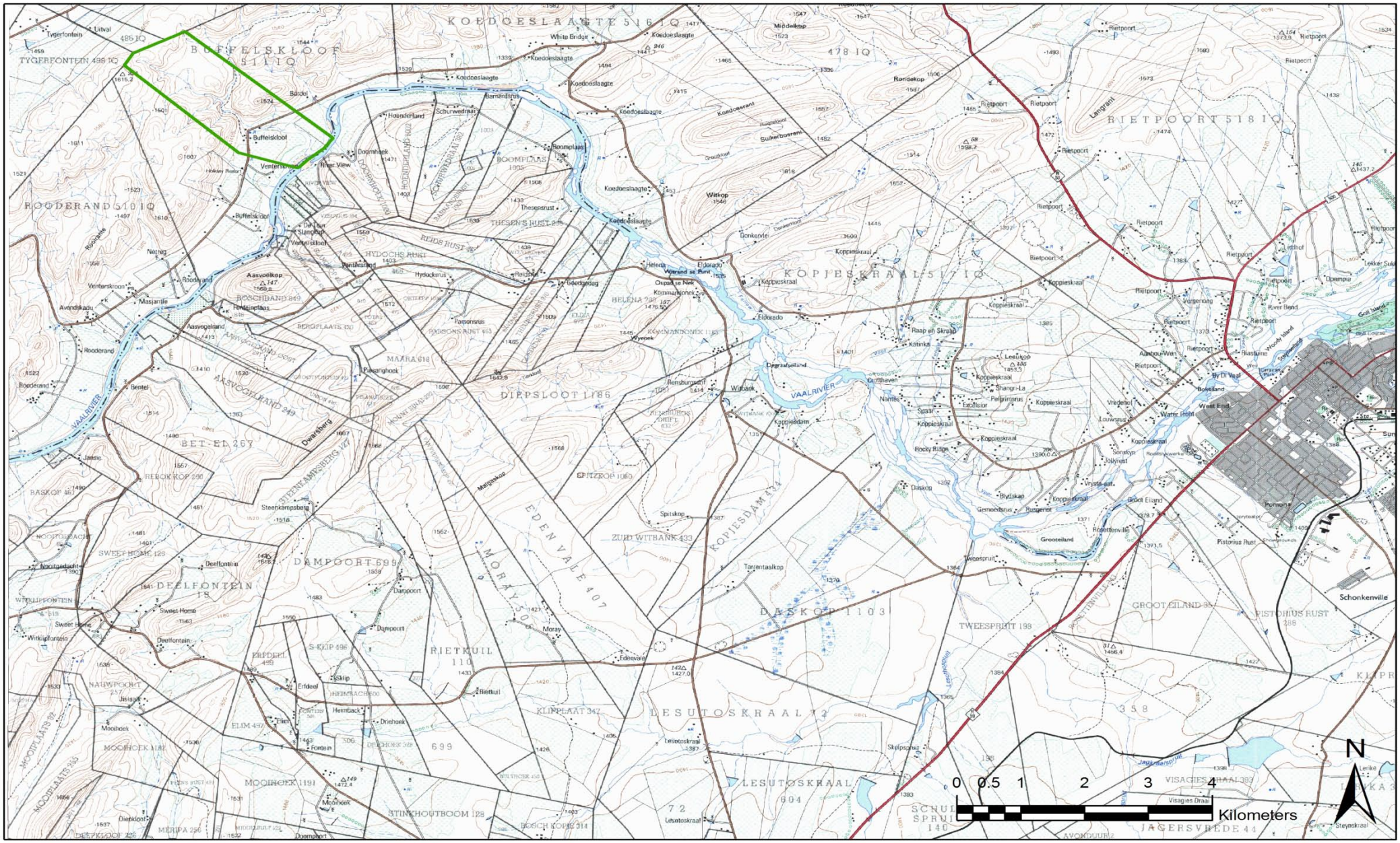


Figure 1.2 Map of Region

Thabela Thabeng is outlined in green, falling within the old farm of Buffelskloof. Parys lies to the east of the research area and the Vaal River winds its way through the area.

Environment

Kevin Balkwill (2005) attributes the variation of vegetation to the varying geology and topography of the Vredefort Dome. The eroded granite plains found within the impact crater contain grasslands with very few trees (Balkwill 2005). This veld type is classified as *Cymbopogon-Themeda* (Northern Variation) (Acocks 1988). This veld type occurs between 1300 m and 1500 m above sea level, in areas that receive between 450 mm and 750 mm rainfall per annum and is subjected to severe frost in the winter months. This veld type is comprised of sparse tufted grass.

Within the quartzite hills that are the main topological feature of the farm we are interested in, we find a bushveld/false grassveld type known as Bankenveld (Central Variation) (Balkwill 2005). This is in effect the same type as the Gold Reef Mountain Bushveld (Mucina & Rutherford 2006). It occurs between 1450 m and 1750 m above sea level, in areas that receive between 700 mm and 750 mm rainfall per annum. It is comprised of extremely sour grass types, meaning that the grasses withdraw their nutrients on maturity (i.e. winter months). As such is only suited to summer grazing (Hardy 1999). However, shifts in climate would result in a shift towards sweeter grass in drier periods, but more sour grass in the wetter periods, such as the climate data discussed below (Ellery *et al*. 1995). This veld types occurs in rocky hills and ridges, with a range of vegetation such as *Acacia karoo, Acacia caffra, Protea caffra, Protea welwitschii and Ziziphus mucronata* (Taylor 1979; Balkwill 2005). Within this veld type you find more sheltered areas, such as ravines near streams. Within these sheltered areas you find temperate forest species such as *Celtis africana, Kiggelaria africana, Halleria lucidia, Leucosidea sericea and Buddleja salviifolia (*Balkwill 2005). These forested areas can be quiet large in the hill region and tend to cling to ravine type areas, near water.

Climate

The Vredefort Dome falls within a summer rainfall region, receiving most of its rain between October and March (Taylor 1979). It receives between 550 mm and 750 mm of rain per annum (Mucina & Rutherford 2006). Summer months tend to be quite mild, with temperatures seldom exceeding 30°C. However, winter months can be quiet severe, with sub zero temperatures quite common along with heavy frost. Winters are also very dry, with much of the vegetation receding during these months.

As this is an archaeological project, it pays to spend some time examining past climate data as this may have had a direct bearing on the use and occupation of the landscape in any given climatic period. The period we shall focus on with this project is the Late Iron Age, which falls within a climatically interesting period (e.g. Tyson 1993; Holmgren *et al.* 1999; Huffman 1996, 2004a). This climate period is known as the Little Ice Age, and occurred between AD 1300 and AD 1850. As the name implies, this period is characterised by cold temperatures. From about AD 1320, temperatures dropped, resulting in erratic rainfall behaviour. Average rainfall fluctuated between very wet or very dry conditions during this period. The driest recorded period occurring at around AD 1700, followed by a steep rise in annual rainfall by the early 1800's, the time of the *Difaqane.*

Research Question

This project shall focus on the Late Iron Age (LIA) of the Vredefort Dome. Particularly, the Stone Walled Settlements (SWS) of the quartzite hills. The Vredefort Dome has been the topic of three Masters Projects over the years (Taylor 1979; Pelser 2005; Nkhasi 2008). However, the quartzite hills have been largely overlooked, primarily due to the aerial photography survey technique employed to conduct some of these studies. Due to the dense vegetation of the hilly region, spotting and correctly identifying these LIA SWS from above can be problematic. Extensive groundwork, by archaeological field schools conducted by the University of the Witwatersrand attempted to map these sites. Due to difficulties described in the next chapter, a mapping technique had to be developed to cope with the challenging conditions presented by the Vredefort Dome.

The initial purpose of this mapping exercise was to create a site catalogue for the farm owner Early results suggested that previous research may have not correctly identified the geographic distribution of sites in the region, with unexpected site types being found within the hills of the Vredefort Dome. To add to this issue, a number of sites that did not fall within the existing typology were mapped out. Taylor (1979) speculates but never extensively tackled the issue as to why these SWS fall within the quartzite hills of the Vredefort Dome, dismissing the hills as a less desirable location based on the geographic distribution of his typology, maybe cattle outposts or *Difaqane* refugee sites.

The aim of this project therefore became to test the validity of these claims on the hilly region. Using new technologies, the mapping data produced could be examined spatially in a Geographic Information Systems (GIS) environment. The idea being that the examination will allow for an understanding on the distribution of these sites, as well as the internal organisation of these sites. From these data we can then speculate over differences or similarities in site types, in terms of layout and placement in the landscape.

To summarise, the aims of this project are to:

- Survey and map all the LIA SWS on the farm Thabela Thabeng.
- Create a site catalogue of the farm.
- Test previous site distribution research.
- Test site typology for the region.
- Examine these data in a GIS environment in order to test ideas on site distribution.

2. Literature Review

Introduction

This chapter has been divided into three different topics: previous research on stone walled settlements (SWS) in the Highveld; previous research on the archaeology of the Vredefort dome and the period leading up to and the arrival of European settlers into the region. The first section deals with how the archaeological evidence presented to us by SWS has been approached over the years, particularity with the emphasis on the typological approach taken by various researchers.

The Archaeology of Stone Walled Settlements

Stone walled settlements have received much attention in the study of the Iron Age communities in southern Africa (e.g. van Hoepen 1939; Maggs 1972, 1976; Mason 1968, 1986). These structures are generally circular in nature, which allows us to distinguish them from later European and post contact structures that have more straight lines and corners (e.g. Biermann 1971, Maggs 1976). However, it is important to note that not all SWS have been attributed to Iron Age communities, as there is a large body of evidence linking herder communities to SWS (e.g. Humphreys 1972, 2007, 2009; Sampson 1985, 2008; Noli & Avery 1987).

For the purpose of this literature review, we shall focus on the research surrounding Iron Age SWS of the Highveld, as the structures found within the Vredefort Dome that we are interested in have been linked to Iron Age Communities (Taylor 1979; Pelser 2003). The movement of agro-pastoralists into the region has been attributed by Martin Hall (1987) to increased food security. Accumulating large amounts of cattle meant that agro-pastoralist communities had both an alternative source of food, as well as the economic means of acquiring food from distant communities in the event of failed crops likely due to the highly localised variations in rainfall across a region. Therefore, trade networks could be established, allowing for greater food security over a wide range. Hall (1987) speculates that the grasslands of the Highveld that were less appealing to more agricultural based communities suddenly became a viable option for these cattle economy based agro-pastoralists with ample grazing. The grassland vegetation of the region meant that wood resources were scarce and as such the new arrivals used stone

as a building material, which was abundant on the occasional hilly outcrop or range found in the grasslands (Maggs 1976; Huffman 2007). Tim Maggs (1976) speculates that the lack of timber posed a new challenge to migrating Bantu-language speakers, who relied extensively on wood for both construction and metalworking, and as such could be a factor in the delay of the movement of these peoples into the grassland region.

Stone walled settlements can provide a large amount of spatial organisation data, as the walls created to divide space linger on far longer than the organic materials used previously. As such, SWS have been intensely studied in terms of settlement patterns and spatial organisation (e.g. Van Reit Lowe 1927; Schapera 1935; Walton 1956, 1965; Maggs 1976; Pistorius 1992).

Based on the idea that every society organises its space according to their particular world view, settlement patterns can provide us with a powerful analytical tool in understanding archaeological settlements. Adam Kuper (1980, 1982), a British anthropologist, conducted a comparative study of southern Bantu-language speakers settlement's using a primarily structural analysis. What he uncovered was "...that all over southern Africa these settlement patterns were variations on a kind of structural theme" (Gibb & Mills 2001:213). This was an important step in the development of southern African archaeology, as Kuper describes it:

> ...suddenly they [archaeologists] had a model, and once they found the structure going back a thousand years they could begin to argue about the cognitive elements in the same sort of way as ethnographers do. (Gibb & Mills 2001:213)

The structural pattern that emerged from this study is known as the Central Cattle Pattern (CCP), and been adopted by various southern African archaeologists as a means of examining Iron Age sites (e.g. Huffman 1982, 1986a, 1986b; Evers 1984; Pistorious 1992). They were keen to address some of the critiques levelled at New Archaeology, and study cognitive aspects of human society (for an overview on Cognitive Archaeology in southern Africa see Huffman 2004b). The CCP describes a common spacial organisation to all eastern Bantu-language speaking societies, such as the division of male and female; sacred and secular; young and old; public and private; and so on (see Huffman 2007:25 for an overview). Central to this organisation is the commonly held worldview of eastern Bantu-language speaking societies of a patrilineal hereditary system, cattle wealth and a positive view of the dead (e.g. Huffman *et al*. 2006/2007). The CCP does not dictate that every settlement will look the same, but rather the principles behind their construction are consistent. As such, there are a multitude of variations of settlement styles linked to the CCP. A study of differing settlement styles shall be referred to

as the typological approach. The typological approach has dominated stonewalling studies in southern Africa.

Before we delve into the work done using the typological approach, it is important to highlight that the CCP is not without its critics. Paul Lane (1995) cautions against the use of ethnographic resources as an acceptable analogy throughout time. The issues he raises are about the suitability of ethnographic information through a large time depth and the dangers of imposing ideas on data that may not be suitable or even relevant. An element of this critique is the static and dogmatic nature of such a model, a point picked up by James Denbow (1991, 1998). The danger with a model such as the CCP is that it becomes a proscriptive model, rather than an analytical tool. Simon Hall (1995) raises this issue in a critique of the application of the CCP, arguing that such a model overlooks aspects such as local variability and historical circumstance. The issue he raises is of the kind of information that can be obtained from such a model, questioning the usefulness of such a study, as it may overlook more informative variations at a local scale. Early approaches to a typological understanding focused more on defining patterns seen within the multitude of SWS rather than following a CCP centric analysis, in fact it pre dates the adoption of the CCP.

Some of the earliest systemic typological work on stone walled settlements was conducted by Revil Mason in the Transvaal/northern Natal region (1965, 1968). In 1964, Mason began a wide survey of the Transvaal using aerial photographs (Mason 1965). As many of these sites are visible from the air, he could cover a large area using this technique. He developed a set of criteria based on the observed patterning of the sites, dividing and defining the different types of spaces found within a site. J.D. Seddon (1968), using Mason's (1965) criteria, surveyed the western Transvaal in order to try tease out the geographic distribution, as well as define the different Types of LIA SWS in the region.

However, Mason discarded his initial criteria (1965) and reworked his approach a few years later. He altered his approach to reflect a new understanding that the organisation of a site can be seen as a result of social systems of spacial division rather than arbitrary patterning he had observed (Mason 1968: 168). This later effort also used aerial photography as its primary data source in a survey area of some 47733 square miles, looking at the southern Transvaal and northern Natal between 26˚E - 31˚E and 25˚S - 27˚S. He identified 6237 Iron Age settlements

within this area and divided them into five main classes, and several sub classes (Mason 1968: 168):

1. Class 1: isolated circles or a cluster of adjacent but isolated circles.
2. Class 2a: small adjacent circles forming a larger outer perimeter wall, with a blank interior.
   Class 2b: multiple large circles formed by smaller interlocking circles.
3. Class 3: made up of a clear perimeter wall with interior circles. Mason (1968) believes that the perimeter wall represents a defensive adaptation. This argument is supported by the relatively small size of Class 3 Settlements which would mean a small and vulnerable community.
4. Class 4a: no perimeter wall but is made up of closely associated but scattered circles.
   Class 4b: no perimeter wall but a large cluster of closely related circles.
   Class 4c: no perimeter wall, made up of loosely scattered but related circles.
   These settlements are generally quite large and as such Mason (1968) argues that a defensive perimeter wall would not be required as a larger community would be more able to defend itself than a Class 3 sized community.
5. Class 5: is composed of irregular walling with no obvious planning, no discernible settlement pattern as such.

Mason continued to rework his classification system throughout his career, until arriving at a revised classification in 1983 for the southern western Transvaal (Mason 1986). This classification consisted of 11 Classes. After doing extensive archaeological work a number of these sites, Mason (1986) could speculate more of the nature of these sites. The 11 classes are as follows:

1. Class 1: elliptical perimeter wall enclosing some simple stone circles. These sites are typically found on the lower contours of hills or in open grass plains. Mason believes these to be the oldest SWS type in the area or later sites belonging to poorer communities. Mason links these sites to Taylors (1979) Group 1 sites.
2. Class 2: large structures formed of adjacent circular structures, linked by long curved walls. Generally sparse interior may contain some smaller enclosures. A lack of embayment in the boundaries suggests to Mason that these sites were made by poorer communities as private space is not delimitated.

3. Class 3: a necklace of stone circles that enclose a large blank elliptical space. Believed to be cattle stations for Class 6 sites.
4. Class 4: an outer perimeter wall that is elliptical or circular in shape, adjacent to an interior area containing smaller circles. These are most likely related to Maggs' (1976) Type V settlements (Mason 1986), although Type V settlements have no outer perimeter wall.
5. Class 5: an elliptical or circular perimeter wall with short straight walls projecting inwards at right angles to the perimeter wall, dividing various living spaces. The interior consists of smaller circles.
6. Class 6: very large settlements encircled by conjoined embayments facing inwards, forming a scalloped look. Each embayment is a distinct household. This perimeter encloses a set of interior circles, possible used as kraals, with a large parallel walled path connected to the interior and leading out of the settlement. Mason links these sites to the Hurutshe-Kwena peoples. May be related to Maggs' (1976) Type Z.
7. Class 7: a large boundary composed of inwards facing semi-circular embayments. These outer structures are separated from each other, with clear openings between embayments. These sites are similar in style to Class 6, but they are distant from each other in terms of pottery.
8. Class 8: a smooth perimeter wall, enclosing an arrangement of small enclosures, forming an interior circle of circles. Only one such example was found during the Potchefstroom University's Mooi River Survey.
9. Class 9: an expanded settlement of the Class 6 idea. The key difference being that there is no single enclosing boundary, but rather a more sprawled out settlement. These sites are also linked to the Hurutshe.
10. Class 10: not a SWS as such, but rather an arrangement of pebbles in order to demarcate hut floors and paths. The structures themselves were made from clay, poles and thatch.
11. Class 11: like Class 10, these are not SWS. Class 11 describes the use of caves by Iron Age Peoples, either as industrial areas or refuges.

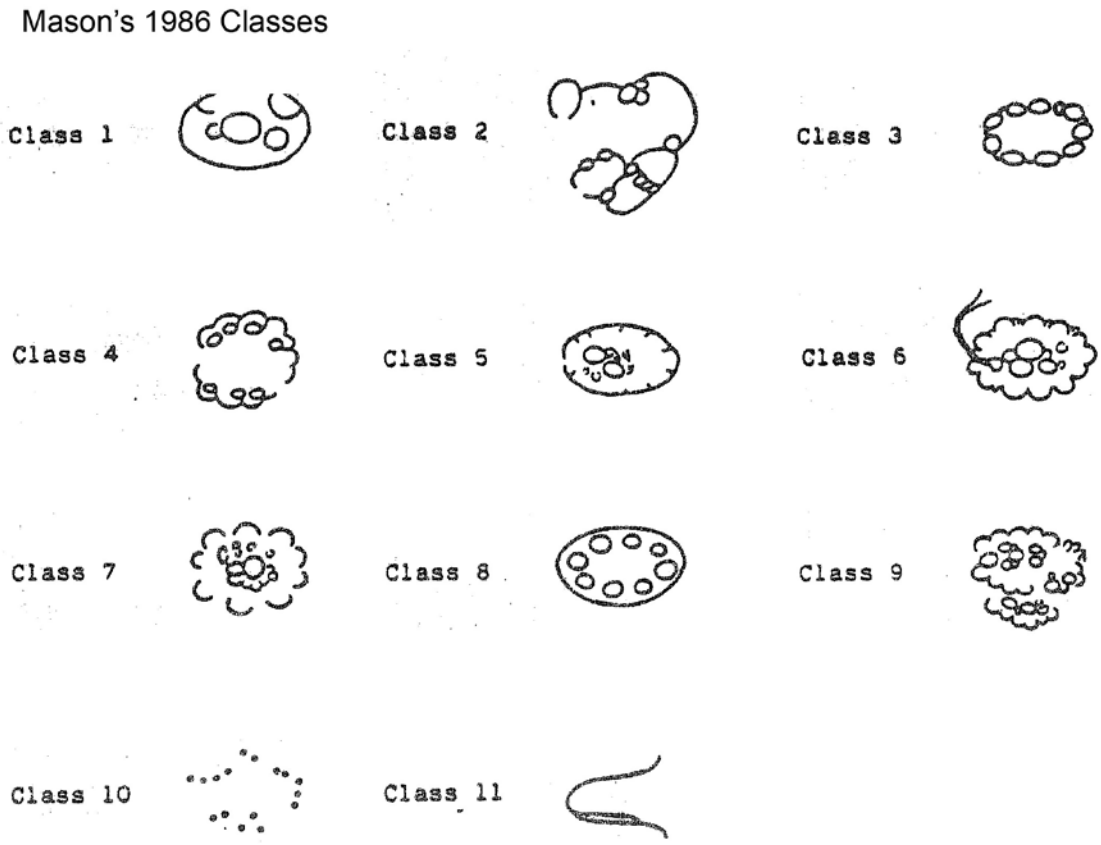


Figure 2.1 Mason's 11 Classes

Adapted from Mason 1986.

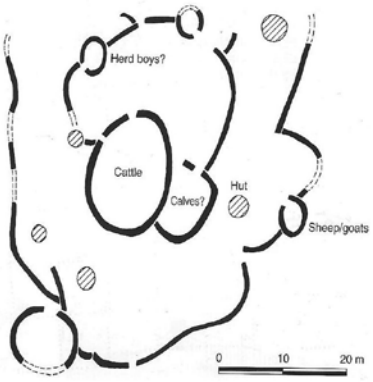
Following Mason's SWS work, Tim Maggs (1976) began his study on the topic south of the Vaal River using aerial photographs obtained from the Trigonometrical Survey for the Free Sate region. He developed a different typology, with some overlapping with Mason's (1968) work. He developed four SWS typologies:

1. Type V: formed by a number of enclosures that are grouped in a ring around a large central enclosure. These outer structures maybe a linked or free standing, but usually have an inwards facing entrance. The central enclosure usually has only one main external entrance. There may also be free standing peripheral structures surrounding the main settlement. This type of settlement has the highest frequency of corbelled stone huts, but should not be taken as a distinguishing feature as these occur in other types of settlements. Type V settlements tend to be found grouped together, anywhere from three to four units, up to over a hundred distinct units. Maggs identified a variation of the Type V settlement pattern which he called an Elongated Type V. The difference

being that instead of a circular formation, the outer structures have been laid out in an elliptical of even belt like shape. These only occur in a geographical limited context along the Klip and Vaal rivers. Maggs states that Type V shares some of the characteristic features of Masons (1968) Class 2a settlements. Maggs (1976) describes Type V settlements as a loose clustering of typically small kinship groups in an unspecialised layout.

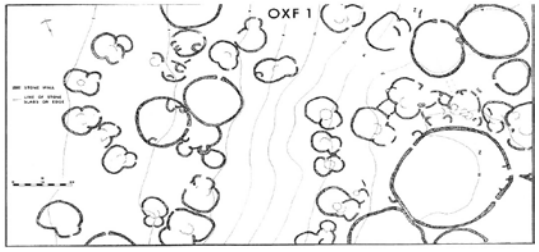
2. Type N: named after the *Ntsuanatsatsi* Site, is composed of primary enclosures, and linked to form an interior enclosure, with the entire settlement surrounded by a perimeter wall. The perimeter wall sometimes has small scalloped sections incorporated in it. The frequency of these scallops increase further north. With this type, standalone huts appear between the perimeter wall and interferer enclosures. The perimeter walls vary greatly in shape, anything from circular to oval, with varying sections of straight and curved walls. Whilst the definition of Type N is similar to Mason's (1968) Class 3, it is a broader category because Masons (1968) Class 3 does not include the scalloping sometimes found in type N.
3. Type Z: an inner cluster of tightly packed enclosures. This central cluster is surrounded by multiple *Bilobial* type arrangements which encircle the inner cluster forming what Maggs (1976: 40) refers to as "...a pattern similar to the petals of a composite flower". These outer structures are not connected to each other. *Bilobial* arrangements consist of a circular or oval hut that conjoins a larger circular courtyard which resembles two conjoined circles, the courtyard the larger (Maggs 1972). Maggs (1972) states that Type Z settlements closely resemble Masons (1968) Class 4 settlements.
4. Type R: one large primary enclosure in the centre, with smaller primary enclosures scattered loosely around it (Maggs 1976). Maggs speculates that these sites are the result of Khoe-San rather than Bantu-language speaking communities (Maggs 1971; Humphreys 1972). This idea had been carried forwards and the evidence suggests that these sites are formed by a local Bushman group that adopted a pastoralist mode of production due to complex interactions with new Bantu speaking neighbours (Humphreys 2007, 2009).

Type N



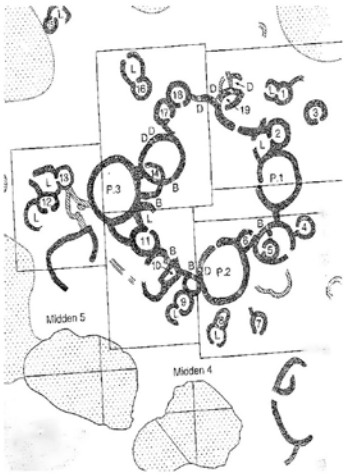
Adapted from Huffman 2007

Type Z



Adapted from Maggs 1972

Type V



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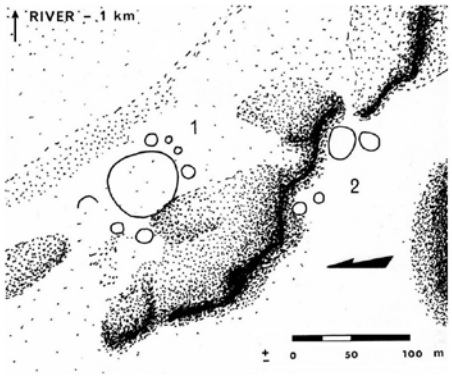
Type R



Adapted from Humphreys 2009

Figure 2.2 Maggs' 1976 Types

The Highveld region is by no means the only region of southern Africa that has received attention when it comes to SWS. The oldest known type of stone walling associated with the Iron Age (agro-pastoralists) in South Africa is known as Moor Park walling, and is found in KwaZulu-Natal (KZN) (e.g. Whitelaw 2000, 2001). In the Limpopo, stretching northwards we have extensive walling, from Zimbabwe era through to more recent Venda walling (e.g. Huffman 1982, 1986, 2000). There has been much research into the stone walled structures of Mpumalanga, containing distinctive agricultural terraces and cattle paths made from stone walls (e.g. Collett 1982; Maggs 1995, 2008; Delius & Schoeman 2008), which have even attracted exotic explanations (e.g. Hromnik 1982, Heine and Tellinger 2008). KZN also has an abundance of SWS, attracting research into these Nguni settlements (e.g. Hall & Maggs 1979; Hall 1984). An increasing amount of research has been looking at early non Iron Age stone

walling, linked to early pastoralists, in South Africa and Namibia (e.g. Humphreys 1972, 2007, 2009; Sampson 1985, 2008, Noli and Avery 1987).

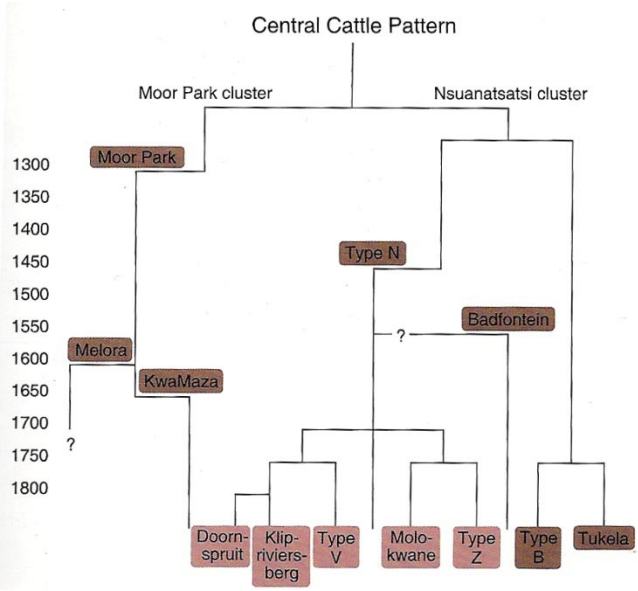


Figure 2.3 SWS Chronology (Huffman 2007:31)

Figure 2.3 was developed by Huffman (2007:31) in order to establish a chronology of SWS throughout South Africa, based largely on Maggs' (1976) typology. It shows current thought on the development of various SWS, showing development of types through time. Whilst we won't go into detail here on this chronology, the important piece of information to take from here is the relative old age of Moorpark and Type N SWS, and the explosion of different types from about AD 1700.

Archaeological Research of the Vredefort Dome

Whilst the pervious section covered the archaeological research of SWS in the Highveld, these were very large scale projects looking at a wide area. Maggs (1976:44) described the Vredefort Dome as an area of great archaeological potential due to the high concentration of different Types of SWS, which could help explain the relationships between them. Mike Taylor (1979) chose this area for his study region for his MA research project. The aim of his project was to establish an archaeological sequence for the last 500 years of the region. Taylor examined aerial photographs in a manner similar to Maggs (1976) and developed a classification of three

different Groups of SWS. He then excavated a sample of these different types, allowing him to perform an analysis of the pottery he uncovered at different types of sites. From this he established a ceramic sequence for the area, which he then tied to radio carbon dates he had obtained for the different types of sites.

Taylor (1979) designated settlements characterised by an outer perimeter wall enclosing a group of smaller enclosures as Group I. Group I SWS have been equated to Maggs' Type N settlements (Huffman 2002). However, Maggs' (1976:44) argues that Type N settlements differ to the simple Types found in the Vredefort Dome as they lack an interior enclosure formed by interlinked circles. Taylor found these sites on both the open plains northwest of the dome, as well as in the quartzite hills of the dome region. Taylor (1979) noted that these hill sites were usually hidden under trees and therefore difficult to spot in aerial photographs. These hill sites generally had little or no excavatable deposit, and as such, he concentrated on sites north of these hills. His excavations on Group I sites produced a calibrated radiocarbon date range of roughly AD 1500 to AD 1570.

Group II sites consist of an inner cluster of enclosures surrounded by numerous inwards facing semi-circular walls (Taylor 1979), similar to Maggs' (1976) Type Z walling. These are found on the Potchefstroom plains north west of the Vredefort dome, usually on the various koppies that occur in the area. The calibrated date range for these sites was between AD 1700 and AD 1800.

Group III settlements are formed by a tight clustering of circular enclosures with an outer perimeter of curved walls and small enclosures (Taylor 1979). They are more complex in their construction, as they consist of numerous interlinked circles. These sites are located on the north eastern outer limits of the Vredefort dome, stringed along the base of the outer quartzitic hills ringing the dome (Taylor 1979; Loubser 1985). Associated dates obtained in excavations are very similar for Groups II and III.

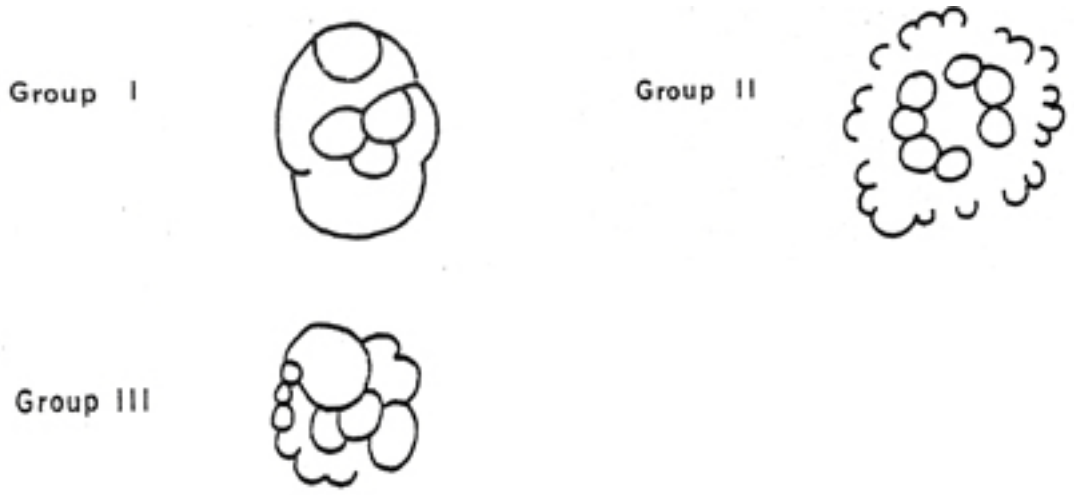


Figure 2.4 Taylors 3 Groups.

Thus, Group I SWS clearly are the oldest type, dating to roughly AD 1500 - AD 1570. Groups II and III appear to be contemporaneous at around AD 1700 to AD 1800. Taylor (1979) concludes that Group III pottery appears to be descendant from Group I pottery. Taylor believes that Group II heralds a new population into the area, while the local population changed architectural style to Group III. Due to Legassick's (1969) demonstration that there were people in the area before the Tswana Rolong, he assigns Group I settlements to the early Sotho (possibly Kwena-Fokeng)[1] settlers in the area. Group II sites were constructed by an influx of Tswana (probably Rolong) into the region, which displaced the Sotho into a previously unsettled area, where they built in Group III style. He speculates as to the fate of the Sotho in the region, who either assimilated into the Tswana before or during the *Difaqane*, or retreated to the hills during this period. He was unable to determine their fate. Interestingly, Taylor found stone tool artefacts only associated with the Group I sites.

Taylor (1979:107) speculates that the open plains north/west of the Dome region were the preferred area for settlements, and that the early Group I settlements there became displaced by the influx of Group II. He is uncertain as to the reasoning behind the placement of Group I

[1] It is important to note that since Taylor's (1979) and Loubser's (1985) work, the Fokeng group has been re-identified as an early Nguni speaking population (Huffman 2007), which was later "Sotho-ised", possibly by the Kwena. Early Type N, which Huffman (2007) links to Taylors Group I was therefore most likely produced by an Nguni speaking population. Also, Huffman (2002) rejects the differences between Group I and Group III when a larger sample is examined. However, he still accepts the later date for Group III sites, and as such it represents a continuity rather than variation.

type settlements in the hilly regions of the dome, but speculates that they could be cattle posts or defensive settlements.

Jannie Loubser (1985) was tasked with following up on Taylor's (1979) work with a particular focus on Group III settlements in the same area. This is due to the low amount of data produced during Taylor's excavations of Group III sites, attributed to a lack of features within his chosen sites. Loubser (1985) therefore chose a well-delimited site of rich archaeological potential. This study comes to much the same conclusion as Taylor, in that the Group III sites were most likely occupied by a Southern Sotho Group, possibly the Kwena or Fokeng, who had incorporated many aspect of the Rolong into their lifestyle.

Anton Pelser (2003) sought to expand on what we know about the Vredefort region with his MA thesis. He chose the Askoppies as his research site, on the north-western edge of the Vredefort Dome. The site itself is a large aggregation of Group II SWS. Pelser (2008) brings up a division in the Group II typology, based on a distinction made by Mason (1986). This distinction has to do with the outer semi-circular scallops. With Mason's (1986) Class 6 walls, these scallops are all connected. Pelser (2003) designates this type as Group IIa, which was been identified Western Sotho-Tswana. This type has been linked to the Kwena in the Suikerbosrand (Huffman 1986). With Mason's (1986) Class 7 these outer perimeter scallops are clearly separated. Pelser (2003) designated these types of sites as Group IIb, which belonged to the South Western Sotho-Tswana. Both Taylor (1979) and Mason (1986) link this type of site to the Rolong.

The purpose of Pelser's (2003) research as Askoppies was to try clear up the distinction between Groups IIa and IIb (Western and South Western Sotho). Based on his pottery analysis, Pelser concluded that the ethnic identity of the people at Askoppies was Rolong, confirming Taylors (1979) conclusion. However, Pelser (2003) states that the *Difaqane* most likely clouded the picture as many different groups of people would aggregate for protection.

Further study of SWS in the region was done by Mamakomoreng Nkhasi (2008) looking at the geographical distribution of Taylor's Groups in the Vredefort Dome. This study expanded upon Taylor's (1979) survey area, which she felt to be too geographically limited. Like Taylor, Nkhasi

(2008) used aerial photographs as a primary data source. However, Nkhasi (2008) employed GIS to organise and analyse the data she gathered, looking for spatial patterns over a wider geographical footprint than Taylor (1979). She used Taylor's (1979) typology for her study, identifying and mapping out the location of various settlement types within the Vredefort region. From these data she by and large confirmed Taylor's (1979) site distribution over a larger area. She then proceeded to examine possible reasons for the placement of these different types based on variables such as vegetation, agricultural potential, settlement size, clustering etc. These data were used to explore possible reasons for site location based on aspects such as agro-pastoral activities, social stratification, defensive and social aggregation.

Nkhasi (2008) expands on Huffman's (2007) re-evaluation of Group I sites as an early Nguni population, seeking to examine spatial layouts in terms of what is known about early Nguni speaking settlements based on the work of Hammond-Tooke (1991). She concludes that the spatial organisation of Group I reflects that of such a population, thereby supporting the Nguni origins of the original settlers in the region. Nkhasi (2008) concludes that Group II sites present an aggregation prompted by the difficulties posed by the *Difaqane*, as in a defensive adaptation, built by Rolong Sotho-Tswana speakers. This is in contrast to the idea that these sites could present aggregation due to social/political stratification.

Historical Background

In the previous section, we have seen the term *Difaqane* used quite often as a period of significance for the region. The purpose of this section is to explain why this is considered an important period; and how it may have affected our research area. The *Difaqane/Mfecane,* is a term describing a period social, political and economic turmoil in southern Africa in the early 19th century, which culminated in a breakdown in social order; places a likely upper time limit on the occupation of our sites. The conventional view on the cause of this period is the creation of the Zulu kingdom under Shaka (e.g. Omer-Cooper 1966). However, this Zulu-centric view was challenged by Cobbing (1988), who saw the conventional view as a means to justify *Apartheid* land divisions. Cobbing's (1988) revision of the topic looked to the effects of European slave raiding on the social dynamic of the region.

However, the evidence did not seem to seem to support the idea of European slave trading as the prime mover in this period (e.g. Eldredge 1995). The effect this argument did have was to broaden this study from the Zulu-centric approach, leading to studies on the impact of various factors on the social structure at the time. These factors include the impact of the increase of demand by European traders at Delagoa Bay for items such as ivory, which became an increasingly scarce commodity with over hunting (Hedges 1978; Smith 1969) and cattle to supply whaling ships, which increased cattle raiding (Wright & Hamilton 1989). The introduction of maize may have also been a key factor in this equation (Maggs 1982; Huffman 1996). With a higher yield and lower labour requirement, maize was an ideal crop in times of higher rainfall such as the latter half of the eighteenth century (Hall 1976). Huffman (1986a) argues that this increase in food supply resulted in an increase in population, as evidenced by larger aggregated communities. However, maize is less drought resistant than traditional crops, which proved problematic in the early nineteenth century when a series of droughts, as well as cattle disease, hit the region (Hall 1976; Bonner 1983). This natural disaster may have led to food shortages, adding to the already tense social/political dynamic of the region.

The net effect of these factors was the formation of centralised power blocks, which either absorbed or drove off smaller chiefdoms and came into conflict with each other (Mitchell 2002). This process created the conditions that allowed Shaka, a commander of the slain Dingiswwayo to form a Zulu dominated power block that later came to be the most powerful in the region. Whilst the initial events of the *Mfecane* had little effect on the research area around the Vredefort dome, the knock on effect most certainly did.

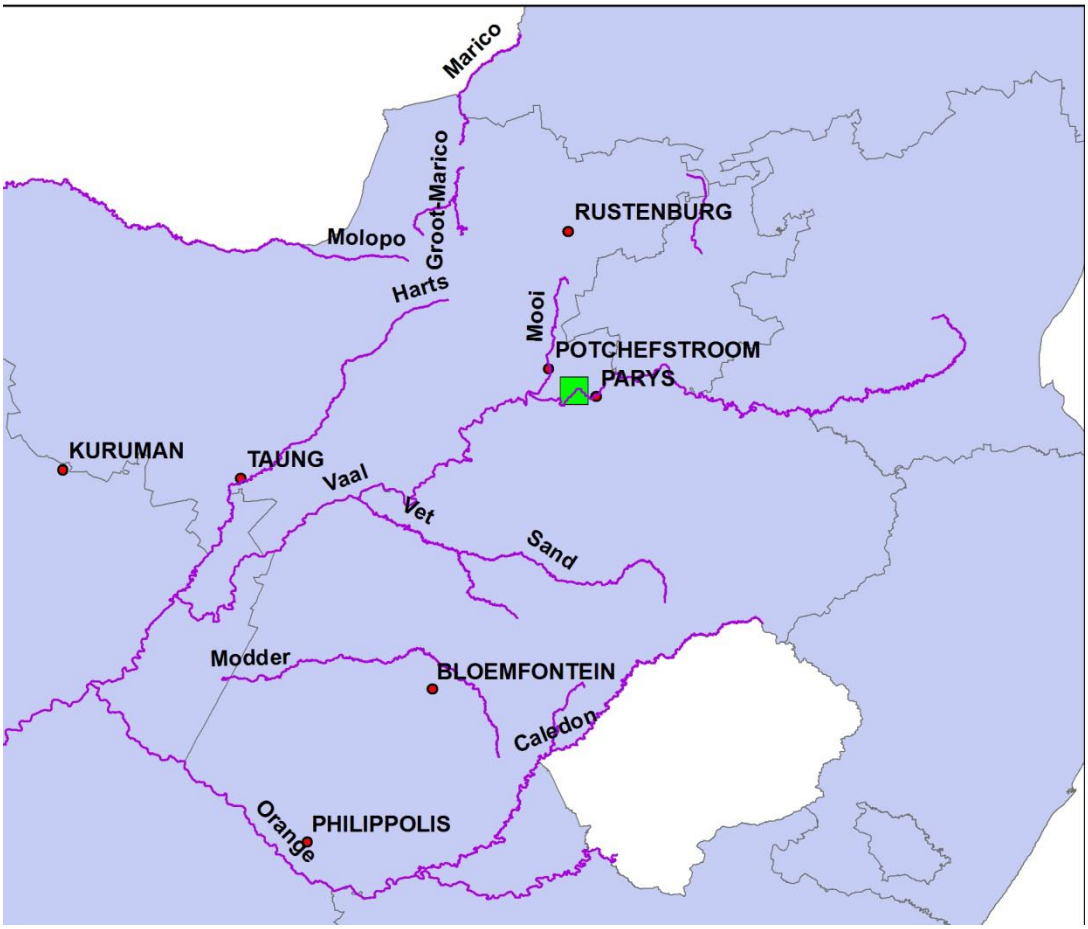


Figure 2.5 Transorangia Region

Martin Legassick (1969) outlines a sequence of events and population movements in what he terms as the Transorangia region for his PhD on the frontier societies of the late 18th and early 19th centuries. The Transorangia region can be defined loosely as the region extending north of the Orange River, as far as the Molopo and Marico rivers. This region extends eastwards towards the upper part of the Caledon River. Figure 2.4 shows where the Vredefort Dome lies within this region. The significance of the Orange River lies in its status as the border with the Cape Colony, and as such was labelled as a frontier zone, although the boundaries in this region were usually blurred (Legassick 1969). Much of the movement of peoples discussed by Legassick (1969) is described in terms of river locations, which is illustrated in Figure 2.5.

Before the *Difaqane,* peoples belonging to the Sotho Tswana linguistic group lived in the region along the Vaal River valleys, stretching eastward to the Vet, and south to the Caledon lived in relative isolation, except for the San hunter-gatherers who they slowly displaced or integrated as they moved into new territories (Legassick 1969). By the 1820's, Khoekhoen pastoralists had

moved into the region, primarily along the Modder and Vet rivers. Relations between these groups seemed to be amicable, with trade occurring between them. Legassick (1969:163) stresses however, that the Sotho Tswana groups in the region were growing as increasingly complex socio/political entities rather than stagnant communities that preceded the *Difaqane*.

The arrival of the Nguni speaking Hlubi in the early months of 1822 began the process that we call the *Difaqane,* lasting three years, in this particular region (Legassick 1969). Driven from what is now KZN by the Ngwane, the Hlubi settled in the upper areas of the Caledon. They proceeded to raid neighbouring communities to the west, along the Caledon River, and northwards towards the Vet/Vaal confluence. The Thlokwa, unwilling to ally with their neighbours against the Hlubi, fled from the Hlubi and began conducting raids of their own against various Sotho Tswana groups along the way (Legassick 1969). This caused a breakdown of the social order of the region, with various communities destroyed, absorbed by the Hlubi or Thloka, or fleeing. Some remnants of shattered communities sought refuge in caves and mountains, with or without cattle (Legassick 1969). The Thlokwa ended their raids after a failed attempt at laying a siege against Moshwehwe's mountain kingdom; eventually leaving the area. The Ngwane pursued the Hlubi, eventually destroying a large portion of the Hlubi, the remnants of which fled the area.

This process mobilised many of these affected groups into bands of raiders, who looked to communities north of the Vaal to exact revenge and/or try replenishing their lost resources such as cattle and people (Legassick 1969). These dispossessed peoples attacked the Kwena at Molokwani, as well as the Hurutshe at Kaditshwe, during this period (Legassick 1969). The dispossessed group, consisting of Sotho groups such as the Phuthing and Fokeng, turned its attention westwards, attacking various Rolong groups and threatened the Thlaping town of Old Dithakong, just east of Kuruman. Kuruman was the base of the missionary Robert Moffat. Moffat, under the advice of the Thlaping, requested aid from the Griqua. The Griqua were a group of mixed Khoekhoen and European ancestry, who were associated with the Korana, a group of people descended from the Khoekhoen who had adopted elements of an European lifestyle (Rasmussen 1978). These communities generally lived on the fringe of the Cape Colony due to their persecuted status amongst European settlers. The power of these fringe communities came from possession of European firearms and horses, both of which offered a huge military advantage over the local populations. This rare alliance between various Griqua factions and the Thlaping force drove off the invading *Difaqane* armies at Old Dithakong (Rasmussen 1978). The Griqua continued to harass the *Difaqane* invaders, which fell apart not

long after their initial attack. This gave rise to a new raiding group, the Taung under the leadership of Moletsane (Legassick 1969). The Taung raided along the Vaal River, attacking various groups including the Korana and Rolong.

The power dynamic changed in this region with the arrival of Mzilikazi, of the Khumalo chiefdom, leader of a group collectively known as the Matabele (later the Ndebele) out of KZN. Mzilikazi fled the KZN area after a dispute with Shaka over cattle that he was supposed to turn in after a raid (Rasmussen 1978). His early movements are hard to trace. One account has Mzilikazi fleeing into Mpumalanga where he encountered the Pedi who were already weakened from internal strife (Rasmussen 1978). However, the identity of the group attacking the Pedi has been disputed, with Peter Delius (1983) attributing it to Zwide. Rasmussen (1978) then traces Mzilikazi's movements southwest, towards the central Vaal River around 1823. Here he consolidated his kingdom, gathering more followers such as Nguni refugees or incorporating local Sotho women and children he had captured. His territory ultimately stretched from the confluence of the Vaal and Suikerbos rivers in the east to the confluence of the Vaal and Mooi rivers in the West (Rasmussen 1978). However, Legassick (1969) places Mzilikazi's movement into the area straight to the Apies River in 1825, near present day Pretoria; a move Rasmussen (1978) speculates only happened later (1827) due to constant harassment by Korana and Griqua raiders. Whatever the date of this settlement of the Apies River, Mzilikazi developed his own style of SWS based on Zulu military structures known as Doornspruit walling (Pistorius 1995, 1997).

Perhaps due to the transient nature of Mzilikazi's growing kingdom, aggression seemed like the best defensive technique, as they held no strongly fortified settlements (Rasmussen 1978). Most of their military actions were in a westward direction, displacing the Khudu and Kwena westwards through Rolong territory. His raids eventually hit the Rolong and went as far north west as Botswana. Mzilikazi presented a new type of force into the region, one geared towards building a powerful kingdom rather than razing all that stood before him (Legassick 1969). This involved incorporating captured people into his kingdom, or allowed subdued groups to co-exist under the conditions that they offer tribute and military assistance.

Mzilikazi's power in the region did not go unchallenged. The Taung chief, Moletsane allied with previous enemies, the Links Griqua and Korana, under the leadership of Jan Bloem, in order to

form a power block of his own (Legassick 1969, Rasmussen 1978). This alliance caused problems for Mzilikazi as they frequently raided his cattle posts (Rasmussen 1978). Mzilikazi did not take well to this harassment, and sent forces to recapture his cattle (Legassick 1969). He decided to remove this threat to his hegemony in the region by creating an army of his followers, as well as Rolong tributaries (Legassick 1969). He then launched an attack against Moletsane, winning a decisive victory over Moletsane near modern day Bloemfontein. Moletsane then suffered further harassment by Griqua groups under the leadership of Berend Berends from the south, reducing their numbers to a fraction of their peak strength (Legassick 1969). However, by this stage Mzilikazi had another problem in Dingane, Shaka's successor, who sent expeditionary forces to harass Mzilikazi (Rasmussen 1978).

The defeat of Moletsane by Mzilikazi awakened other Griqua groups to the threat Mzilikazi posed to the Griqua way of life, which involved trading with transfrontier peoples and hunting in these lands (Legassick 1969). They formed an alliance, with the idea of driving out the Ndebele so that Sotho Tswana groups could re-establish themselves and resume trading with various Griqua and Korana groups. This commando conducted a highly successful raid against Mzilikazi, seizing a large number of his cattle and people (Rasmussen 1978). Mzilikazi dispatched an *impi* to retrieve his cattle, which caught the commando unawares and ill prepared to mount any form of defence. The *impi* decimated the commando force and retrieved Mzilikazi's cattle and people (Rasmussen 1978). This defeat muted Griqua offenses against Mzilikazi, which were reduced to minor skirmishes and raids.

Mzilikazi's position remained secure (despite several raids by Dingane's forces) until the arrival of settlers of European (mostly farmers or Boers) and Khoekhoen descent into the previously un-colonised central interior and modern KZN region, in what later became known as the as the Great Trek (Groot Trek) (Legassick 1969; Naudė 2005). The collected movements of these people, seeking independence from British Colonial rule, was written into a series of almost folk legends, by those seeking to forge an Afrikaner national identity in the early twentieth century (e.g. Hofmeyer 1988). Reasons for this migration are varied, but generally tend to revolve around disaffection for British colonial rule (Naudė 2005). There were numerous aspects of British colonial rule that did not sit well with frontier farmers, such as attempts of Anglicization and a lack of political power for those of Dutch descent. There were also more practical reasons behind the Great Trek, such as the desire to find better land as well as long lasting conflict with the Xhosa in the Eastern Cape, closing that boundary to any form of expansion.

The arrival of the Trek Boers into the region of our interest dates to around 1836, with the arrival of a large group under the leadership of Andries Hendrik Potgeiter near the Vet River southeast of the Vredefort Dome (Naudė 2005). This was the period following the *Difaqane,* which had devastated local populations, allow the Voortrekkers to claim easily what seemed to them to be sparsely populated land. A group of Potgeiter's followers made the mistake of crossing over to the northern side of the Vaal, Mzilikazi's southern border. This prompted an attack on this party, near present day Parys, wiping them out. The European settlers allied with the remnants of the Taung and Rolong groups, and proceeded to launch an attack on Mzilikazi (Naudė 2005). The Rolong were rewarded for their assistance in this matter by the settlers with land in what is now the North West Province (Naudė 2005). Where the Griqua advantage of guns and horses had failed to defeat Mzilikazi, the settlers used a new tactic that was devastatingly effective, the Laager (Legassick 1969). A Laager is a circular formation of ox wagons, creating a barrier from which firearms could wreak havoc on the close quarter weaponry of the Ndebele. The Ndebele moved into what is now modern day Zimbabwe (Rasmussen 1978). The newcomers settled, establishing Potchefstroom near the Mooi River, the largest town in the region.

This historical research on the wider region can aid and inform our study in a number of ways:

- It outlines the rather brutal end of the Late Iron Age in the region, which occurred in a very short period between 1822 and 1836. It is unlikely that the sites of the Vredefort dome postdate this time, as it saw a complete devastation of the Iron Age peoples of the area.
- We also know that during this period people "...sought refuge in caves and mountains, sometimes managing to hold onto a few cattle." (Legassick 1969:163). This is consistent with speculations made in the archaeological research of the area that the location of some sites in the hills of the Vredefort Dome may be related to the events of the *Difaqane.*
- The Vaal river is mentioned several times as both a place that has been settled, as well as a transport corridor for various groups through time, both hostile as well as refugee. It also acted as a border for Mzilikazi's kingdom, which we know was defended close to our research area (Parys). As the Vaal River falls within our study area, we can view it in these ways.

3. Method

Introduction

Taylor (1979:12) identified thick vegetation cover as a problem in using aerial photography to survey the quartzite hills of the Vredefort Dome. The varying types of vegetation of this region make finding and classifying SWS a difficult and possibly inaccurate exercise. To verify this observation, aerial photographs from a low flying aircraft were taken of the research area, in order to compare with maps created on the ground. Some of the results of sites located within the dense vegetation are displayed below.



Figure 3.1 Aerial photograph of BFK SWS 1

Even zoomed in, the site is not visible in the vegetation.

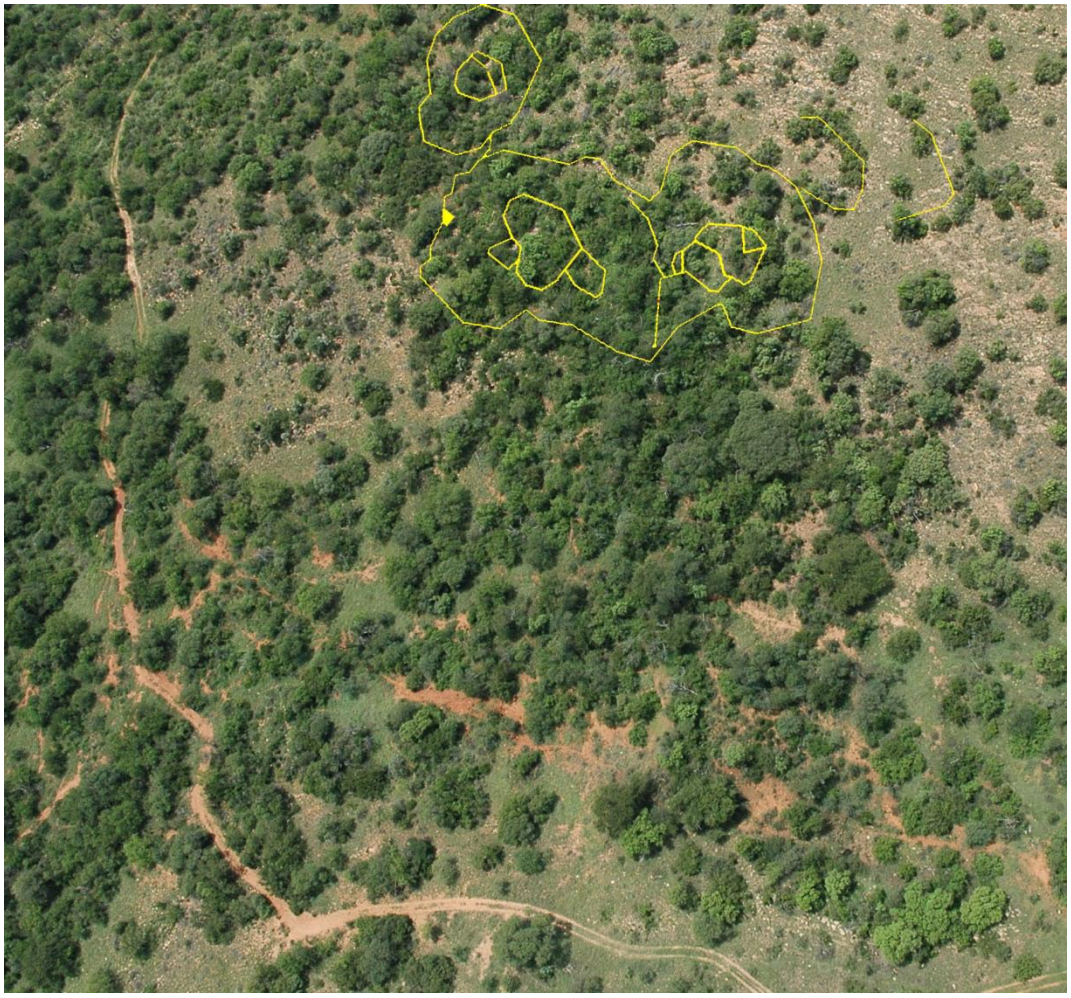


Figure 3.2 BFK SWS 1 Map superimposed.

As we can see, the dense vegetation makes this form of survey ineffective. However, not all the sites within the Vredefort Dome are within this dense vegetation.

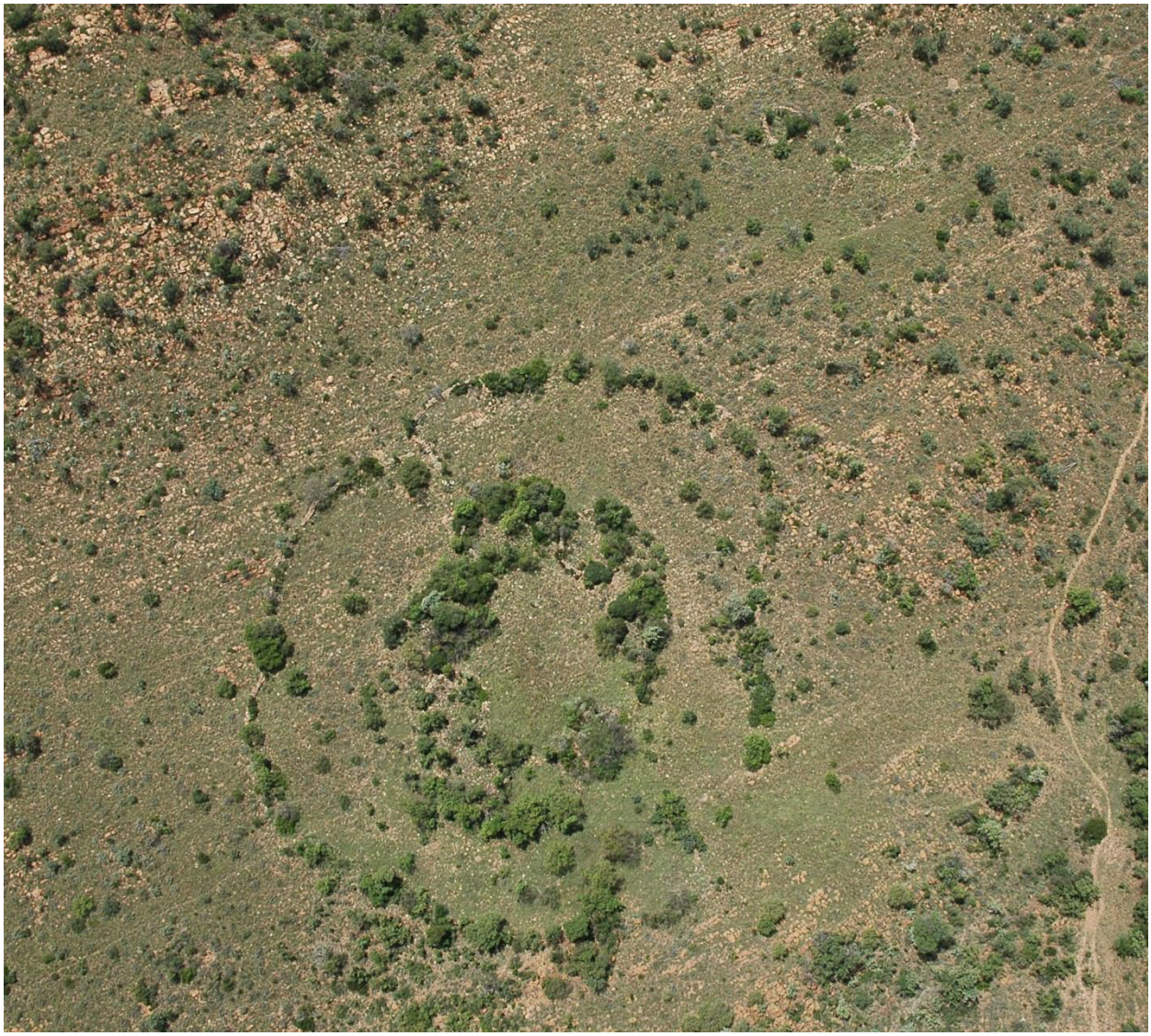


Figure 3.3 BFK SWS 17

An example of a site that is clearly visible from the air. This site was labelled BFK SWS 17. From this photograph, this site seems to be a Group I site. However, once mapped, it became evident that this site fell within Mason's Class 8.

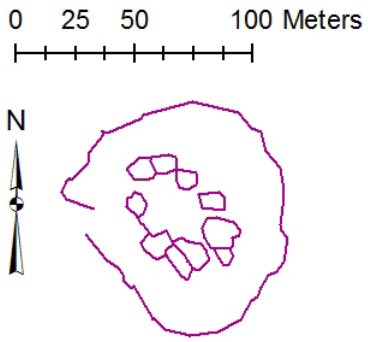


Figure 3.4 GPS map of BFK SWS 17

The above examples demonstrate the problem with aerial surveys in this region. Even if a site is clearly visible from the air, it is possible to misclassify a site due to the difficulties in seeing fine inner site detail.

We can conclude from this exercise that whilst aerial photographs can provide us valuable data, the range of usable data only came from sparsely vegetated areas. As such, a comprehensive ground survey was required to locate and identify all the SWS sites in the survey zone. Buffelskloof was surveyed over a period of four weeks, with any archaeological feature being recorded or mapped in the case of SWS. The location of many of the sites was known due to the work of the former assistant farm manager, who held an interest in these sites. Finding other sites, particularly in the dense vegetation was more easily achieved in the winter months, as the vegetation had thinned out during this time.

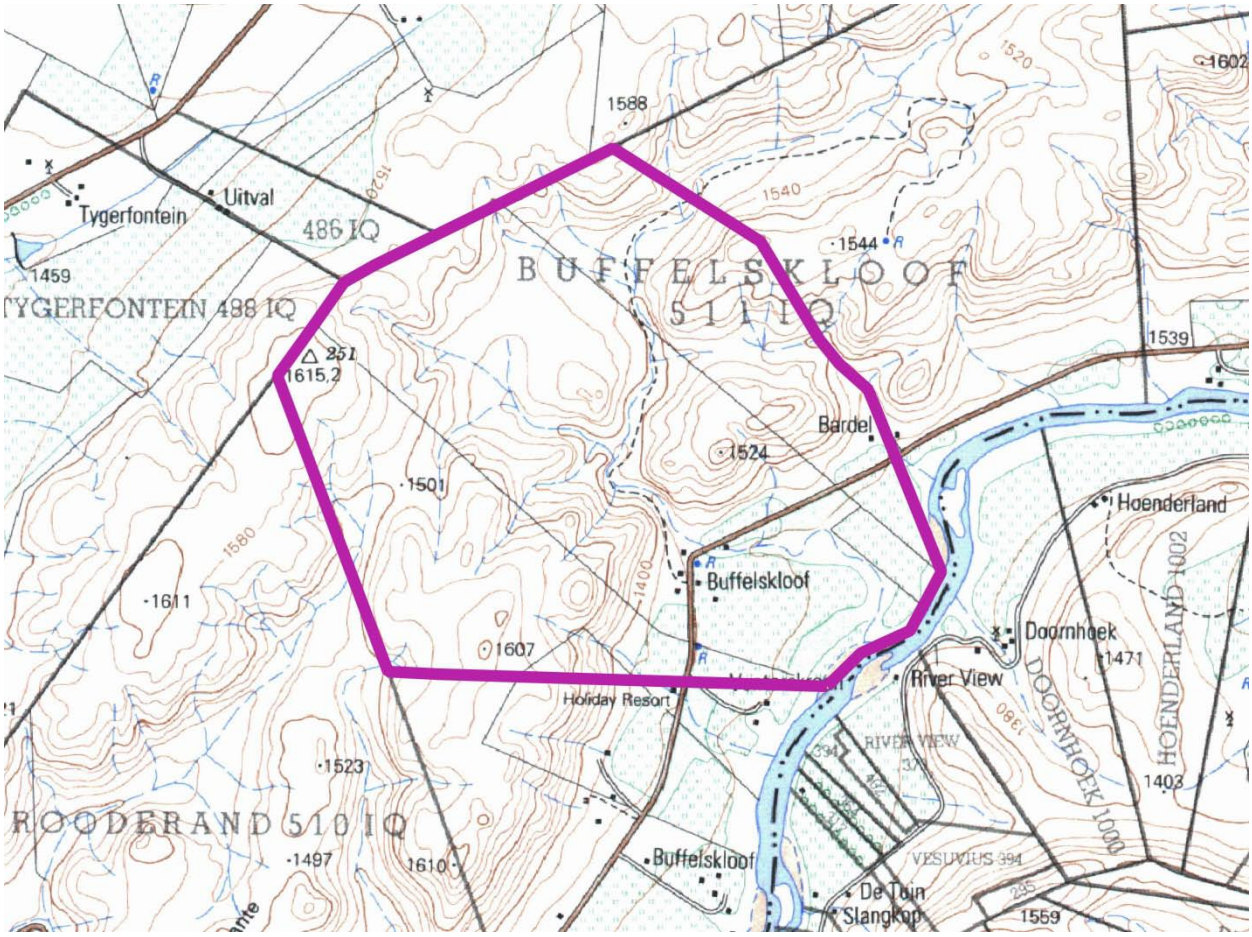


Figure 3.5 Survey Area.

Mapping Stone Walled Structures

It was determined that in order to facilitate the identification these SWS, it would be necessary to map them out. This is due to the difficulty in seeing the overall shape and features of the SWS from the ground in dense vegetation. Three mapping techniques were tested. The first was traditional mapping with a dumpy level by third year undergraduate students in 2008 during a field school (Sadr 2008). It was noted that the dense vegetation along with the inexperience of the third year students; rendered this mapping technique ineffective. The dense vegetation restricted line of sight, the primary element of this mapping technique. The students were unsuccessful in producing a complete map of a single SWS over the course of a week. Each site would require substantial clearing, which would be a time consuming task. Given the large number of SWS in the area, a wide scale mapping exercise would not be feasible using this technique. It was noted in the field report that a different mapping technique would be required (Sadr 2008).

In 2009, another mapping technique was tested (Sadr 2009). The idea was more of a semi accurate sketch map, which would prove less accurate than a traditional dumpy level map, but easier to manage in the dense vegetation. This technique involved using a mirror compass from a central datum. An assistant would then move to a spot to be mapped, and the compass bearer would measure the angle from (magnetic) north using the compass sight. The distance between the two would then be paced out for a rough estimate of distance. This technique proved to be more effective than the dumpy level method, but was still very time consuming. It involved much crashing through dense foliage, which could only be tolerated for a certain amount of time. Line of sight was easier to determine using this technique, based on the larger nature of the "target", being the volunteer student. An example of the results of this mapping exercise can be seen in Figure 3.6, which took a team of three people a full workday to produce.

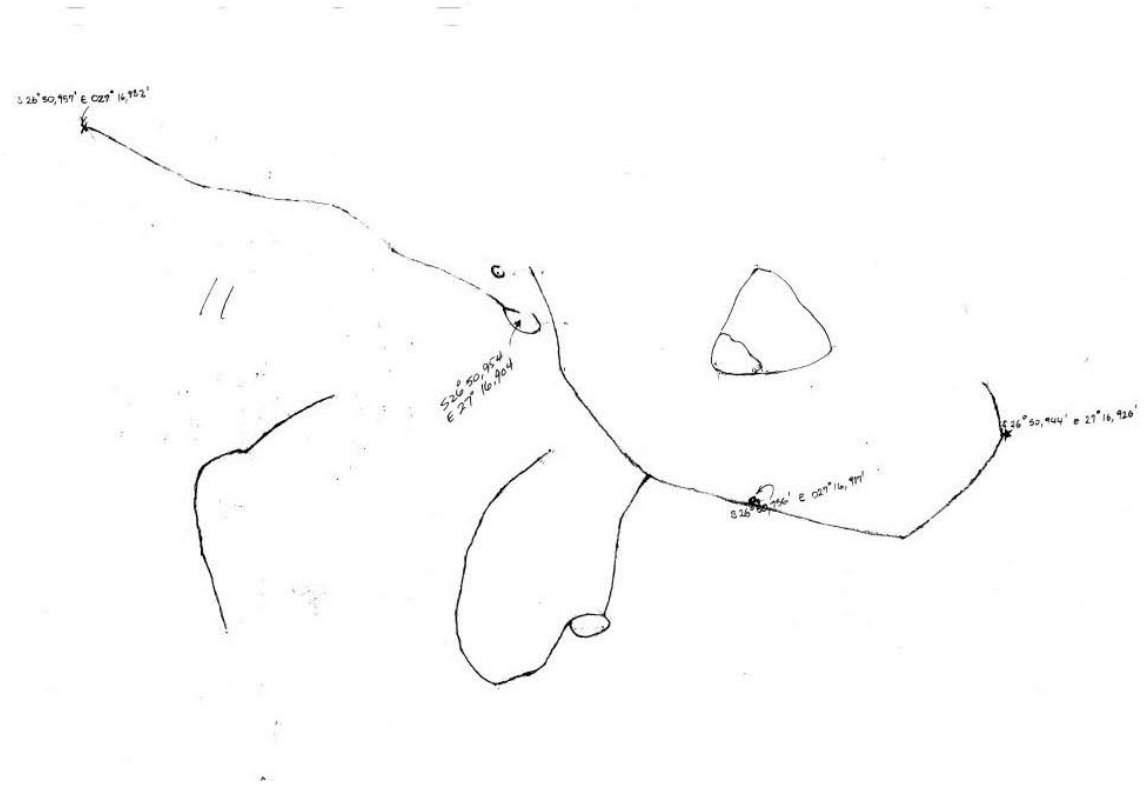


Figure 3.6 Sketch map of the upper section of BFK SWS 1

Whilst more effective than the former mapping technique, this method still had some issues. It was time consuming; involved crashing through dense thorny foliage and was not particularity accurate. Karim Sadr trialled the idea of using a Global Positioning System (GPS) to map these SWS. The idea being that one could walk along the walls themselves holding a GPS receiver, which could map your path as you move. Therefore the GPS path would represent the walls of the SWS, and as such one could simply map a SWS by walking its walls. The attraction of this idea is that it eliminates the need for line of sight. The element of crashing through the bushes would remain, but one would only need to walk through a particular set of foliage once. The initial attempts at this mapping technique were less than satisfactory, primarily due to the equipment used. This was done with a bluetooth GPS receiver that would send the information to a Personal Digital Assistant (PDA) running the mapping software suit OziExplorer. The fundamental issue with this early attempt was the lack of precision of the receiver. As such, it could not provide the kind of resolution that mapping these sites required. It produced long straight lines, with sharp bends that did not accurately represent the walling followed. A later attempt at this mapping technique using a more accurate and customisable GPS proved to be

far more satisfactory. This became the method employed in order to map out SWS found in the area.

The GPS used is a Garmin GPSMAP 60CSx hand held receiver. This GPS offers a number of features that are useful for this type of mapping. The initial problem with using GPS tracks was the resolution of the paths produced. GPS tracks are created by recording multiple points at set intervals in a particular order. The reason for the inaccuracy of the first receiver was that the recoding intervals of the path were too far apart, meaning that the tracks skipped from one point to another over a large distance, missing large amounts of detail. With the Garmin GPSMAP receiver, it is possible to set a custom interval-recording period. Setting this interval at one second provided sufficient resolution to the data to map out all the kinks and curves along the walls, provided one did not move too quickly. Movement speed on these walls was not, however, an issue, as navigating them took quite some time. The second useful feature of this GPS that makes it useful for this type of work is the high sensitivity receiver hardware in the Sirf Star III chip (Penrod 2006). This becomes an asset in the field is the GPS receiver's ability to acquire and maintain satellite lock under challenging circumstances. Some of the sites mapped were under a tree canopy, and whilst the reported accuracy of the receiver unit dropped, it was still able to maintain lock and produce a track that closely resembled the SWS that was mapped out. Other benefits of the GPS receiver are the Universal Serial Bus (USB) port for easy data transfer and the device's rugged construction, which helps in the conditions presented by the Vredefort Dome.

Field trials were performed with a differential GPS (DGPS) to test the viability of such a system for mapping these types of sites. The DGPS employed here was a Trimble LS 4600 land surveying system. This operates with a base station and a roaming receiver. The Post Processed Kinematic (PPK) method of recording/processing data was used due to time constraints. This method offers sub centimetre accuracy. Whilst I won't go into the technical details of how this system works, I will explain a few problems that were encountered that ruled this system unworkable for the purposes of this project. The receiver of the GPS requires an initialisation period of twenty minutes in order to guarantee a good level of accuracy. The fundamental issue here is that should the roaming receiver lose its lock on with satellites, the system need to be reinitialised. Losing contact occurs when the receiver loses line of sight, which can occur when the receiver moves under a tree or is tilted at an angle greater than 30˚ off vertical. This makes the receiver troublesome to move around on rugged terrain and unusable under any form of dense vegetation. The second major issue is the single frequency

nature of this particular unit. Should the satellite view differ between the base station and the receiver they will record different GPS information. Without the ability to autocorrect this, there is a high probability that the data collected wont process in the post processing phase. A Trimble R6 was acquired by the department which was far more suitable than the older LS 4600, but came during the period of writing up, too late for fieldwork.

The method used for mapping SWS was relatively straightforward. When a SWS was located, a preliminary survey of the site was performed in order to determine the overall structure of the site. Based on previous work done on SWS typologies, it is quite common to find some form of perimeter to a site. By finding this perimeter, it is possible to find the boundaries of the sites. Once the outer limits of the site had been established, the interior walling was examined. This allowed the site recorders to develop a mental map of the site and establish the best way to map the site. A rough sketch map of the site was made in order to help correct any recording errors at a later stage. There are various considerations when making a map such as this. Perhaps the biggest issue was the twenty track limit the of the GPS receiver. As such, one had to try minimising the number of tracks used in order to make a map. Backtracking over previously mapped areas produced overlapping tracks which required post processing to remove, and as such was kept to a minimum. The track produced was drawn in real time on the display which provided a visual aid, preventing any redundant mapping as well as allowing for any mapping problems to be spotted in the field. In order to increase accuracy, these maps were created in one go over a short period. The reasoning behind this is that the GPS was likely locked the same satellites during this period, meaning that the many points recorded that make up the map were more accurate in relation to each other. The idea behind this is that whilst the accuracy of the actual point may be within a certain accuracy confidence, the same data set (satellites in view) is used to calculate the next point, meaning the points are relatively accurate to themselves. Mapping over different satellite sets would provide inconsistent results and as such was avoided.

The GPS receiver was taken to the start point of a new segment, any existing track data was cleared from memory, which would start a new track. Once the GPS receiver had been moved along the walling and reached an end point, the track was saved. The receiver was then moved to the next point and the procedure was repeated. This method saved only relevant data, with useless data such as the movement from an end point to another starting point being deleted. Tracking was disabled once the site was recorded for the same reason.

Importing the Data

Each day once the fieldwork was completed, the data were downloaded to a laptop and converted into a format that could be used in a GIS environment. Downloading the data was a three-phase process:

- The GPS receiver was connected to the PC via the USB port. The data were imported using the Garmin MapSource software suit provided with the GPS. The advantage of this step was that any junk data could be removed at this stage and the maps could be "stitched" together out of all the individual tracks. This was a necessary step as there would sometimes be wayward tracks (such as backtracking) and un-cleared data that would clutter the maps produced. MapSource offered a quick and easy visual platform for performing this task.
- Once the initial cleaning of the GPS maps was complete, the map would be exported to a format GIS could understand. The data from MapSource would be saved as a GPS exchange format (*.gpx), which is the universal format for transferring GPS data.
- This file was then converted to an ESRI vector shape file (*.shp). The software for this conversion was a freeware program called DNRGarmin. DNRGarmin is produced by the Minnesota Department of Natural Resources as an interface between GPS receivers and various GIS packages. It can be downloaded via the department's website. Whilst ArcMap can directly read gpx files, it kept crashing when attempted.

Data Cleaning

Once in a GIS package, these data were cleaned and combined into a dataset that would allow for GIS analysis. The initial step involved combining many SWS map ESRI shp files into one comprehensive ESRI shp file for the region. This was necessary for many of the analytical tasks that GIS can perform. In their original form, the GPS maps were quite rough, with various errors that needed correcting. Such errors include incomplete circles, overlapping lines and redundant data. The next step in preparing the data for analysis was the data-cleaning phase. An example of an original map and a cleaned map can be seen in Figure 3.7. Figure 3.7 shows a example of a mapped SWS both pre and post clearing. Notice how redundant data were removed, such as overlaps. Field sketches were a valuable resource in this process, when uncertainty arose in the recorded map.

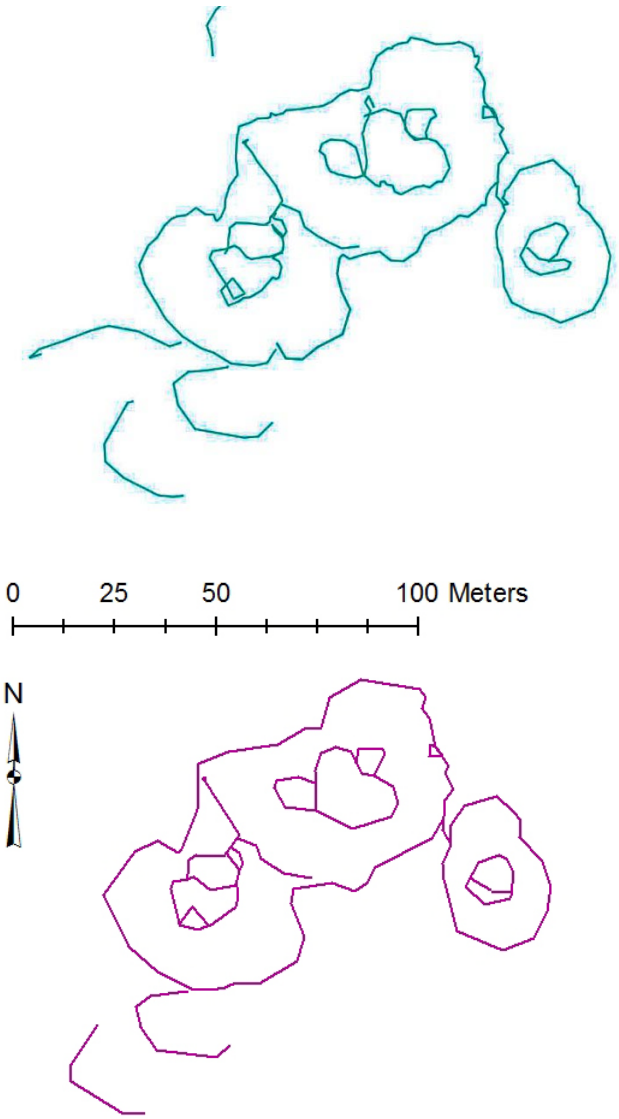


Figure 3.7 BFK SWS 1, before and after cleaning

There were two steps to the cleaning process. The first is a tool in ArcGIS that smoothes out lines and bends. The Simplify_Line tool in the ArcToolBox allows for the simplification and smoothing of vector lines and bends. This tool proved to be useful in an initial cleanup of the original data, as it removed many of the discrepancies caused by the difficulty of maintaining a smooth line along the walls of SWS, such as those caused by dense vegetation or obstacles along the path. The net result of these navigational difficulties was the recording of many

redundant data, particularly in areas where movement was slow or stalled for some time whilst negotiating an obstacle (time based point recording meant many overlapping or collapsed points when stalled).

The point_remove simplification algorithm for the Simplify_Line tool with a maximum allowed offset of 1 meter that allows for a greatly simplified line. This purpose of this step was to strip the vector map lines of redundant points. Whilst the bend_simplify algorithm would have provided a more accurate representation of the original tracks, the results it produced were still contained far too many redundant points to be useful. The remove_point simplification algorithm provided a much simpler line that greatly aided manual editing, the next step of the process. However, the cost of such a simplification is a less accurate representation of the original lines. The cost however, was deemed worthwhile.

The manual editing of the vector lines allowed for the removal of any data the above process could not properly clean. This was done using the editor suite available in ArcMap, which can edit vector lines in a number of ways such as cutting segments, combining segments etc. With the aid of field notes, a number of changes were made to the maps. The first was to close any incomplete circles or move any lines that were out of place. This step also involved deleting redundant data, such as the occasional backtrack in a path or areas that were mapped twice for some reason. Features that fell within the same category of a particular site but were recorded separately were merged at this stage. Features that were of different categories but recorded along with other features were split.

Additional Data

Each site was given a site ID, allowing for the differentiation of sites. A column was added to the attribute table in order to describe the wall type represented by a vector line. These wall types are: Interior Walls; Perimeter Walls; Field Walls and Other. Another column was added to classify our sites by Type, which will be discussed in the next chapter. These added attributes were vital in the analysis stage, allowing us to perform SQL queries on this map shp file and filter sites by type.

The maps produced thus far were purely vector lines. This is due to the nature of the GPS tracks themselves, which were created in the same way vector lines are created (multiple points that are that are linked in a sequential order). However, it is possible to extract useful data using polygons of our sites. This is due to the enclosed nature of these sites, which are often contained within a perimeter and have internal enclosures. The lines in the map shp file were not useful to describing and analysing some of the data, and as such, polygon data were required. Due to the difficulty involved in converting line to polygons, especially in areas were deliberate gaps in line data are present (such as kraal openings), a manual tracing of the lines was used to create polygons of the various enclosures that make up a site. This was achieved by creating a new shp file, and using the editing tools in ArcMap to trace the lines using the create polygon tool. The snapping tool in the editor simplified this process, allowing for a fast and accurate creation of these polygons. An attribute column was added to identify the circle type, as well as the site ID to be able to join these tables to the original map table.

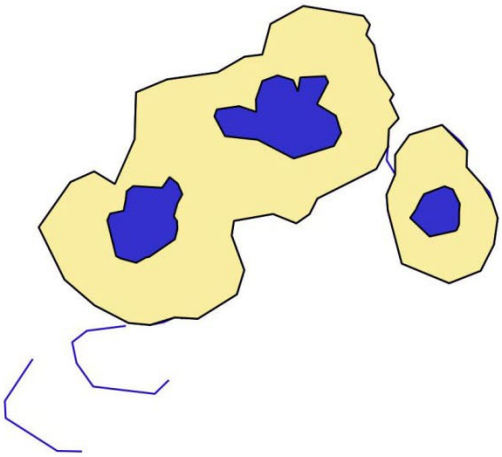


Figure 3.8 BFK SWS 1: Inner and Outer area tracings.

Additional data were gathered from various sources. The National Geo-Spatial Information (NGI) division of Department of Rural Development and Land Reform provides many types of geographic information to the public. For the purposes of this project, various data were collected in order to help with analysis. These data include a topographical map in raster format (WGS2627CD) as well as other data types such as vector contours, roads, rivers, vegetation, water sources etc. AGIS (Agricultural Georeferenced Information Systems) from the Department of Agriculture provided additional data, such as vegetation types and agricultural maps. Finally, a Digital Elevation Model (DEM) of the area was acquired from the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) project to perform a terrain based analysis in a Geotiff raster format. The ASTER data are in 30x30 m squares that provide elevation data. It was decided that this resolution was sufficient for the scope of this project.

Projections

All of the above data, including the GPS maps, were originally acquired or produced in the GCS WGS84 (EPSG 4326). This means that the data were in a Geographic Coordinate System (latitude longitude) using the WGS84 system used by GPS satellites. Whilst the NGI data were created using the Hartebeeshoek94 datum and WGS84 ellipsoid, the difference between the data produced is negligible. A geographic coordinate system relies on degrees, minutes and seconds in order to describe location. The problem with this is that the distances between these units change as latitude changes, due to the spheroid shape of the earth. Therefore, in order to perform accurate measurements and analysis in a GIS package, the data need be projected into a Grid Coordinate System with a metric linear unit (meters in this case) to allow for these calculations.

The projection chosen for this project is the South African specific LO (local orientation) projection system. LO is a Transverse Mercator Projection (Gauss Conform) based on the WGS 84 ellipsoid and Hartebeeshoek94 datum (interchangeable with the WGS 84 datum). These LO belts are situated within one degree of a defined central meridian (therefore they have a positive and negative values east of west of the defined meridian) (Coetzee 2008). The defined central meridian lies on all odd numbered meridians, which means our research area falls within the LO27 belt. This projection has the following proj4 definition:

+proj=tmerc +lat_0=0 +lon_0=27 +k=1 +x_0=0 +y_0=0 +ellps=WGS84 +datum=WGS84 +units=m +no_defs

From this we can see we have used the WGS 84 datum instead of the Hartebeeshoek94 Datum, have a linear unit of meters and have defined our central meridian as 27˚E. Because we fall within the southern hemisphere, our y value will be negative in the GIS package (Coetzee 2008). Whilst this poses no difficulty in practical terms, or an issue with this project, it is important to note that sometimes, LO27 is defined using a South Orientated Transverse Mercator (EPSG 2052) in order to compensate for this, such as in surveyors drawings.

GIS Packages

Numerous software packages that will be employed throughout the course of this project:

- Garmin MapSource. The initial processing of GPS tracks were performed using this software package.
- DNRGarmin. Produced by the Minnesota Department of Natural Resources, this program is free to download off their website, and provides an easy interface between GPS and GIS.
- ESRI ArcGIS. This is the primary GIS package used in this project. It is produced by the Environmental Systems Research Institute (ESRI) and included a wide range of propriety programs that collectively make up a GIS package. The version used for this project was 9.3 sp1 with an ArcView licence and several additional extensions belonging to the University of the Witwatersrand.
- Quantum GIS (QGIS). QGIS is an open source GIS package allowing for much of the same functionality as ArcGIS produced by the Open Source Geospatial Foundation (OSGeo). It is a generalised GIS package that supports community developed plugins, similar to ESRI ArcGIS extensions.
- GRASS. Like QGIS, GRASS is an open source GIS package. Standing for Geographic Resources Analysis Support System, GRASS is also produced by OSGeo, which took the project over from the US Army Corps of Engineers.

- PostGIS in a PostGreSQL environment. Whilst it is possible to perform vector based analysis using SQL queries in this database environment, for the purposes of this project PostGIS was used primarily for data management.
- Google Earth. Free online virtual earth, allowing for the easy navigation of satellite and aerial images. Primarily used to plan surveys. The resolution of the survey area was generally low during field work, but has subsequently improved.

4. Findings, Mapping Results and Classification

Introduction

The purpose of this chapter is to describe the results of the survey conducted for this project. The first phase of this exercise is to discuss what was found and where it was found. This lays the foundation for the next section, which is classification of the various SWS found in the region. The classification section includes an overview of how the classification system was developed, as well as the descriptions of the different Groups that arise as a result of this study. Following this exercise is a site catalogue, which contains maps of each site, as well as a description of the site and the justification of the classification of the site. This will help clarify any confusion over the classification system used in this study.

Survey Results

The total area covered by the foot survey was about 7 km² (Figure 4.1). 32 LIA SWS were found and mapped during this survey. Of interest is the complete lack of LIA sites within the valley created by the Vaal River. A survey by the Wits archaeology honours class of 2010 failed to uncover any sign of LIA occupation in this area despite pottery found in previous years, which now appears to have washed in from an upslope site. All SWS in the survey area were found in the hilly region of the Vredefort Dome, with the lowest recorded altitude of any SWS at 1430 m above sea level. Each site was given a site label, according to the order in which they were found. Site names beginning with BFK for the farm Buffelskloof, followed by a descriptive acronym as well as a number.

The different types of archaeological features are as follows:

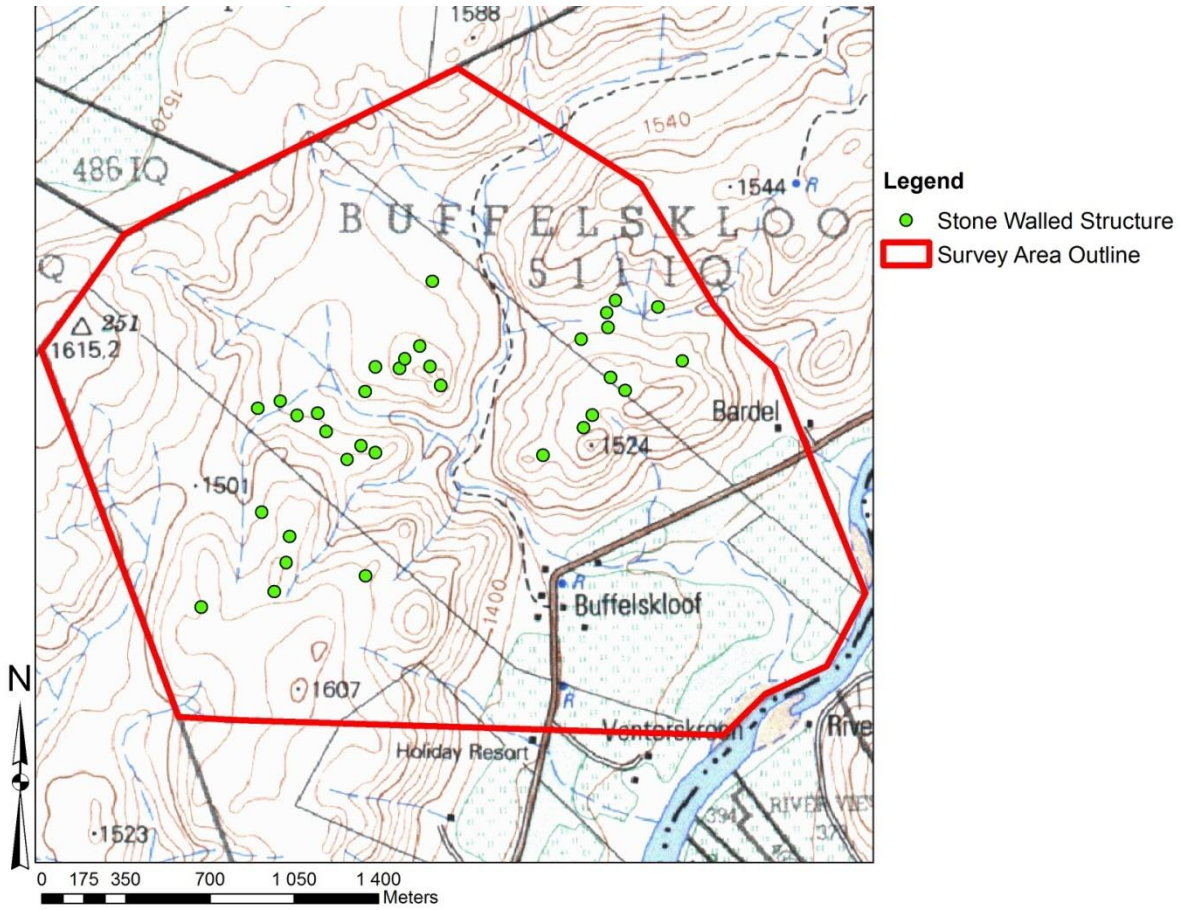
- SWS. Stone Walled Structures. The primary archaeological sites in the region. There were 32 SWS within the survey area.
- FW. Field Walls. Long walls through the landscape. These field walls range from roughly 50 m to 400 m in length, sometimes containing gaps in the wall. Generally, these walls tend to follow on a contour in the landscape. There were five of these field walls. Whilst these field walls fall near SWS, only two directly link to a SWS (BFK SWS 1).

- LC. Lone Circle. Whilst structurally similar to a SWS, these differ in that they only have a perimeter with no additional features, and not connected to a larger nearby site. Three of these circles were found.
- Furn. Furnace. The location of this Iron Age furnace was well known to the farm owners, and has been the topic of a metallurgical study (Waanders *et al 2005*) which placed the source of slag found around the furnace as occurring locally (within 4km of the furnace). The furnace was excavated as part of a dating exercise by the 2010 honours year. The results were not yet available at the time of write-up. Only the presence of this single furnace is known, and its discovery most likely has to do with the large degree of erosion occurring near the furnace, making it visible.



Figure 4.1 BFK Furn 1

Pre excavation but post clearing. Only a portion was visible pre excavation (post clearing), due to heavy erosion near the furnace.



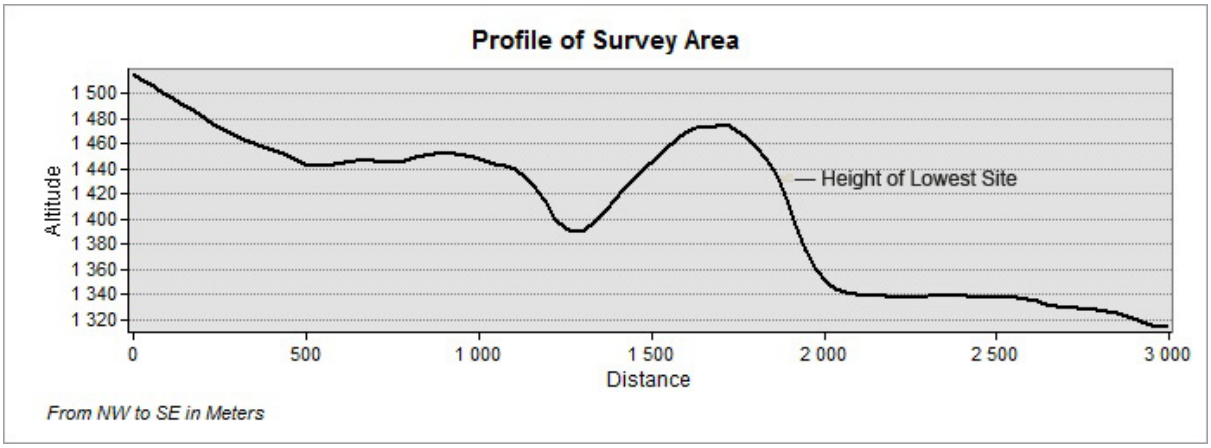


Figure 4.2 Survey area and site locations.

The Vaal river is visible in the southeastern corner of the map, which falls within a valley. The ring hills of the Vredefort dome begin at the edge of this valley. Included in this figure is a profile view of the survey area.

Figure 4.1 shows how the hilly region of the Vredefort dome was selected for SWS site location, despite the abundance of easier terrain to the southeast near the Vaal River. As such we can state that the builders of these sites deliberately chose the more rugged and elevated landscape to build their settlements.

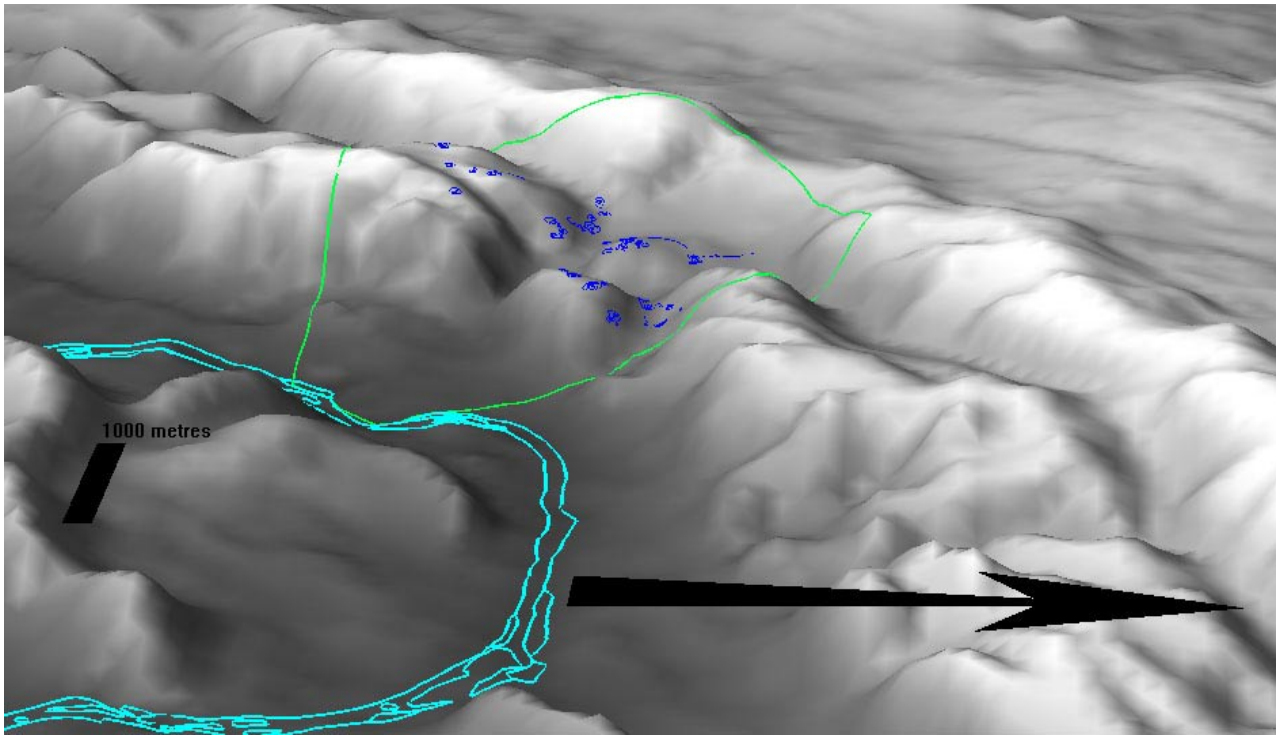


Figure 4.3 3D View of Survey Area

Survey area (green outline) with SWS maps draped over the DEM. The Vaal River is displayed in blue in the valley.

Whilst it is possible to gain an idea on the layout of the terrain using the topographic maps, the Figure 4.3 3d view provides a better visual idea as to the lie of the landscape as well as site location on that landscape. The above image was generated using the ASTER DEM with the vector layer of the GPS maps draped over it using the NVIZ tool in GRASS. Due to the limits of the DEM the Z factor has been exaggerated by 50% to provide a better visual assessment of the landscape.

Taylor (1979) did not excavate the sites that fell within the described region as he felt they had low potential in terms of excavatable deposits. The observations of this survey largely confirm this finding, as not many archaeological artefacts could be observed on the surface of these sites. Added to this is the seeming lack of viable deposits for excavation. Primarily due to the shallow soil and rocky terrain presented by these hills. This was confirmed by the Honours year class of 2010 when they tried to collect soil samples for phosphorous testing. A depth of at least 10cm was required for these soil samples, which was in many instances not achievable without substantial rock removal. Possible reasons for this lack of material remains shall be discussed in a later chapter.

Typology

Based on the SWS maps, not all fitted comfortably into the types produced by Taylor (1979). As such, it was decided to modify Taylor's (1979) Groups in order to fit better the data.

Before we can discuss the approach used to develop the typology for this project, we shall examine various elements of typologies, such as why we do it and what the various approaches to it are. The reason for this discussion is to examine critically the use of typologies in this field, and various issues surrounding type classification systems. The following is an overview of the work of William and Ernest Adams (1991), a reader in typologies in archaeology.

The first and foremost idea that we must understand about typologies is that they do not represent hard and fast laws of archaeology, but should rather be thought of as a system of tools that can be primarily used to describe, analyse and compare data (Adams & Adams 1991). In this, a typology goes beyond mere classification, which can be seen more as the labelling of things by attributes. Typologies require the sorting of things into distinct categories (pigeonholing), which requires a way of differentiating between types. Whilst types may contain similar features, there must be some way to differentiate between types, making them mutually exclusive entities (Adams & Adams 1991).

Adams & Adams (1991:4) reject the notion that typologies should be developed with objectivity as a primary aim, but should focus rather on reproducible consistency. This refers back to the original notion that typologies do not represent laws, but are rather a communication tool to aid in scientific study. What defines a useful typology lies in the purpose and practicality of a given typology (Adams & Adams 1991). As mentioned earlier, there are different kinds of purposes for creating a typology. The first of these is a descriptive purpose. An overwhelming amount of data cannot be described by every individual component. Every typological exercise discussed in the literature review has an element of a descriptive typology. For example, Taylor (1979) used a typology to reduce a large amount of data into a manageable set of categories based on morphological features of the SWS he uncovered. This allowed him to describe several hundred sites using three general groups that he could differentiate from each other. A comparative typology can be used to compare between various sets of data, or within a set of data (Adams & Adams 1991). Such a typology will focus on differences as well as similarities between types.

There are three broad sub categories in the purposes of an analytical typology (Adams & Adams 1991). The first of these is an intrinsic typology, which treats the actual objects as the focus of study, such as someone who specialises in lithic production (e.g. Orton 2002). This is in contrast to an interpretive study, in which the object is merely an expression of the topic of interest, the makers. Thus, the purpose of such a study is to derive cultural information from material remains, rather than just study the material remains themselves, such as rock art studies in which the art is seen as a reflection of cultural processes (e.g. Lewis Williams 1981). The final sub category is a cultural/historical approach, in which the purpose of a study is to examine change over time. Thus, a chronological typology is essential to this type of study. An example of such a study can be seeing in pottery analyses, where stylistic changes are tracked through time (e.g. Huffman 2007). Whilst these various purposes are by no means the only purposes of a typological exercise, they are the most common.

What we can take from this is that a typology is useless without purpose, and a good typology is fit for purpose. Mason (1968, 1986) revised his typology at a later stage. This does not mean that his original typology was incorrect, but rather that the original typology was no longer fit for purpose. His dataset was widened over the years, and as such a more useful typology was developed. Whilst not specifically stated in many archaeological studies, the purpose of a given typology can usually be determined in the method of that study. One danger we face as archaeologists, is to employ a typology that was developed with a different purpose in mind, which may divide types based on criteria that do not aid in a different study.

The process of classification or developing a typology relies on the selection of features or attributes that than can used to group or differentiate things (Adams & Adams 1991). This process is problematic, as it requires the deliberate discarding of what are deemed to be unimportant or uninformative, an exclusion of data (e.g. Foucault 1973). The issue with this is our perceptions of what is or isn't relevant is wildly variable, and quite subjective. The danger we face is that we cannot know whether our selected features are genuinely meaningful. The distinction of these features can sometimes also be problematic, as quite often there is a blurring between what are supposed to be two distinct categories. Begging the question, where do we draw the line? There are no easy solutions for these problems, but they should be considered when conducting such an exercise.

What we need to take from this overview is that that a typology should not be viewed as the definitive law for a given data set, but rather a tool to aid in the scientific process when dealing with large quantities of data. Perhaps more importantly, is that the typology used is directly relevant to the study. Earlier it was stated that Taylor's (1979) typology did not stand up to the data collected for this study. This is not to say that his typology was incorrect, but rather needed to be modified for the purposes of this study, to account for different features deemed significant as well as sites that do not fit within his morphological types.

Bearing this in mind, the development of a typology for this study uses Taylor's (1979) work as a platform from which to build. Maggs (1976:24-25) describes a number of features that are common or distinctive in SWS. We employ some of these concepts in the development of this typology. As discussed earlier, features allow us to segregate our types, which will allow us to distinguish between them. We shall begin with the perimeter of the site. This is the outer most section of stone walling within any SWS. The perimeter contains the rest of the SWS, and is the common feature that allows us to distinguish between types. The perimeter may contain different elements:

- A perimeter wall. This is a clear wall surrounding a given SWS. The wall is usually circular in shape.
- A detached perimeter feature. These features can be linked to SWS, but are not directly attached to a perimeter wall. They may themselves from the perimeter itself, such as Maggs' (1976) *Bilobial* structures.
- An attached perimeter feature. This is a feature that is external to the perimeter wall, but is somehow linked (such as a short connecting wall or just touching) to what is otherwise a clear perimeter wall.
- A perimeter feature. This is a feature (that is not a perimeter wall) that is incorporated into, or forms part of the perimeter.

Features that occur within SWS are labelled as internal features. These are generally associated with the keeping of livestock or storage. Based on Dreyer's (1992) calculation that a single head of cattle requires 10 m^2 in an enclosure, we can assume that smaller enclosures were used for other livestock, calves, storage or as a dwelling space. Internal features may be attached or detached from the perimeter.

Categories

Based on these features, five different Groups were created. In order to differentiate between Taylor's (1979) typology and the new typology, we shall employ Roman Numerals as Taylor did for his types, and numbers for the newer types. Group I was split into sub Groups 1 a, b, and c; although they would have all been classified as Group 1 by Taylor (1979). There are enough differences between my Group 1 SWS to further segregate.

Group 1a: Simple Group 1 as described by Taylor (1979). These sites have a clear perimeter wall. The interior consists of enclosures that are usually (but not necessarily) detached from the perimeter wall. There are less than four of these interior enclosures, a number derived from observation that shall be explored further in the following chapters. Might contain some perimeter features or attached perimeter features, but in small numbers.

Group 1b: Compound Group 1. These sites have multiple Group 1a sites that are either conjoined or interlinked somehow.

Group 1c: Complex Group 1. These sites have the same concept as Group 1a, with a clear perimeter wall and internal features. The difference comes with the complexity of the internal features and size of these sites, as well as their larger size than Group 1a. There are usually six or more internal features that are interlinked via connecting walls or conjoined. These sites usually, but not necessarily, have more perimeter wall features than simple Group 1a sites.

The difference between Groups 1a and 1c at this stage is based on the site complexity and size. The validity of the segregation between these site types, as well as the possible reasons behind this are tested in the analysis chapter.

Taylor's (1979) Group II and Group III were retained in their original form, as no variations of these Groups were mapped.

Group 2: As described by Taylor (1979) and updated by Pelser (2003). Group II sites consist of an inner cluster of enclosures surrounded by numerous inwards facing semi circular walls (Taylor 1979), similar to Maggs' (1976) Type Z walling. Whilst this is included in the list of types, no examples of this Group were found in the research area.

Group 3: Described by Taylor (1979). Group III settlements are formed by a tight clustering of circular enclosures with an outer perimeter of curved walls and small enclosures. The primary feature of this Group is the abundance of perimeter features, and lack of internal features. Meaning that this type can be seen as a collection of clustered features rather than distinct difference between perimeter and internal features.

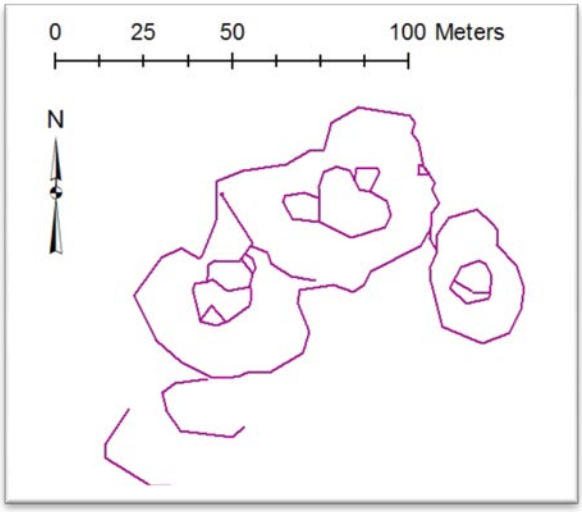
Two new types were defined for the purposes of this study:

Group 4: Group 4 sites are a category of sites that are not characterised by a clear outer perimeter, be it a wall or a cluster of features that form a perimeter. These sites have a disjointed perimeter that does not enclose the entire site. These sites contain non connected stone enclosures scattered throughout the site. They may also contain half circular "scallops" that resemble Group 2 sites. However, these "scallops" are not arranged facing inwards around the site like a typical Group 2 site, but appear more dispersed and less organised. Initially the irregular construction was thought to be as a result of stone cannibalisation for other SWS. However, there are two factors that make this unlikely.

The first is the abundance of good building material in the area. At any given point in the area, even where it seems to have been cleared, there is still plentiful rock that is suitable for construction. The second factor is the proximity of Group 4 sites to each other. It makes little sense to cannibalise stone to create other incomplete sites. Enough examples of this type were mapped in order to deem it a worthy of its own type, with its irregular construction being by design.

Group 5: These simple sites are made up of a long perimeter wall that is left open at one end. There is an enclosure at one of the ends of this perimeter wall. There are no internal stone enclosures in these types of sites.

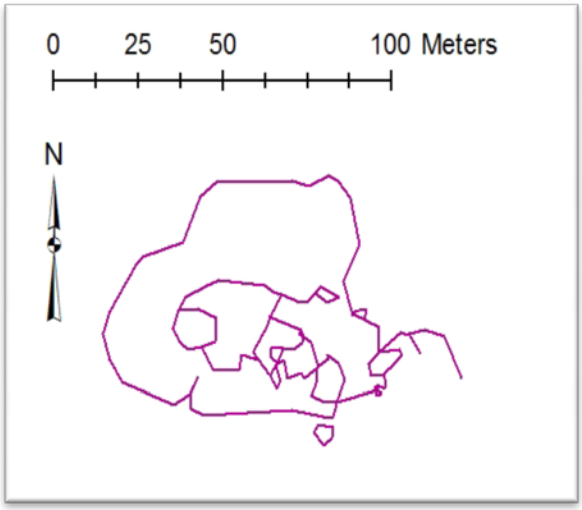
In order to better understand these types, the next section is a site catalogue. A map of each site is displayed, as well as a description of the site and how it was classified. This will allow for a critical judgment of the classification, in order to increase the reproducibility of the Typology. This is not an attempt to build a universal typology for SWS like previous studies, but rather a typology that suits the data at hand.



Name: BFK SWS 1

Type: Group 1b

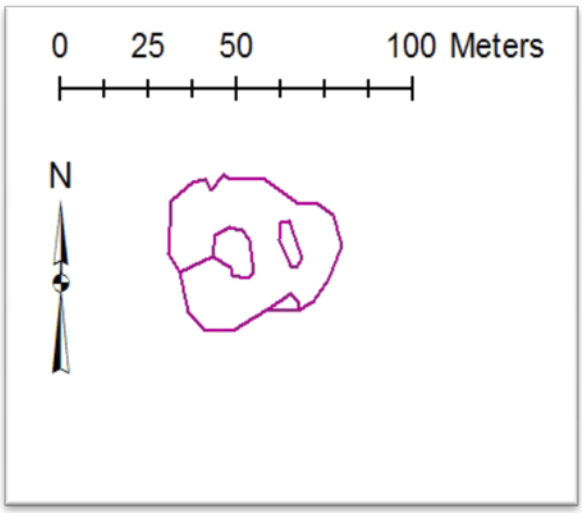
Description: Multiple conjoined Group 1a Sites. Three distinct Group 1a sites, with four or less inner circles. Two of the sites share a common wall whilst the third is linked by a short connecting wall. Two detached perimeter features to the south west of the main site.



Name: BFK SWS 2

Type: Group 1c

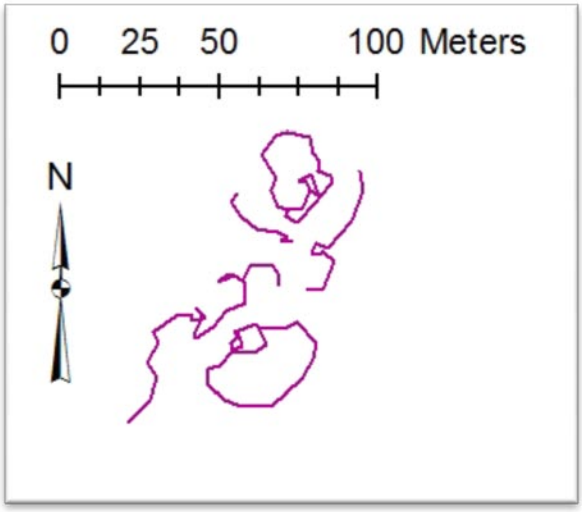
Description: Clear perimeter wall for the majority of the site. The internal complexity of the site places this in the Group 1c type, primarily due to the number of internal enclosures (9). The site has a single detached perimeter feature.



Name: BFK SWS 3

Type: Group 1a

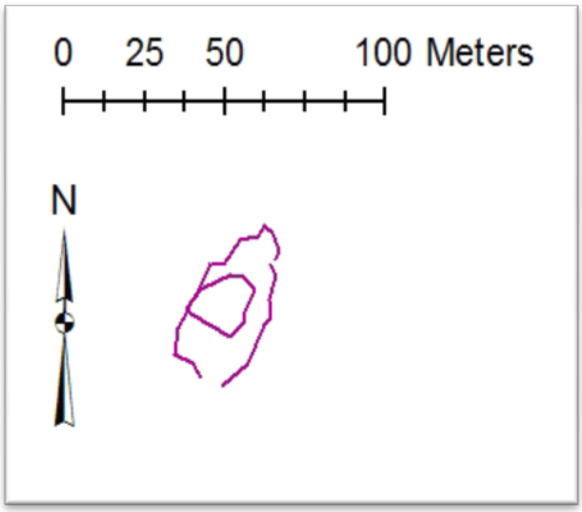
Description: Clear simple Group 1 site. Clear perimeter wall with 2 interior features and one perimeter feature.



Name: BFK SWS 4

Type: Group 4

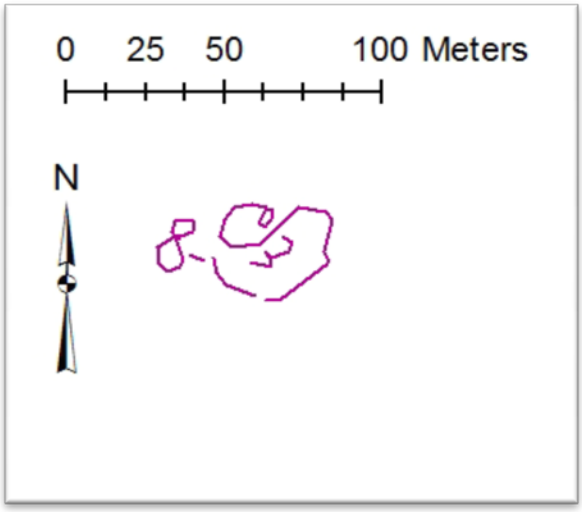
Description: Elongated site containing two enclosures. There is no clear perimeter wall. The site has a broken perimeter consisting of three disjointed walls. The primary enclosure consists of a large circle with two perimeter enclosures.



Name: BFK SWS 5

Type: Group 1a

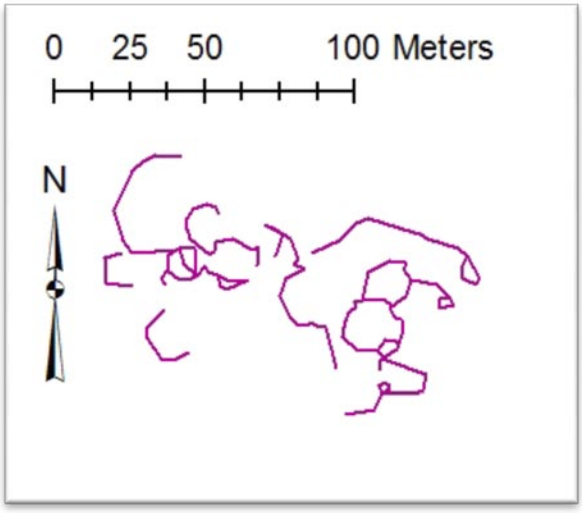
Description: Large perimeter wall enclosing a single internal enclosure. Not a typical Group 1a site as the perimeter is far more elongated and less circular than usual, making the classification of this site dubious.



Name: BFK SWS 6

Type: Group 4

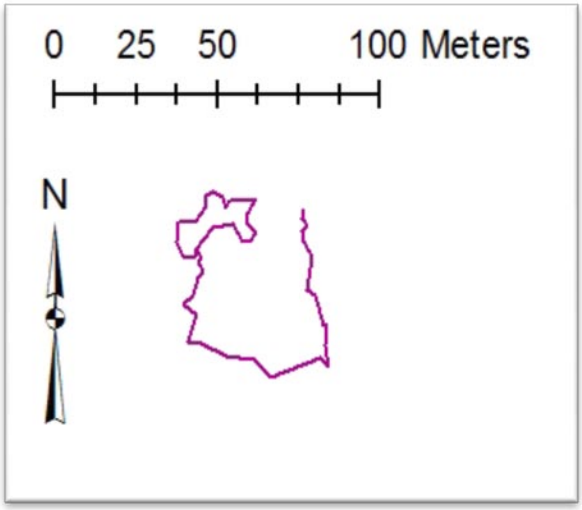
Description: What appears to be a perimeter wall that becomes an enclosure. No inner enclosures, but two central half circles. Two outer enclosures. Placed in the Group 4 type due to the irregular layout of the site.



Name: BFK SWS 7

Type: Group 4

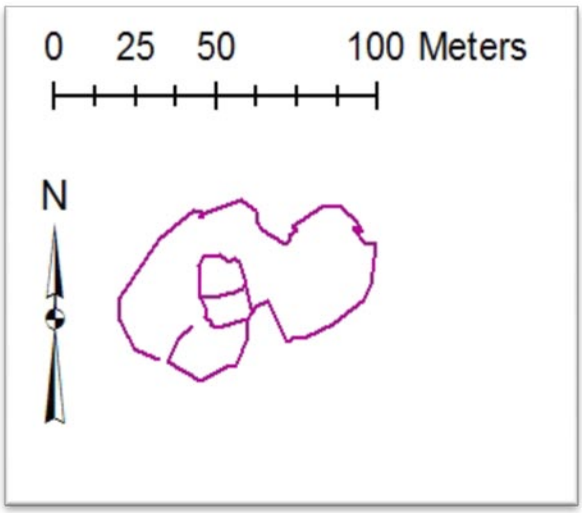
Description: A large site with no clear perimeter wall. A number of disjoined but interconnected circles. Some half circle formations, within the site as well as on the extremities. Classified as Group 4 due to irregular construction principles.



Name: BFK SWS 8

Type: Group 5

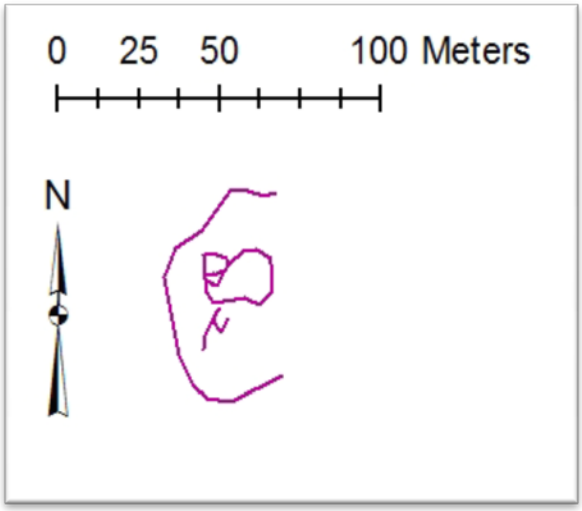
Description: An incomplete perimeter wall containing no internal features and one perimeter enclosure.



Name: BFK SWS 9

Type: Group 1a

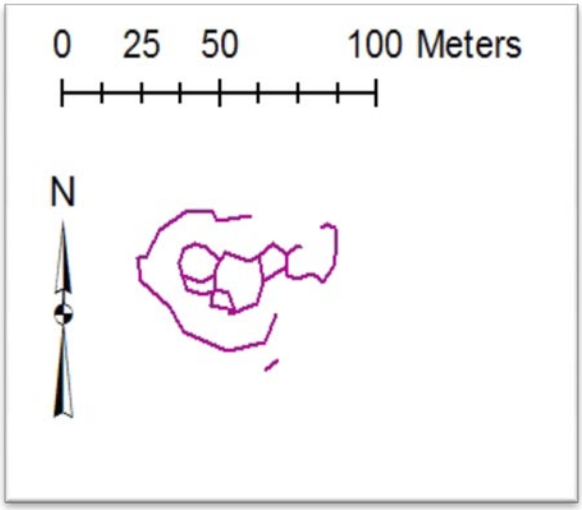
Description: A clear perimeter wall enclosing a split internal enclosure.



Name: BFK SWS 10

Type: Group 1a

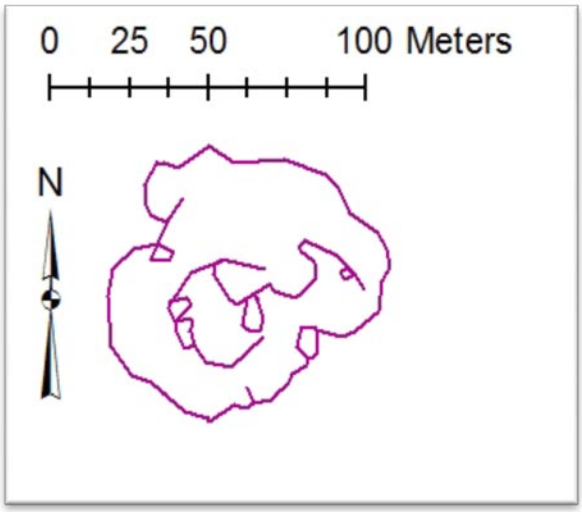
Description: A clear but incomplete perimeter wall. Interior consists of three internal enclosures.



Name: BFK SWS 11

Type: Group 1c

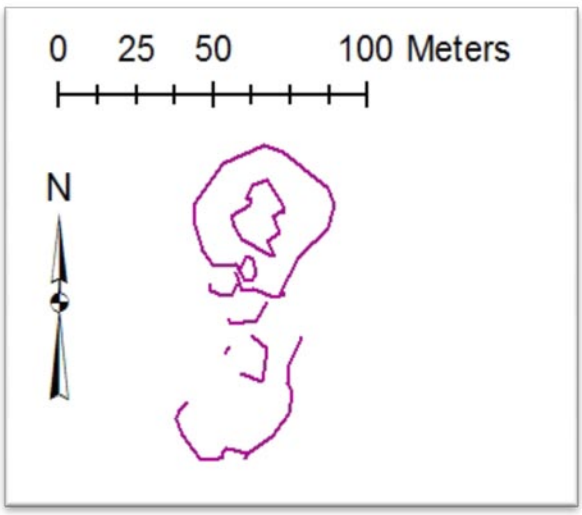
Description: An incomplete perimeter wall enclosing six internal circles.



Name: BFK SWS 12

Type: Group 1c

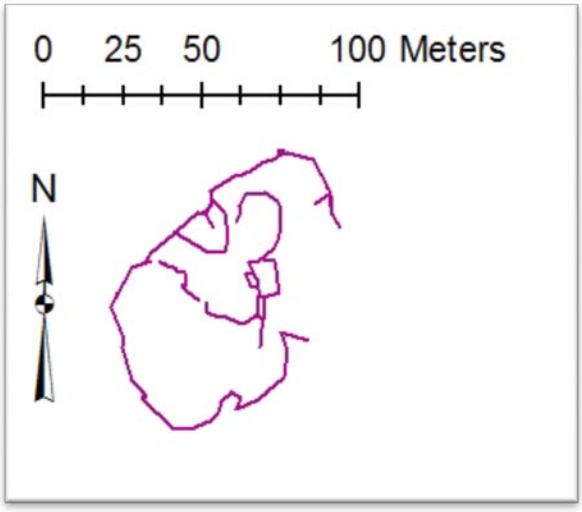
Description: Clear perimeter wall containing 3 enclosures. The interior complex consists of 6 enclosures.



Name: BFK SWS 13

Type: Group 1a/4

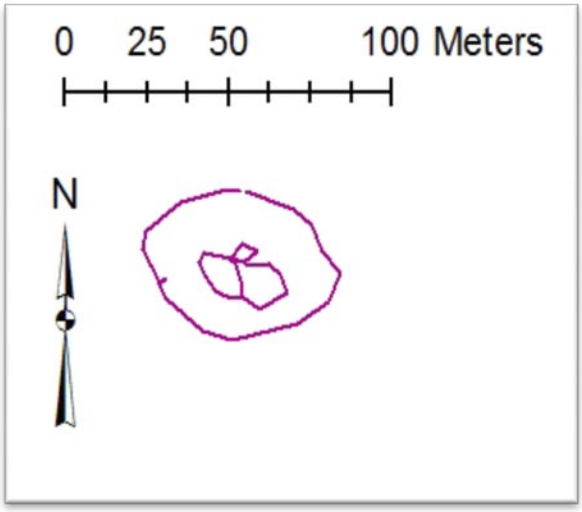
Description: A typical Group 1a site with a perimeter wall and two internal enclosures in close proximity to what appears to be an incomplete Group 1a site. The lower portion of the site resembles a Group 4 site with half circle formations and irregular site layout.



Name: BFK SWS 14

Type: Group 1c

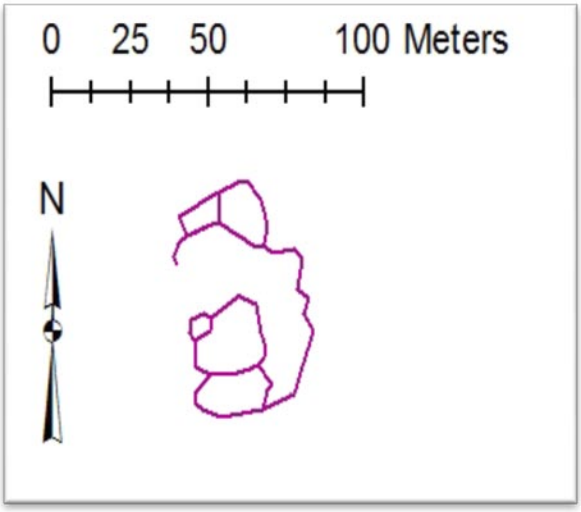
Description: There is a clear perimeter wall surrounding the bulk of the site. The interior features in places are incorporated into the perimeter, but not enough to classify the site as a Group 3 site.



Name: BFK SWS 15

Type: Group 1a

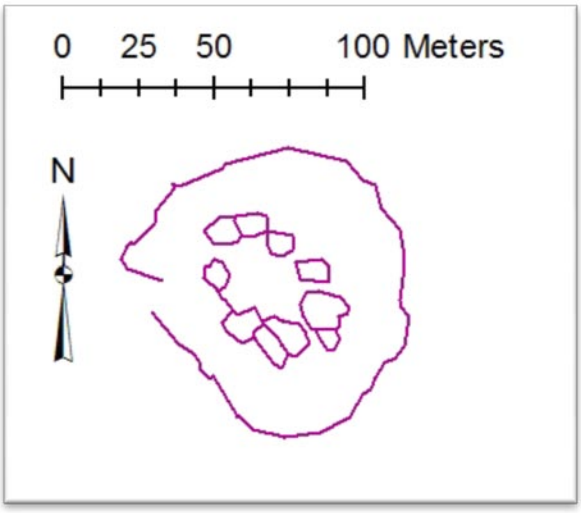
Description: Classic Group 1a site. Clear perimeter wall with three internal enclosures.



Name: BFK SWS 16

Type: Group 3

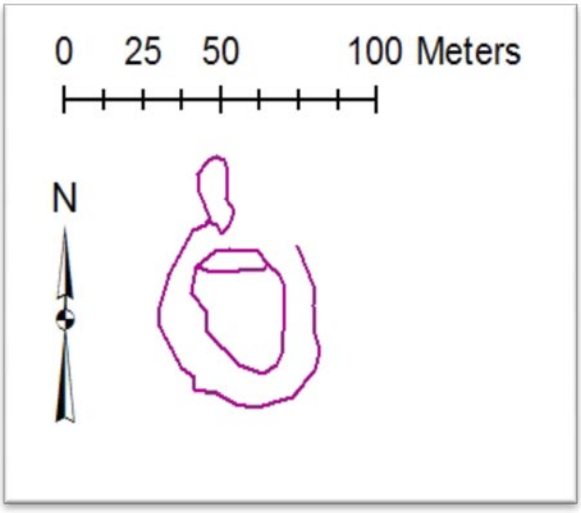
Description: Whilst there is something of a perimeter, the site itself is made from non encircled enclosures.



Name: BFK SWS 17

Type: Mason Class 8

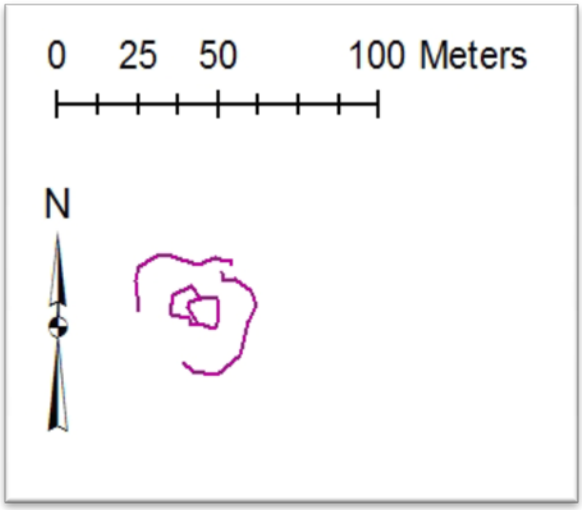
Description: Massive site, with a clear perimeter wall. Interior features are formed by a string of enclosures, created an empty central space.



Name: BFK SWS 18

Type: Group 1a/5

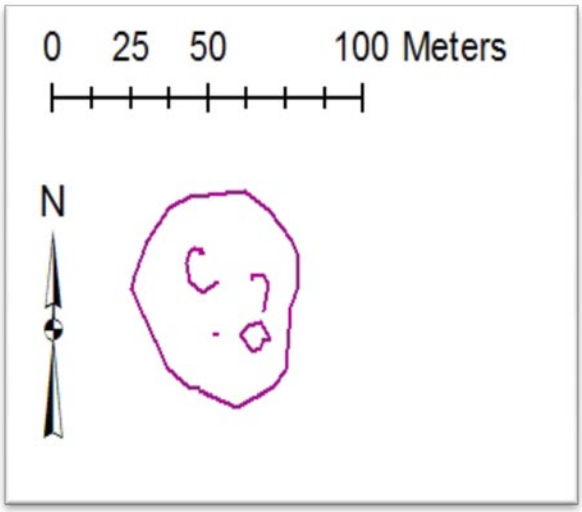
Description: A clear perimeter wall with containing one enclosure. The sheer dominance of the internal features makes this an unusual Group 1a. The site has a distinct Group 5 perimeter. However, with only one example this has been cautiously classified as a Group 1a, but will be excluded from morphological analyses.



Name: BFK SWS 19

Type: Group 1a

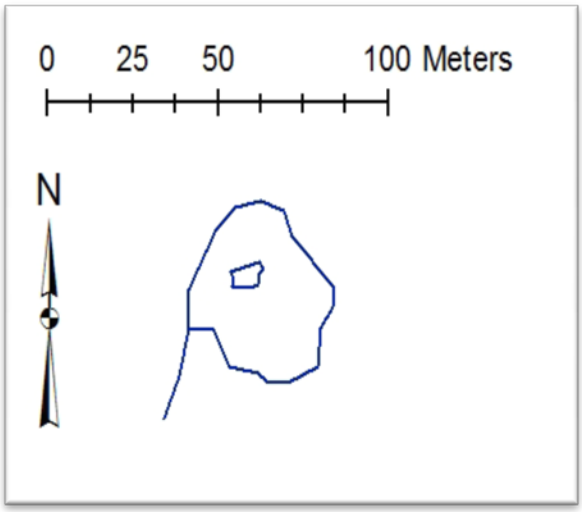
Description: A clear but incomplete perimeter. Two internal enclosures.



Name: BFK SWS 20

Type: Group 1a

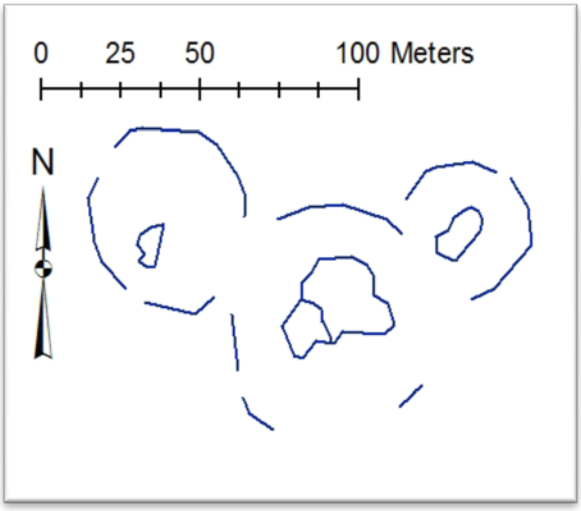
Description: A clear perimeter wall. One complete internal circle. Two incomplete internal circles.



Name: BFK SWS 21

Type: Group 1a

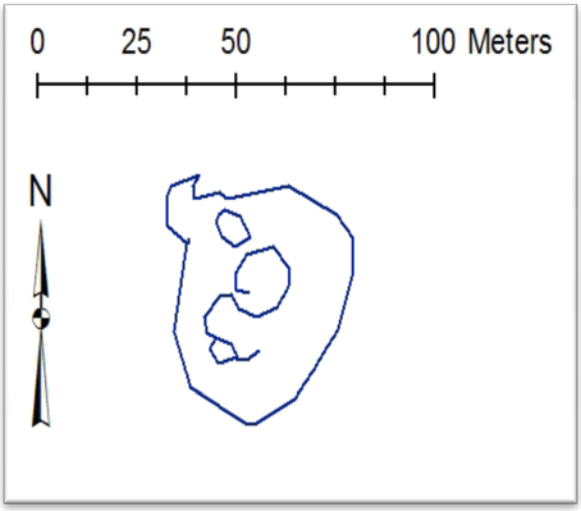
Description: Simple perimeter wall containing a single interior enclosure. The extension of the perimeter wall is most likely a later alteration made by historical miners, as evidenced by a mine shaft situated at the end of this wall.



Name: BFK SWS 22

Type: Group 1b

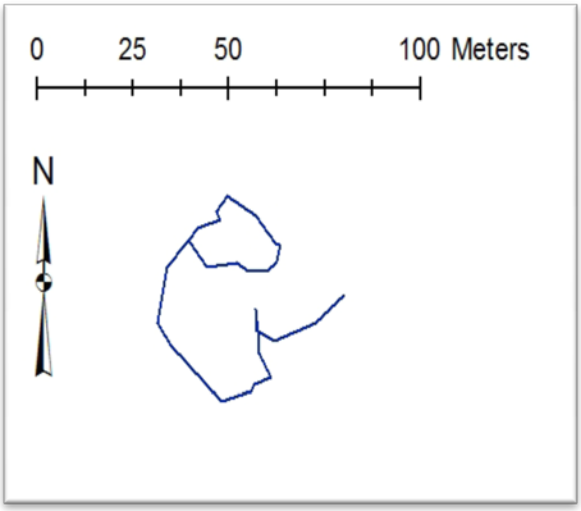
Description: Three interlinked Group 1a sites. Each contains one or two interior circles.



Name: BFK SWS 23

Type: Group 1a

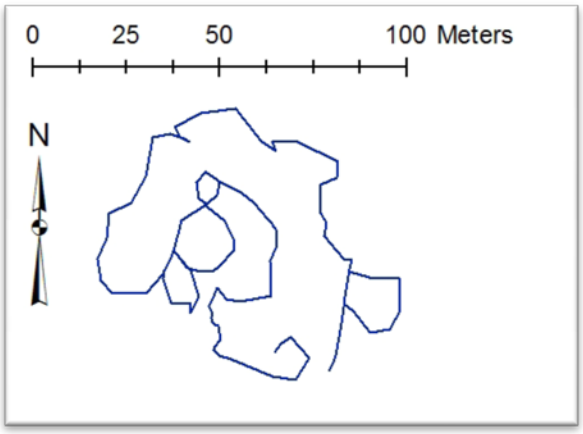
Description: Clear perimeter wall containing four internal enclosures.



Name: BFK SWS 24

Type: Group 5

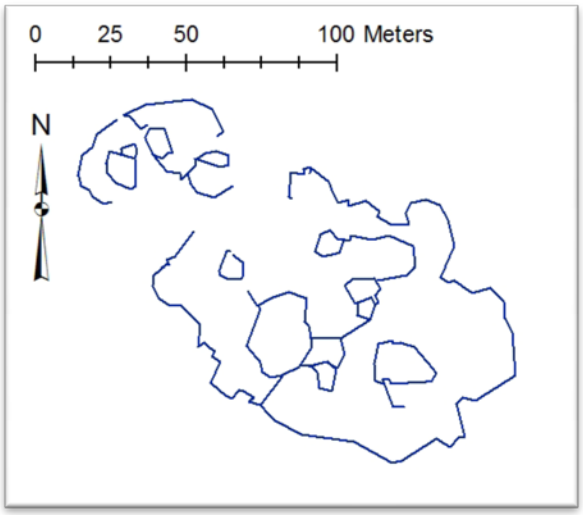
Description: An incomplete perimeter wall containing no internal features and one perimeter enclosure.



Name: BFK SWS 25

Type: Group 3

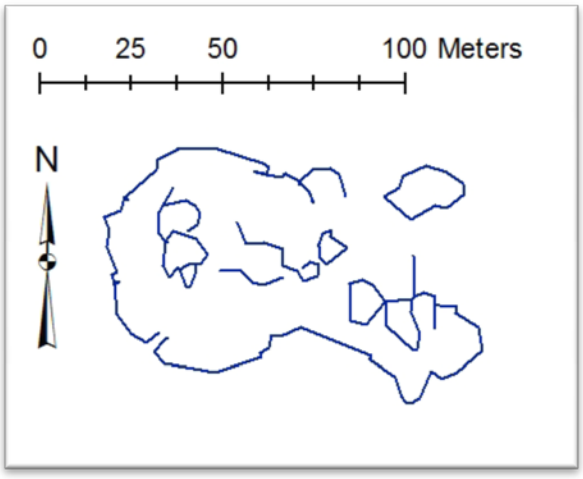
Description: An outer perimeter wall which morphs into enclosures and features forming the rest of the site.



Name: BFK SWS 26 + 27

Type: Group 1c

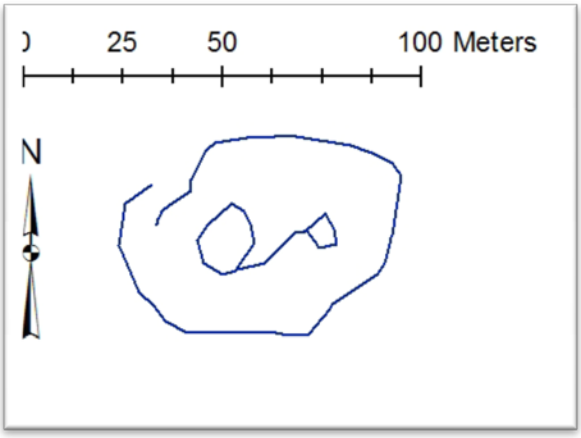
Description: A large site with a clear perimeter wall. Internal structure is quite complex with nine internal enclosures. Included is BFK SWS 27, which whilst geographically distinct from 26 in terms of elevation, is most likely related to 26 as evidenced by the openings of both sites that are orientated toward each other.



Name: BFK SWS 28

Type: Group 1c

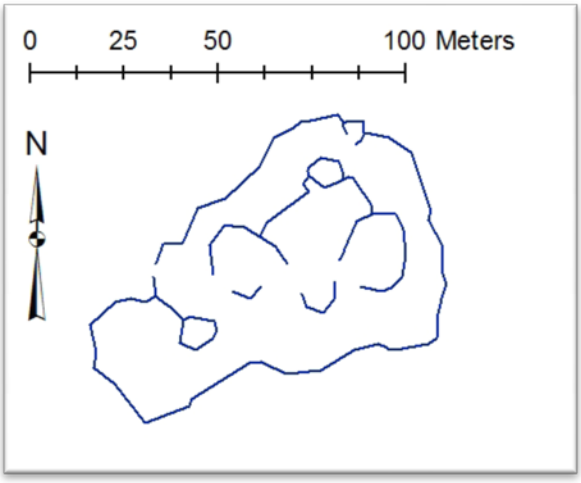
Description: A large, but incomplete perimeter wall. The site contains nine internal enclosures as well as an external circle to the north east of the main enclosure.



Name: BFK SWS 29

Type: Group 1a

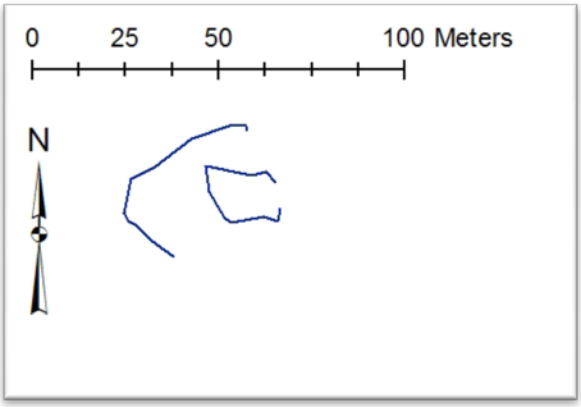
Description: A clear perimeter wall with two internal enclosures.



Name: BFK SWS 30

Type: Group 1c

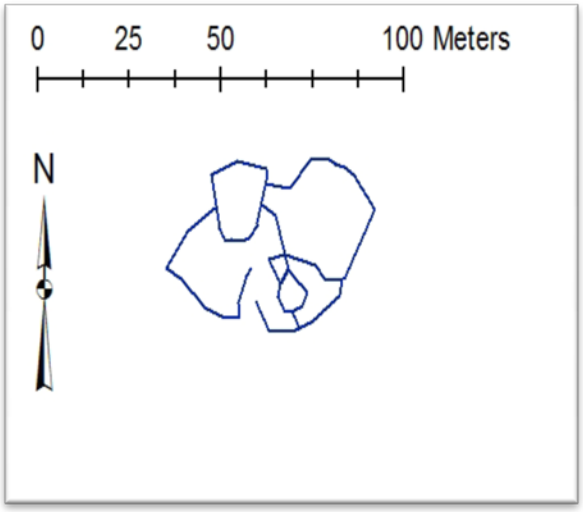
Description: A large perimeter wall enclosing at least five interior circles. However, this site had been bulldozed through the middle to create a farm road and as such could possibly be more complex in the centre.



Name: BFK SWS 31

Type: Group 1a

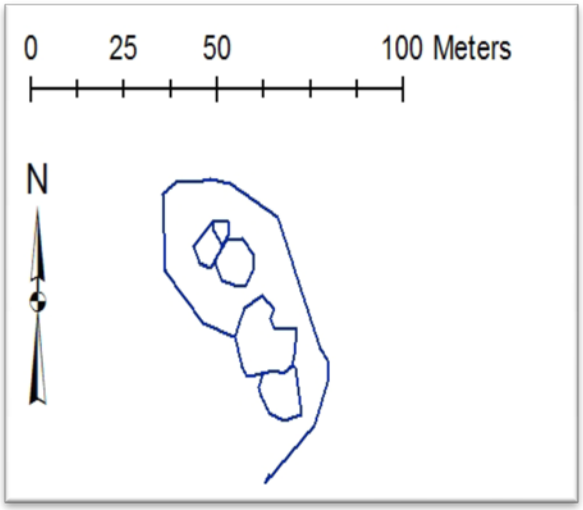
Description: An incomplete perimeter wall enclosing a single internal circle. This site has been defined as a Group 1a due to its simplicity, even if the perimeter wall is decidedly lacking.



Name: BFK SWS 32

Type: Group 3

Description: Whilst this site has a perimeter, the features are primarily made up of conjoined enclosures within the perimeter.



Name: BFK SWS 33

Type: Group 3

Description: An outer perimeter wall that contains three inner enclosures. However, what makes this a Group 3 site is the multiple interlinked features on the perimeter.

Morphological Considerations

Whilst every site in this study has been classified, not every site will be included in the morphological analyses section to follow. These sites will however be included in the spatial and landscape analyses. The types of sites that will be excluded are those that are incomplete, with missing perimeters or those of dubious classification. The reasoning behind this is that whilst there are enough data to classify a site, the data are not sufficient to perform an accurate spatial analysis, such as total site area. This process would therefore require assumptions to be made about the missing data, and as such would not be accurate. However, in terms of a landscape analysis, merely the location and type of the site is sufficient, and as such, these sites are included. Sites that were excluded from a morphological analyses were: BFK SWS 5, 10, 11, 18, 23, 27 and 31. These sites were either incomplete, or of dubious classification.

Conclusion

As you can see, this mapping technique allows us to produce decent site maps quickly. These maps allow us to identify site type using site features. Using these data, we can move on to the analysis phase of this project, where we take these maps and run them through a battery of analyses to try expand our knowledge of these sites. For the raw tables of data produced in order to perform the analysis tasks in the next chapter, refer to the appendix.

5. Analysis

Introduction

Now that we have a picture of what was found and how it was classified, we can begin the process of analysing various data in order to try gain an understanding behind the positioning of these sites. This process can be divided into two main sections; landscape analysis, which includes a terrain based and proximity/overlay analyses. The second section is site-specific analysis, which includes data produced by the mapping process. The classification process described in the previous chapter will allow us to compare sites by type. The significance of these results is only touched on in this chapter, and will be expanded on and discussed in the following chapter.

Aspect

The first landscape features that we will examine is site aspect. This is cardinal direction of the slant of the landscape upon which a SWS is built. Site aspect data has received attention in the construction of archaeological predictive models (e.g. Verhagen & Gazenbeek 2006). Taylor (1979:12) found his Group I SWS generally tended to a northerly aspect. Whilst it is possible that site aspects are determined largely by the landscape upon which they are built, such as found by Marker & Evers (1976), one could expect to find other factors might influence aspect choice. These include the maximisation of solar radiance by orientating a site towards a northerly aspect, which would help warm sites in the cold winter months of the Highveld, or there could perhaps be other factors involved, such as cultural preferences. Aspect data were derived from the ASTER DEM raster, using the aspect tool in ArcGIS. This results in a raster containing aspect data in each cell as opposed to elevation data. The zonal statistics tool then was then used to determine the raster values delimited by the site perimeter polygons. The first part of the exercise was to check the aspect data for the entire survey area. The resulting data are the slope aspect of each raster pixel, which were tabulated and displayed in a rose diagram, which allows us to visualise the data.

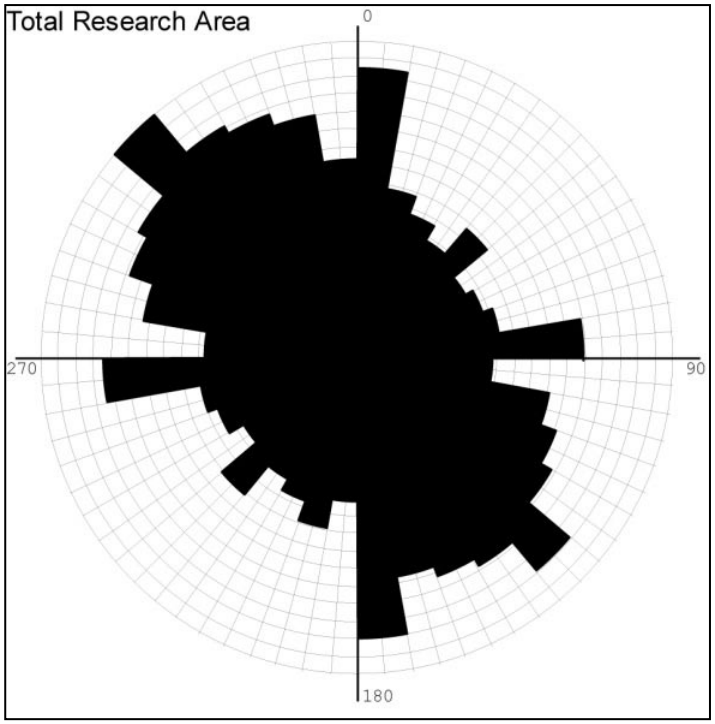


Figure 5.1 Total survey area aspect rose diagram.

Figure 5.1 shows the aspect of each raster pixel for the region. This basically means that the region was divided into 30 m x 30 m squares, the aspect was calculated for each square, and all of these data are displayed here. Therefore, the longer lines in the rose diagram represent a greater frequency occurrence of that particular aspect. What we should take notice of here is the orientation of most of the landscape in this region falls along a north west/south east aspect (longer lines). A quick visual assessment of Figure 1.1 shows why this is, with the survey region falling within the north west extremity of hills that encircle the Vredefort impact area. The question we shall follow here is whether the aspect of the SWS in the survey area follow the landscape pattern, or is there a deviation, an anomaly that needs to be explained.

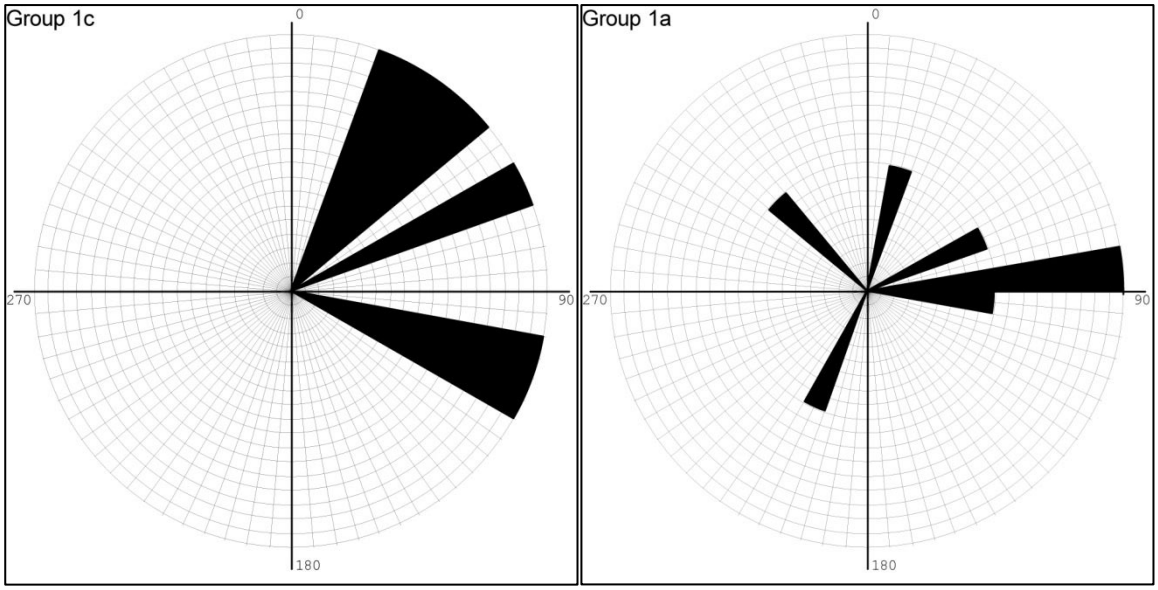


Figure 5.2 Rose diagrams showing aspect data for Groups 1a and 1c.

Figure 5.2 shows the aspect of Group 1a sites and Group 1c sites. The aspect of the SWS is its orientation on the azimuth which is determined by the direction of the slant of the terrain under a given site. Geographically speaking, a northerly aspect will result in the greatest amount of daily sunlight in the southern hemisphere. What we can see here is that whilst the builders of Group 1a SWS did build many of their sites with a more northerly aspect, not every site follows this pattern. Group 1c seems to be more tightly clustered around the north east/east aspect, which follows the idea of maximising solar radiance. We can see elements of Taylor's (1979) findings on Group 1 site aspect, but it does not hold for all sites in this region. Neither group conforms to the aspect norm for the region. None of the other groups seem to follow any form of hard and fast rule on aspect, even when compared to the overall aspect data for the region, meaning that most other sites must have some other factor of greater significance for site selection (see appendix for individual Group rose diagrams). We can therefore conclude that only Group 1c seems to have taken solar aspect into consideration for site location.

Gradient

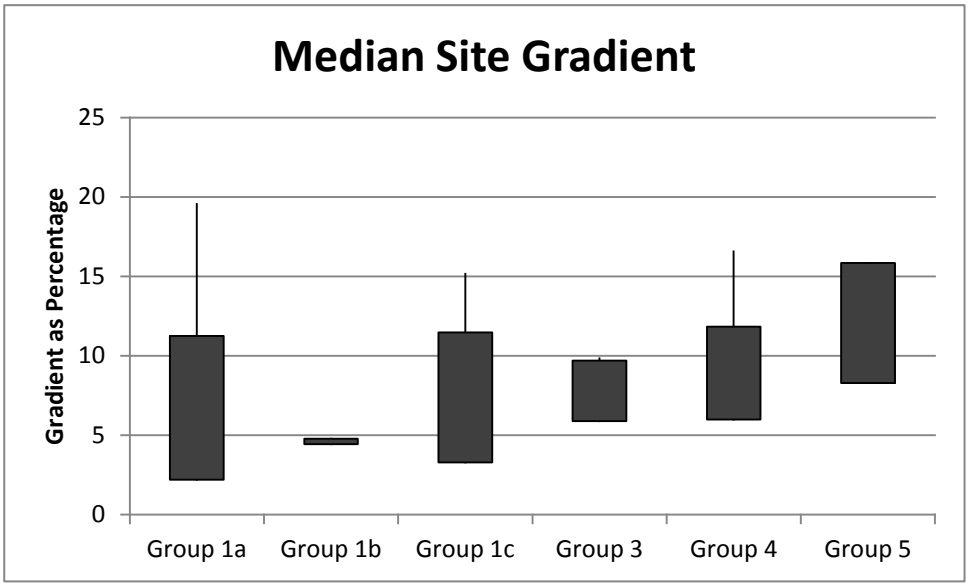


Figure 5.3 Site Gradient as a percentage rise.

Due to the rugged nature of the terrain that the site builders chose for their site locations, finding areas that were suitably flat to build a site must have been somewhat of a challenge. Figure 5.3 shows us the median gradient (over the total area of the site) for each site by type. Once again these data are generated from the ASTER DEM, using the slope analysis and zonal statistics tools. What we can immediately spot is the distinct lack of perfectly flat ground upon which sites could be constructed. As such it would appear that the builders worked within a range of 2% to 10% gradient, with some outliers as high as 19% for Group 1a. From this we can conclude that the builders of these sites were flexible when it came to the slope of the ground they built upon (within reason), which means there were probably more important factors to consider when selecting site location.

Altitude of SWS

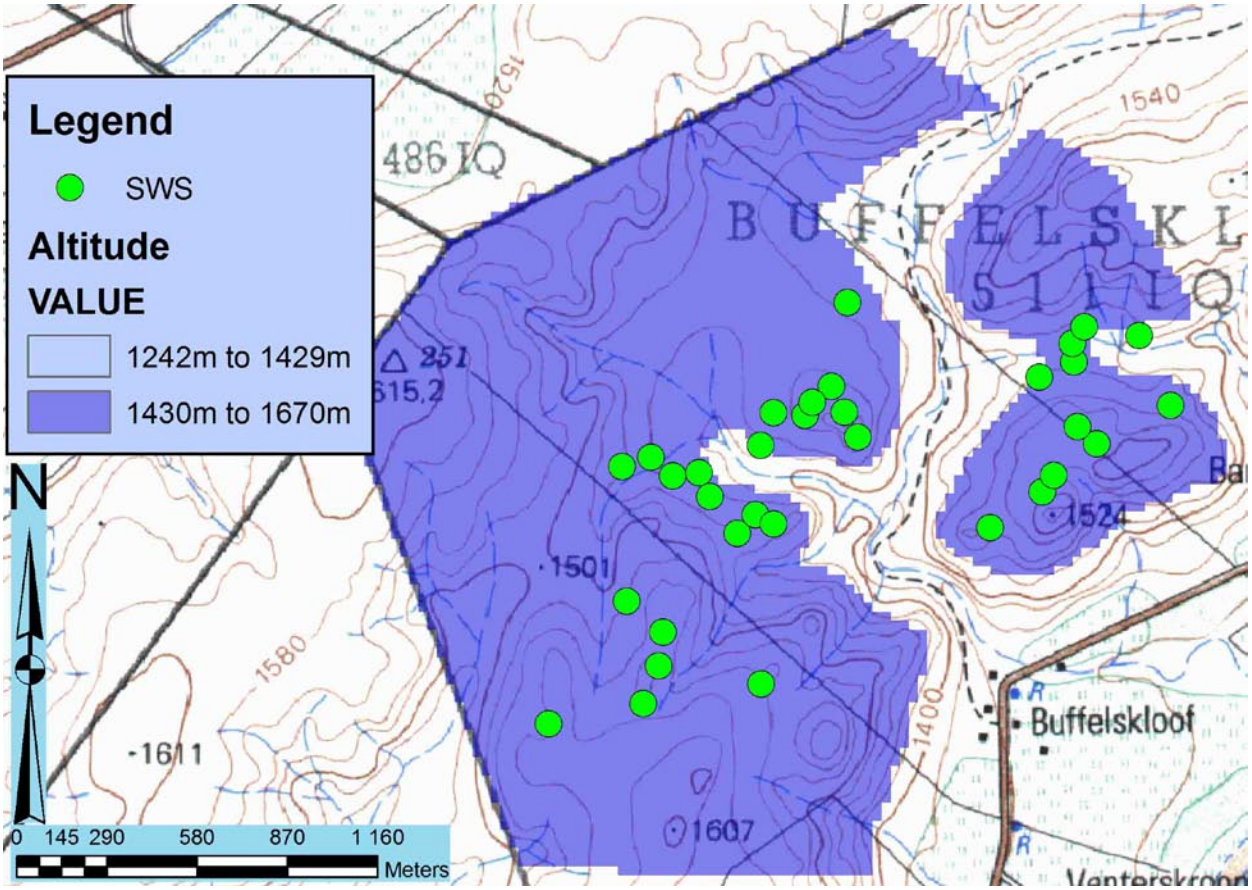


Figure 5.4 Map showing SWS location with regards to altitude

As has been mentioned several times, SWS in the area only occur above 1430m above sea level. Figure 5.4 clearly demonstrates this clearly. The areas of the map in blue are generated from our DEM, with cells in blue occurring above 1430m, with everything below having no colour.

Distance of SWS from Water

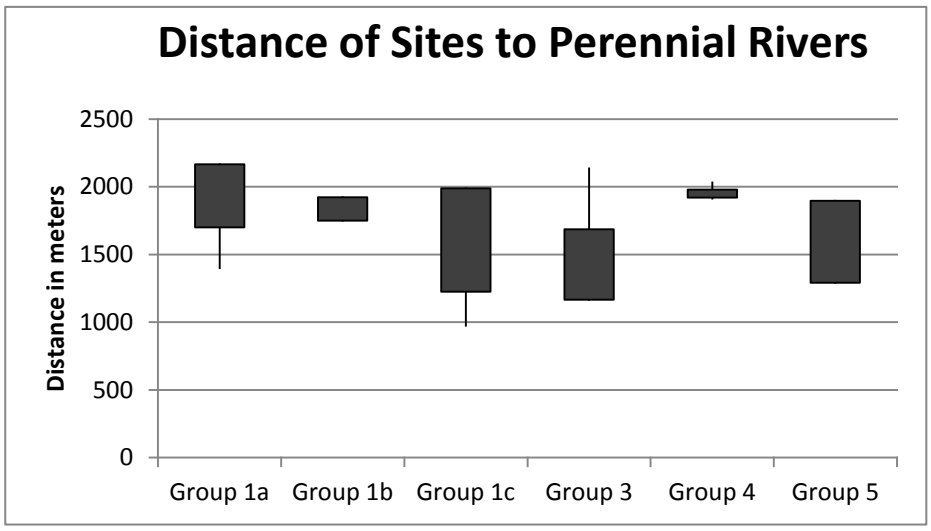


Figure 5.5 Distance to Perennial Rivers.

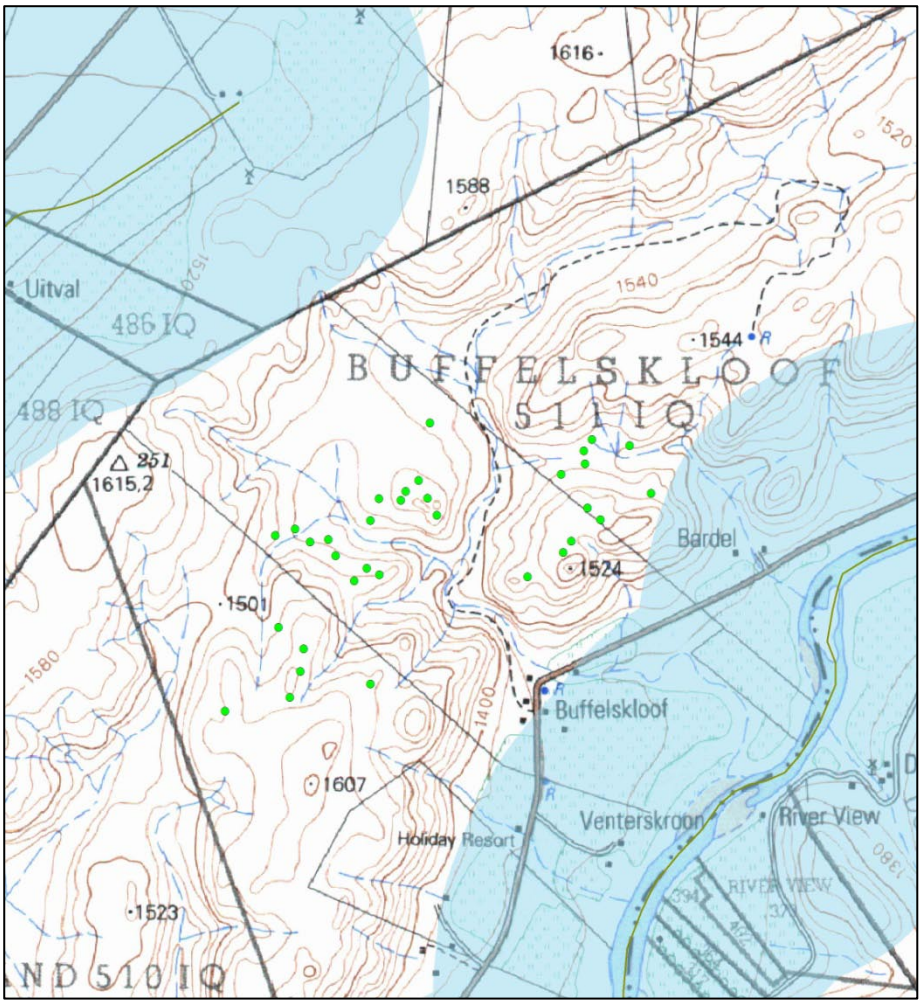


Figure 5.6 1km Buffer Zone from Perennial Rivers

The choice of elevated land for site selection means that the SWS are quite a distance from perennial rivers. As Figure 5.5 demonstrates, the distance of these sites from permanent (guaranteed) water sources range from 1 km to 2 km. This range holds consistent through the different types of sites.

Figure 5.6 shows a 1 km buffer around the two perennial rivers near the survey region. To the southeast is the Vaal River, whilst the Tygerfontein River lies to the northwest of the region. This buffer demonstrates a site selection strategy that does not emphasise proximity to permanent water. These perennial rivers lie within relatively flat and low-lying terrain, which once again reinforces the deliberate selection of rugged elevated positions for site locations. This is not to say that there is no water within the selected hilly regions, as there are many seasonal streams in the area.

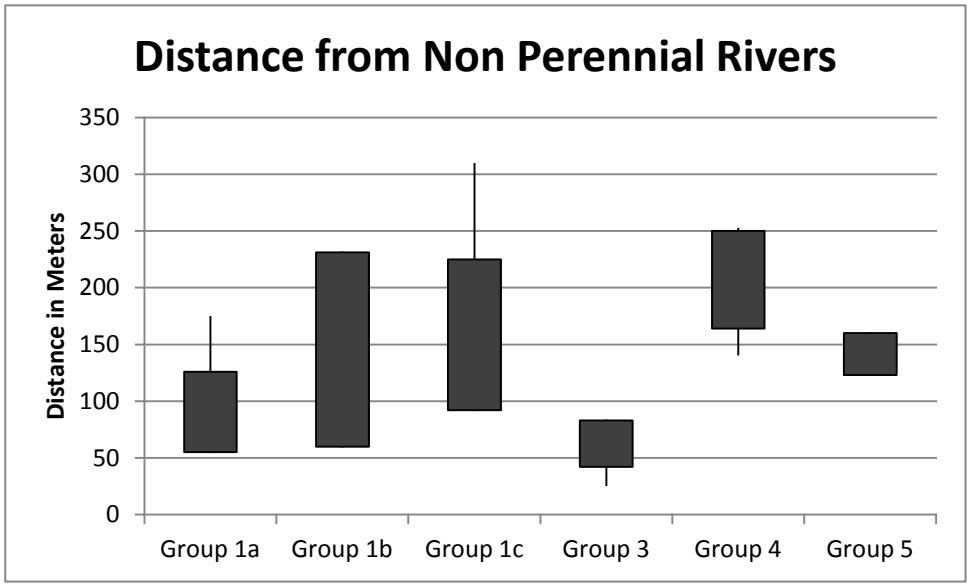


Figure 5.7 Distance from Non-Perennial Rivers.

Figure 5.7. demonstrates how many potential water sources there are in the hills of the Vredefort dome. As we can see, when considering this factor, the range of sites to non-perennial sites is a very narrow 50 m to 300 m. Therefore placing sites in the hills did not come entirely at the expense of easy access to water, provided the non-perennial streams held water at the time of occupation. As a fall back, there is permanent water within about 2 km of any given site, but this does require traversing rough terrain. In terms of reliable water amongst the so-called perennial streams, there are two that run through the survey region that consistently

hold water in living memory (landowner *pers. comm.*), so much so that a small dam wall has been built on one of them. Whilst we cannot project the reliability of this water source back to the occupation period, we can still examine the distance to these streams to give an idea on the ease of access of water in the region.

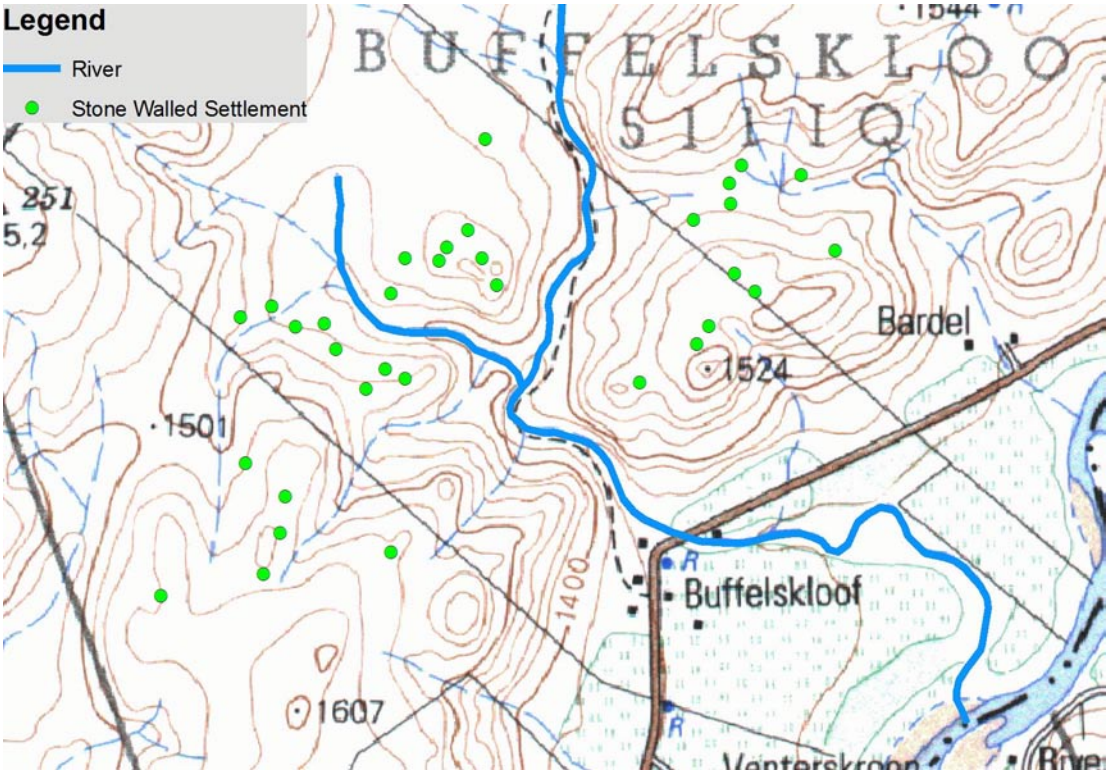


Figure 5.8 Map Showing Present Day Permanent Water

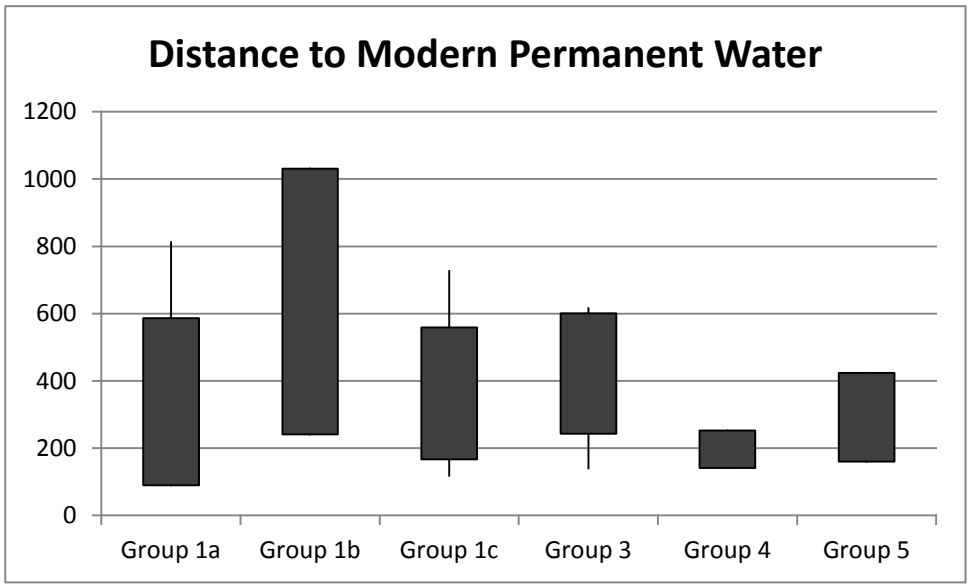


Figure 5.9 Distance to Present Day Permanent Water.

Figure 5.9 shows us that whilst the distance range increases using only these two streams, most sites still fall relatively close by. The furthest site is about 1 km away, but most falling within 600 m of these streams. Whilst we cannot reliably extend these data back to the time of occupation, it demonstrates that access to water is not an issue in these hills.

Distance from Fields

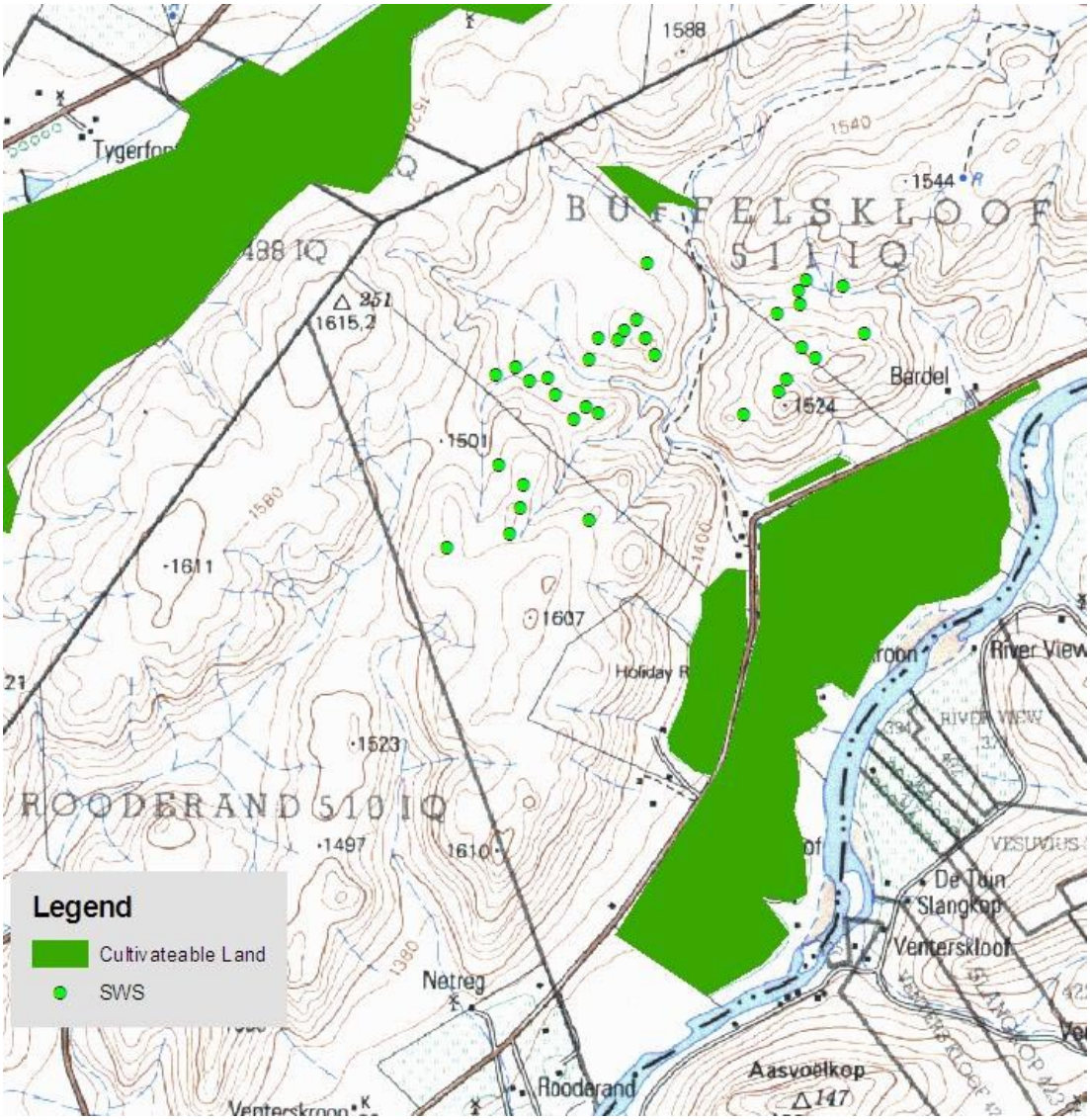


Figure 5.10 Cultivatable Land in the Research Area

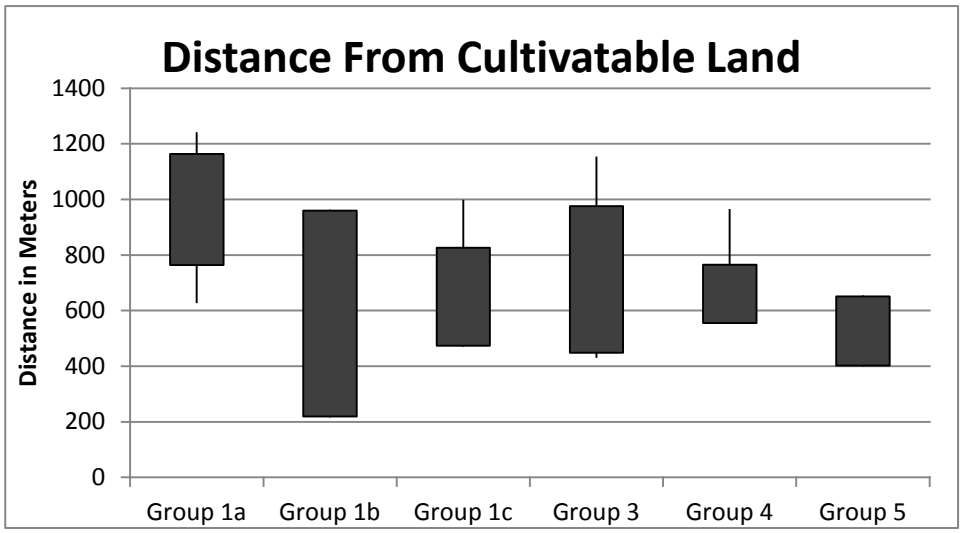


Figure 5.11 Distance from Cultivatable Land

Figure 5.10 shows us the cultivatable land near our research area. These data were digitised from our 1:50000 map, as well as an historical photograph (from the Chief Directorate Surveys and Mapping department). The river valleys of the Vaal and Tygerfontein are the main areas of cultivatable land in the region. In terms of cultivatable land in the hills, there is a small patch (44000 m²) lying between two streams. Figure 5.11 shows us the range of distances between these cultivatable areas and the various SWS types. The sites range from 200 m to 1200 m from suitable land. Group 1a SWS generally lie further from these fields than any other Group.

Terrain Ruggedness Index

Another important factor to consider is the ruggedness of the terrain, primarily due to the challenging topography presented by the Vredefort Dome. In order to quantify this in a GIS environment, the Terrain Ruggedness Index (TRI), developed by Riley *et al.* (1999), can be used. The TRI calculates the degree of difference of height values of a given range of raster cells, deriving these data from a DEM. This differs from slope calculations, in that slope calculates the change in steepness (rise/run) between cells whilst the TRI calculates the height differences (rise) between cells, which is then outputted as a raster. The DEM plugin for QGIS was used to generate these data.

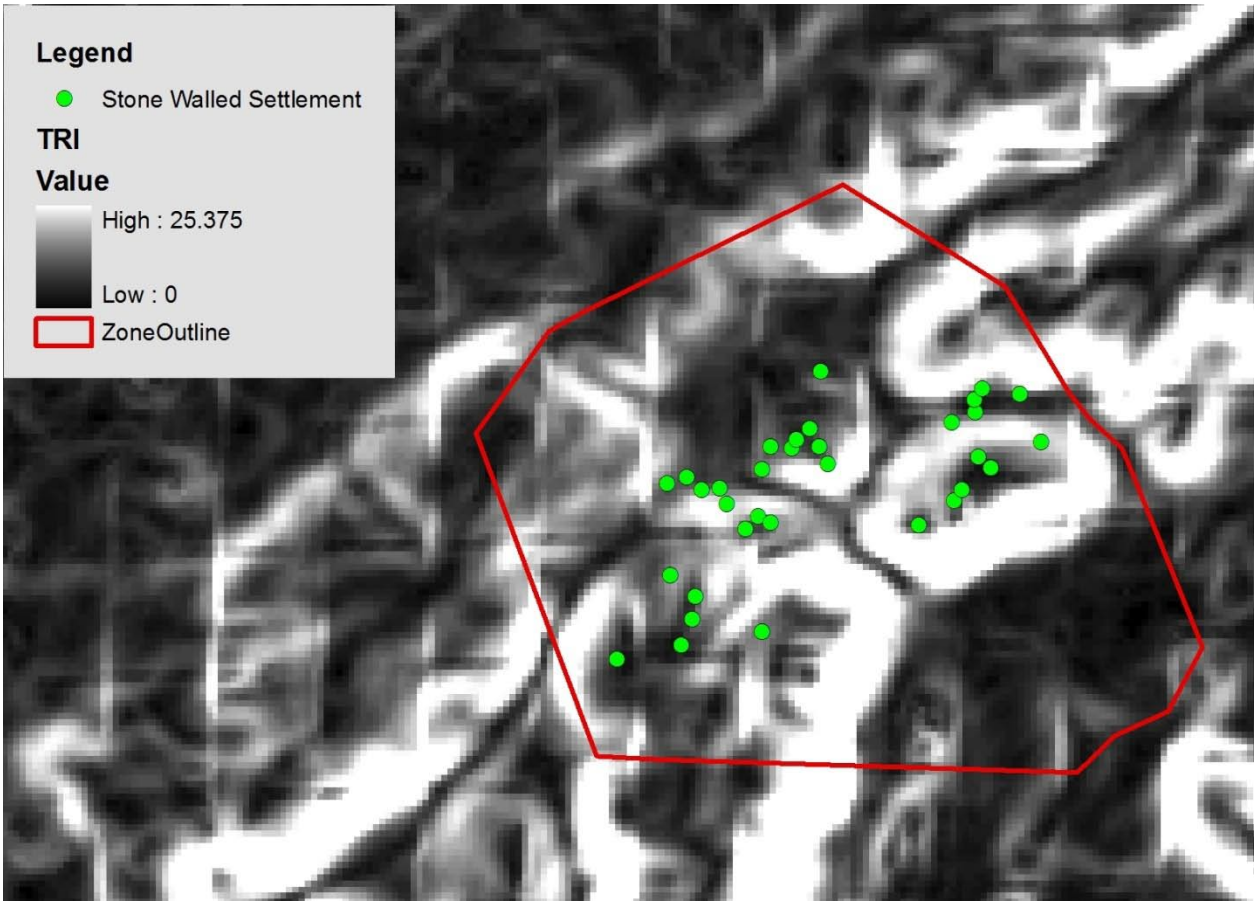


Figure 5.12 : Results of the TRI Analysis.

Figure 5.12: shows the output data of the TRI analysis. The area surrounding the SWS have relatively high TRI values (lighter colours on the colour ramp), demonstrating the difficulty of the local terrain for traversing. From these data, we can see that SWS are generally placed near or in areas bordered by rugged terrain. However, the sites themselves are built just off this rugged terrain, perhaps suggesting a defensive setting.

Cost Paths

Given the terrain difficulties, navigating this landscape can be challenging. Using these data, it is possible to calculate likely routes through the terrain using the cost path tool in GIS (e.g. Gietel *et al* 2008). For this exercise, three departure points were selected from outside the hilly region, in the relatively flat areas near perennial rivers, which probably used as main transport corridors through the region given the gentle terrain (see Historical Overview in Chapter 2). Cost paths were then calculated from these departure points to various clusters of SWS. These arrival points were chosen to represent numerous scenarios.

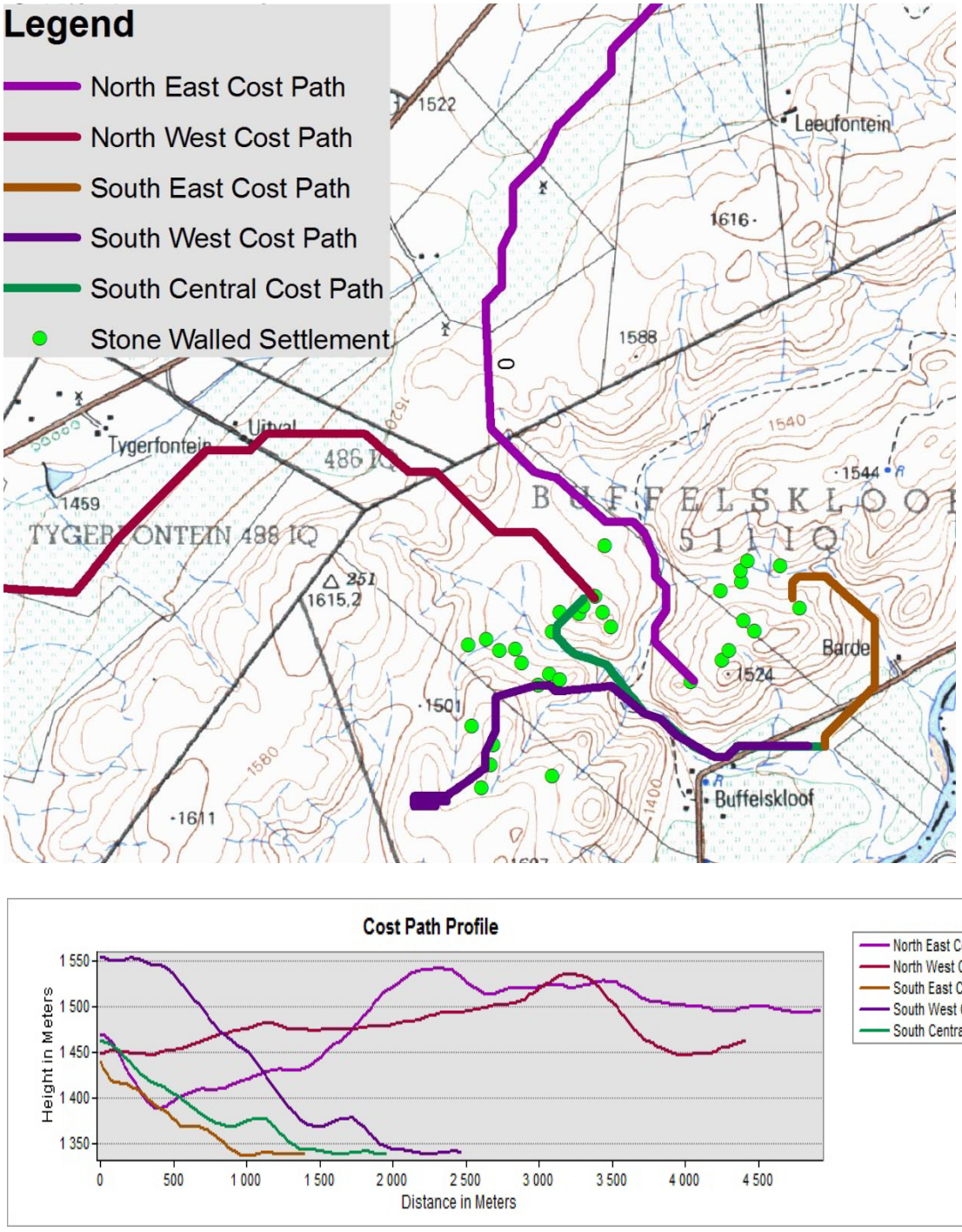


Figure 5.13 Results of Cost Path Tool, with Profiles.

Figure 5.13 shows the results of the cost path calculations. The cost paths select valleys between hills as natural pathways into the hilly regions. This makes sense in terms of traversing the terrain as these valleys offer less challenging terrain in terms of steepness. The paths use the valley floors as corridors until they can reach the easiest point to climb any given hill. What this demonstrates is that whilst it is possible to traverse this terrain, doing so easily can only be

done through limited and restricted channels. The profiles for the cost paths were generated off the ASTER DEM. They demonstrate that even with the most cost effective path, one still needs to scale quite an elevation range to reach SWS in the region, as the sites in the region are all located high on the hills.

Viewsheds

One factor that could have made these hills a desirable location is the wide range of view offered by an elevated position. Using the ASTER DEM, it is possible to quantify the viewshed in ArcGIS. Having a wide range of view from a site, or within a reasonable distance from a site (such as lookout points), allows for a visual domination of the landscape (e.g. Madry & Rakos 1996; Parmegiani & Poscolieri 2002). Visual domination allows for an aggressive or defensive role in the landscape. Such a visual domination is essential in terms of planning a defence or attack, as knowing what is happening within the landscape, as well as what counterparts are doing offers a substantial tactical advantage. A commanding view also allows for the visual control of strategic resources, such as transport corridors (e.g. Madry & Rakos 1996) and agro-pastoral resources such as fields and grazing. The viewshed tool in the spatial analyst toolbox was used to calculate these data. An observer height of 1.65 m above the surface was specified.

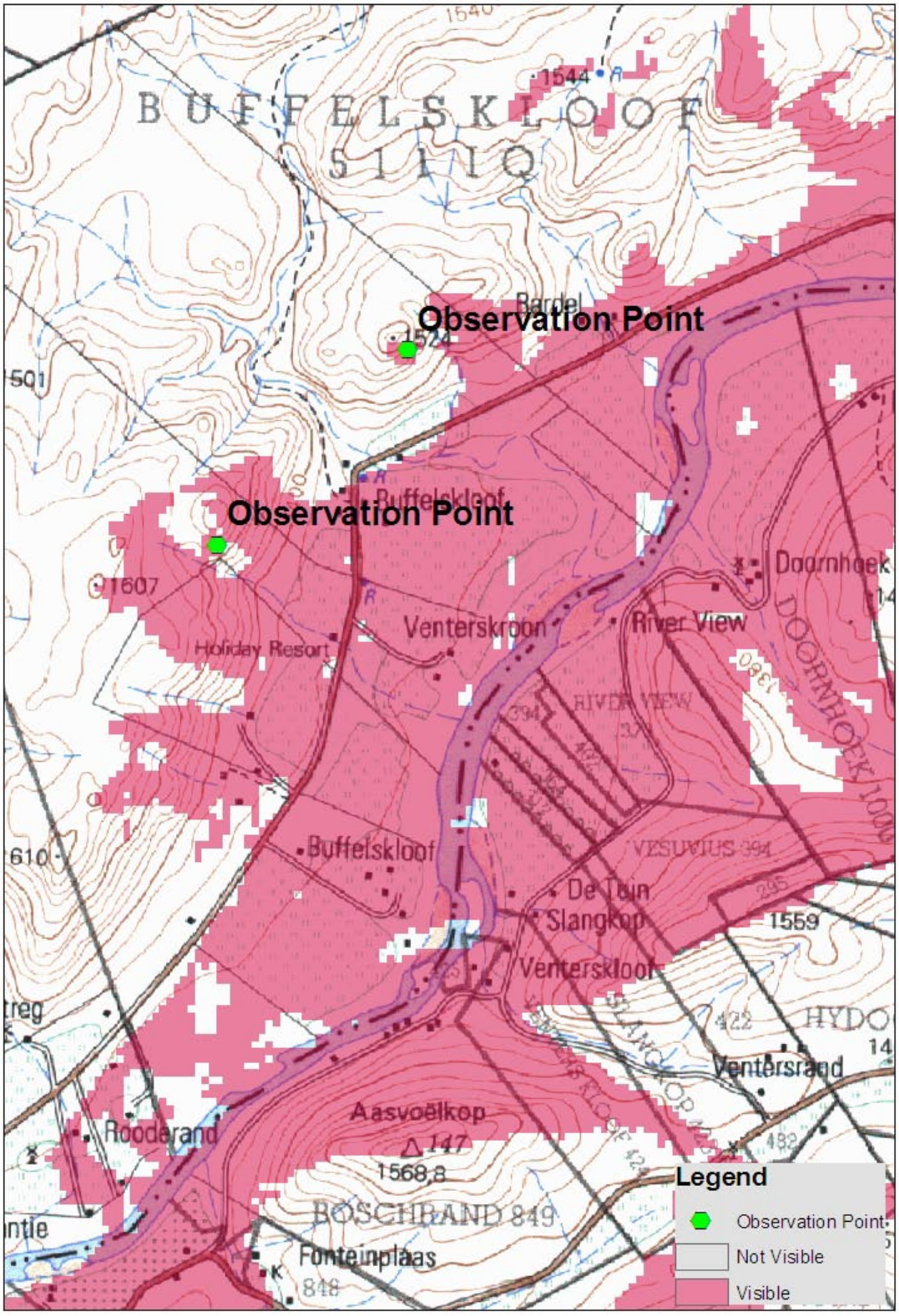


Figure 5.14 Viewshed results from two observation points looking into the Vaal River valley.

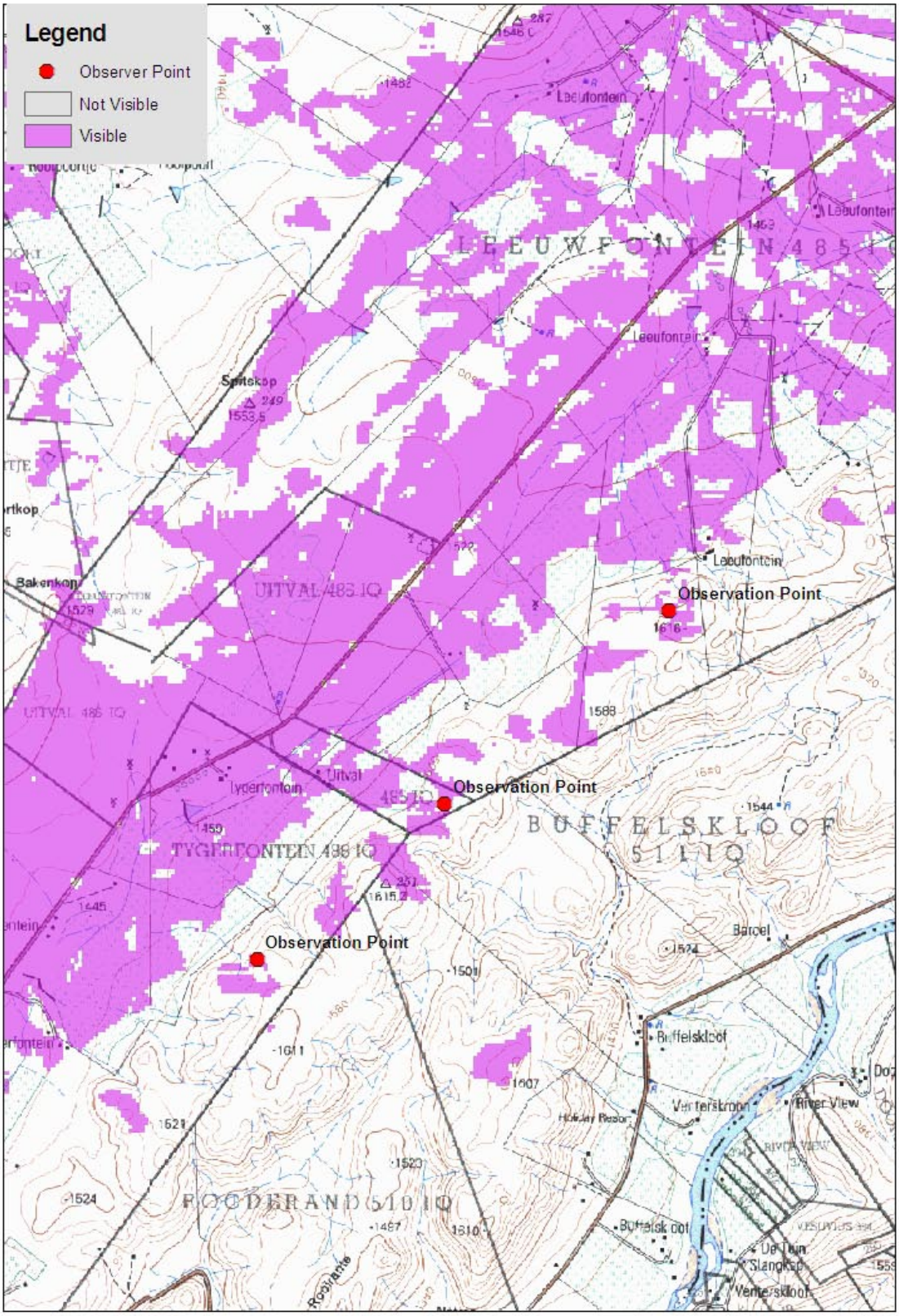


Figure 5.15 : Viewshed of the Tygerfontein River valley using 3 Observation Points.

Both Figures 5.14 and 5.15 provide a visual assessment of the visible range from just a few elevated observation points. These points were chosen to cover the river valleys of the Vaal and Tygerfontein rivers, the main transport corridors. Whilst we can't know where exactly observers would be placed, these viewsheds demonstrate just how easy it would be to keep these areas under surveillance.

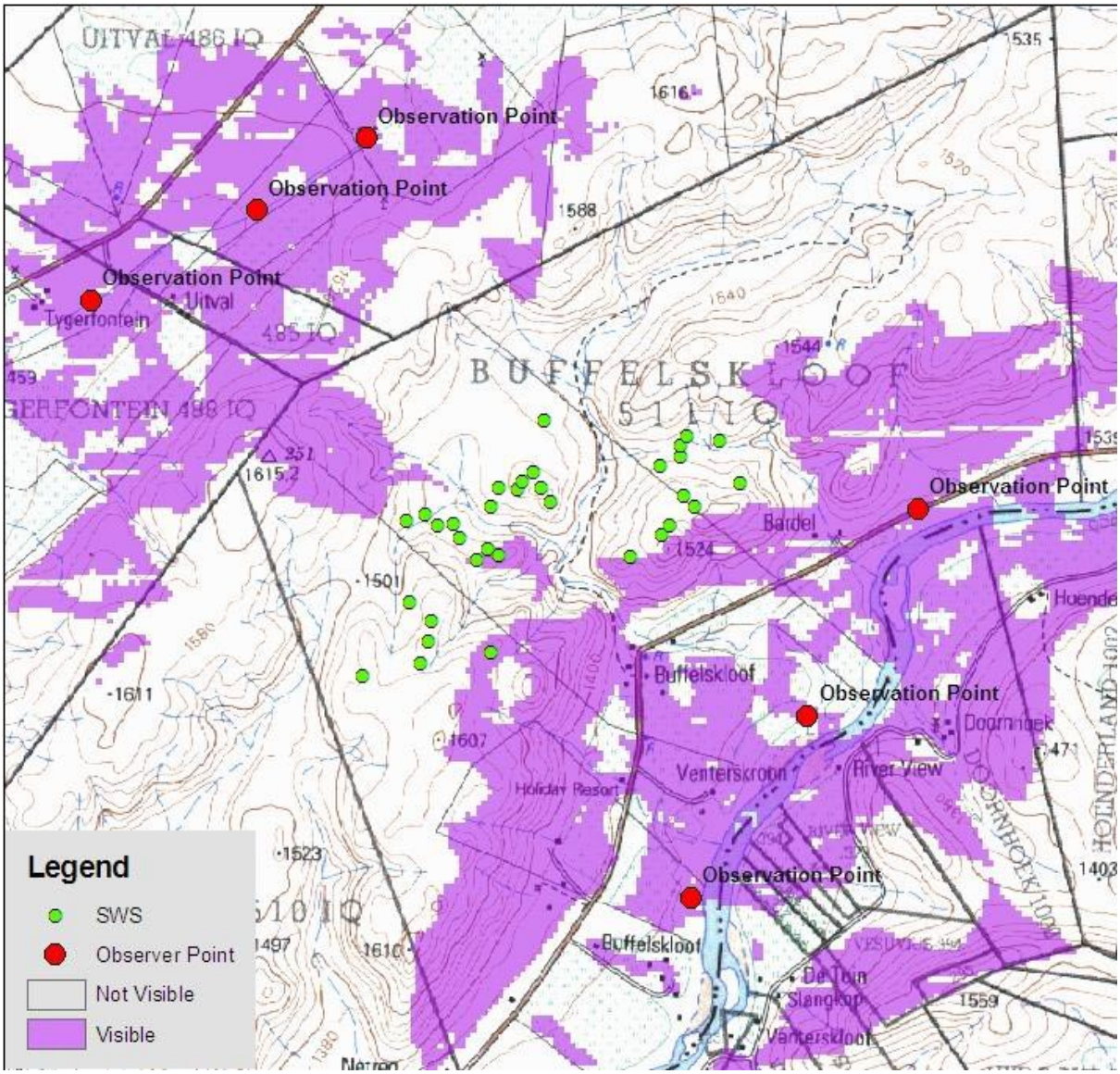


Figure 5.16 : Reverse Viewshed, from the River Valleys Looking back on the SWS.

Figure 5.16 clearly demonstrates the second advantage that the hill location offers the people who built there, that they are hard to see from the river valleys. Observation points were selected along the river valleys of the Vaal and Tygerfontein Rivers, as the natural transport corridors through the region. The SWS in the hills are generally not visible from these areas. As such, the sites could go unnoticed by any passing group. This holds true for the valleys created

by the Vaal as well as the Tygerfontein. There seems to be a deliberate choice in site location that avoids being visible from the main routes.

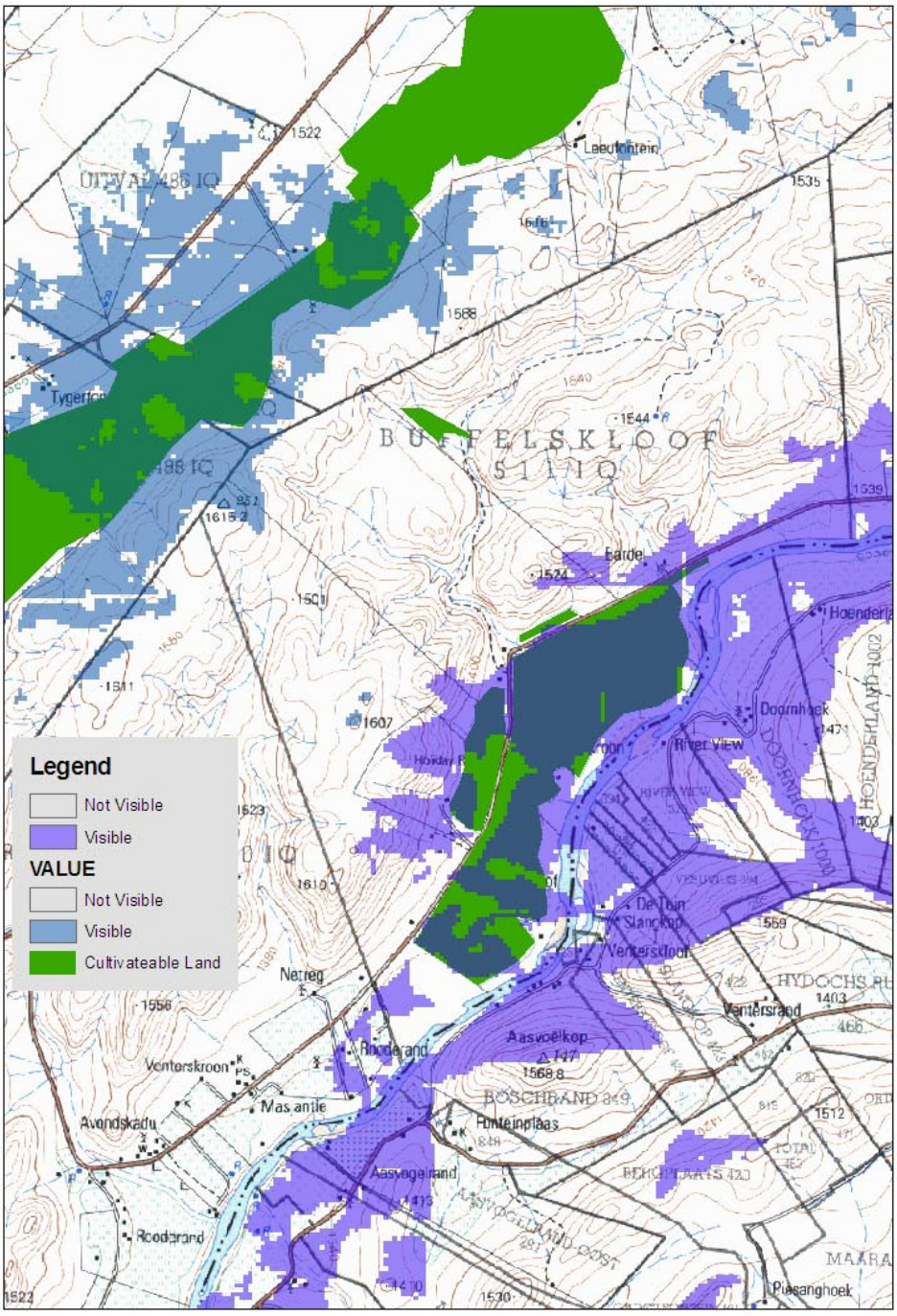


Figure 5.17 Viewsheds Over Cultivatable Land.

Figure 5.17 shows us the same viewshed results as the valley observation points, but has the cultivatable land layer added. As there is a clear relationship between these two, and as such

whilst there may be some distance between fields and sites, it would not be hard to keep an eye on their fields from the elevated hill position.

Site Specific Analysis

The second section of this chapter is a site specific analysis looking at the SWS themselves, analysing various features in these sites. Once again, they are segregated into types, to allow for an overall comparison between them.

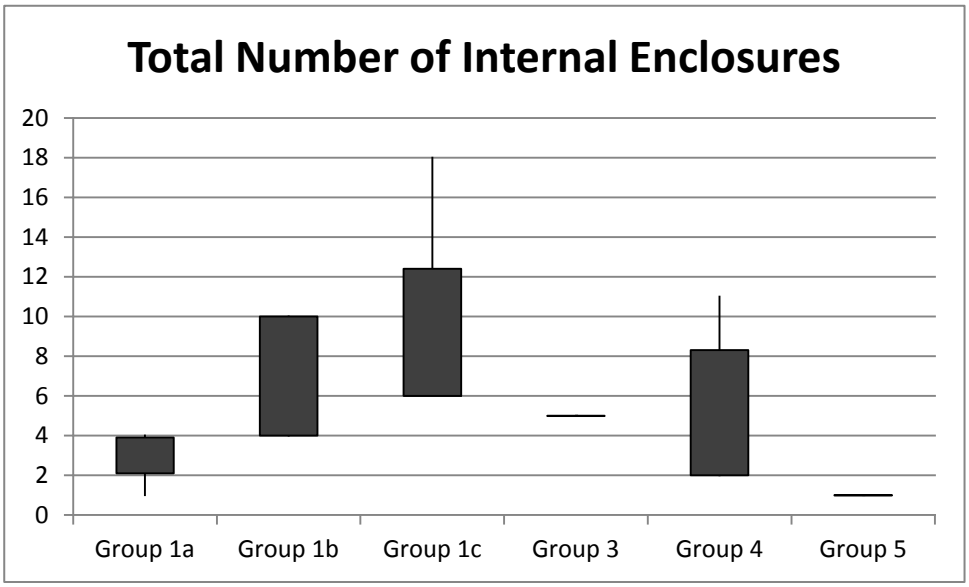


Figure 5.18 Total Number of Internal Enclosures.

Figure 5.18 shows us the total number of internal enclosures contained within each site. These include both enclosures contained within the perimeter, as well as enclosures that are incorporated into the perimeter itself. The number of internal enclosures may reflect the complexity of site use. This was the starting point for distinguishing between Group 1a and 1c sites. As the chart demonstrates, Group 1a sites have few internal features, from one to four. Group 1b, by its compound nature, will have a multiple of Group 1a's range. Group 1c has a much larger range of internal enclosures than Group 1a, starting at six features and increasing to eighteen for the largest site. There is a clear break between 1a and 1c with the bottom of the range of 1c having two more features than 1a. All Group 3 sites have five features, but this is more likely due to a narrow sample rather than a hard and fast construction rule. Group 4 has quite a wide range, which may reflect on the less formal nature of this Type. Group 5 sites only have one feature, which appears to be by design.

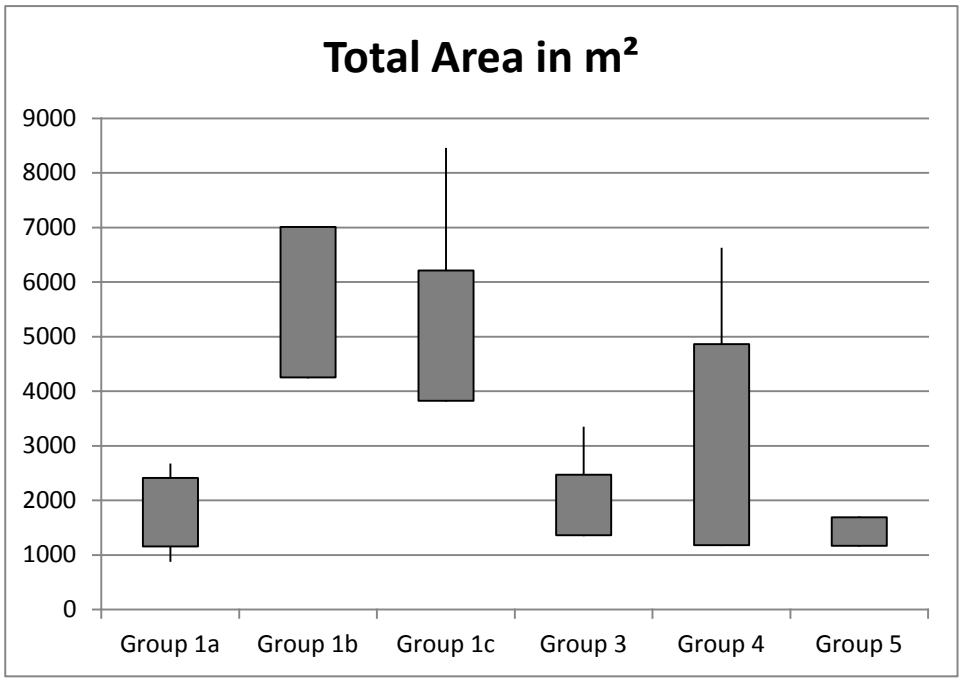


Figure 5.19 : Total Area of Site in Square Meters.

Figure 5.19 shows the range of the total area of each Group type. The thin bar shows us the total range of each data set, from the smallest to the largest in square meters. The thick bar shows us the standard deviation of the entire data set from the mean centre. This helps visualise any outliers that may exist in our data set. Group 1a has a relatively narrow range, despite having the second largest sample size (n=7). Even the outliers of this data set fall relatively close to the expected range calculated from the standard deviation. Group 1b has a small sample size (n=2), but will be expected to be at least twice the size of Group 1a sites based on their compound Group 1a makeup, which is shown in this table. Group 1c (n=7) has a much larger range than Group 1a, showing a wider variability in size. The outlier of this group comes from one massive site (BFK SWS 26+27), raising questions as to why it is so large. Noteworthy with this table is the clear distinction between Groups 1a and 1c in terms of size, with Group 1c being much larger than Group 1a, thereby reinforcing the distinction between these two Types of sites. Group 3 sites also fall within a narrow range, having more in common with Group 1a sites in terms of size, but with a small sample (n=4). Group 4 sites have a wide range despite a small sample size (n=4), demonstration the irregular nature of this Type. There are two examples of Group 5 sites, both of a similar comparatively small size.

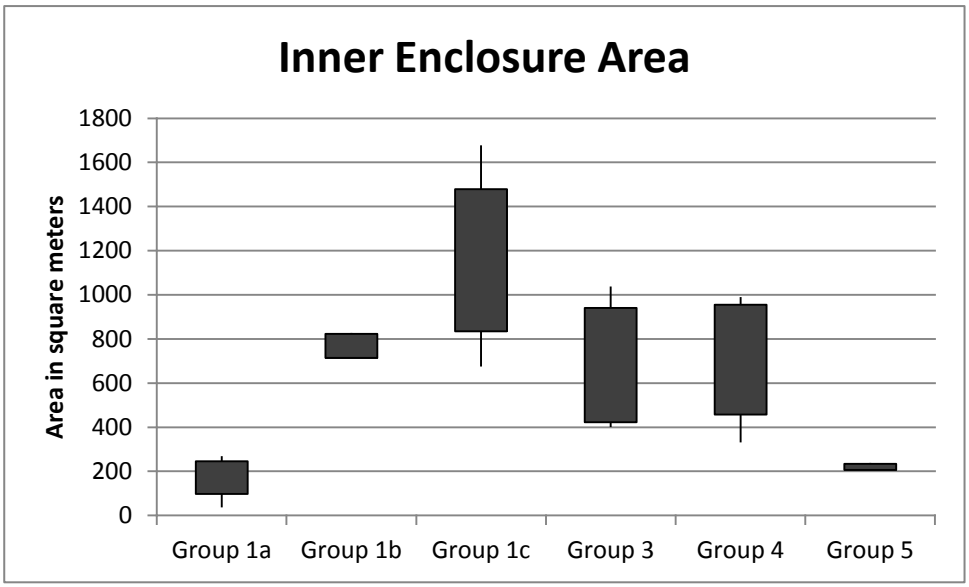


Figure 5.20 Total Areas of Inner Enclosures.

Figure 5.20 shows us the size of enclosed areas by Group type. What is meant by enclosed areas, are circles, both complete and incomplete, within the perimeter of a site. This includes circles that fall on or form part of the perimeter wall of a site. Of note in this chart, is just quite how small the interior area of Group 1a sites are when compared to other Groups, except Group 5 which only has a single feature in the perimeter. Group 1c generally has the largest enclosed area. Because Group 1b is made up of multiple Group 1a sites, it has a similar enclosed area to multiple Group 1a sites. Groups 3 and 4 are very similar in this regard.

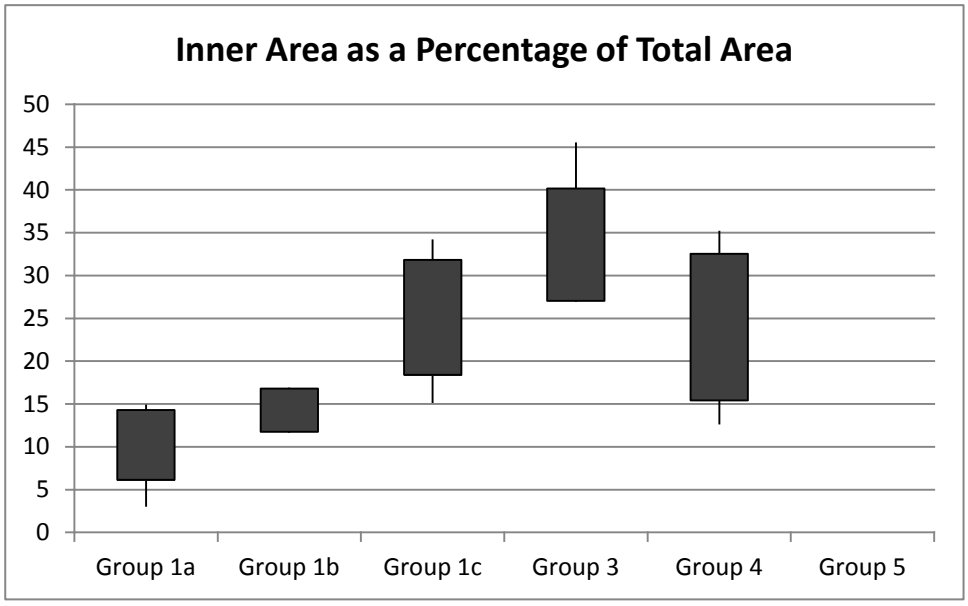


Figure 5.21 Percentage that the Inner Areas of Sites is of the Total Site Area.

Figure 5.21 shows us what percentage of the total site is composed of interior enclosures, i.e. livestock and storage. The purpose of this exercise is to explore possible functional differences between different types of sites. Group 1a sites have the smallest percentage of inner area to total area of all the site types, in a narrow range. Interior areas of Group 1b sites fall roughly within, to slightly above, the upper range of Group 1a sites, which is to be expected due to their compound nature. Once again, there is a clear distinction between Group 1a and 1c sites, with 1c sites containing much larger interior enclosures in comparison to the entire site, as well as a larger range than 1a sites. Group 3 sites have the largest comparative interior area, probably due to the abundance of enclosures within the perimeter, reducing the overall non enclosed space within the site. Group 4 once again demonstrates a large range, demonstrating the variability of this site Type. The range however, is similar in comparison to Group 3 sites.

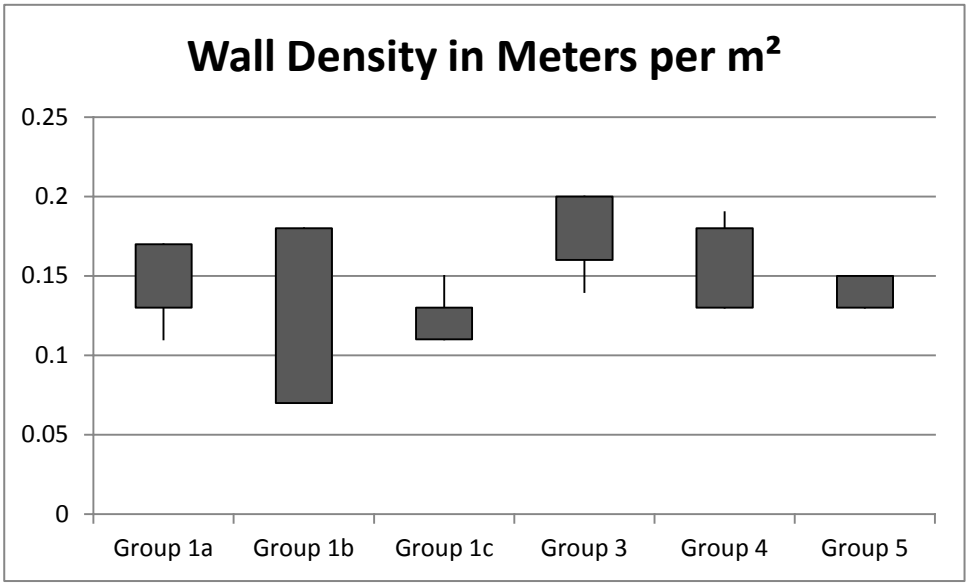


Figure 5.22 Wall Density of Each Type.

Figure 5.22 shows us the density of walling of each site Group. This number is derived by dividing the total area of a site by the total length of all walls within that site. The result is a measure of the length of walling per square meter of the site, an indication of wall density. What is interesting to note here is the relatively narrow range this exercise gives. In fact, one would expect Group 1a to have a low relative wall density, but shows a slightly higher result than Group 1c, which is an architecturally more complex Group. The reason for this is that with increasing complexity, we see an increase in the size of the site. Group 3 has the highest wall density of all the Groups, but it still isn't significantly different to the other Groups. This begs the question as to whether there is some form of convention on wall density, possibly due to space

management. However, a larger sample would be required to see if this result holds true across a wide range.

Spatial Distribution

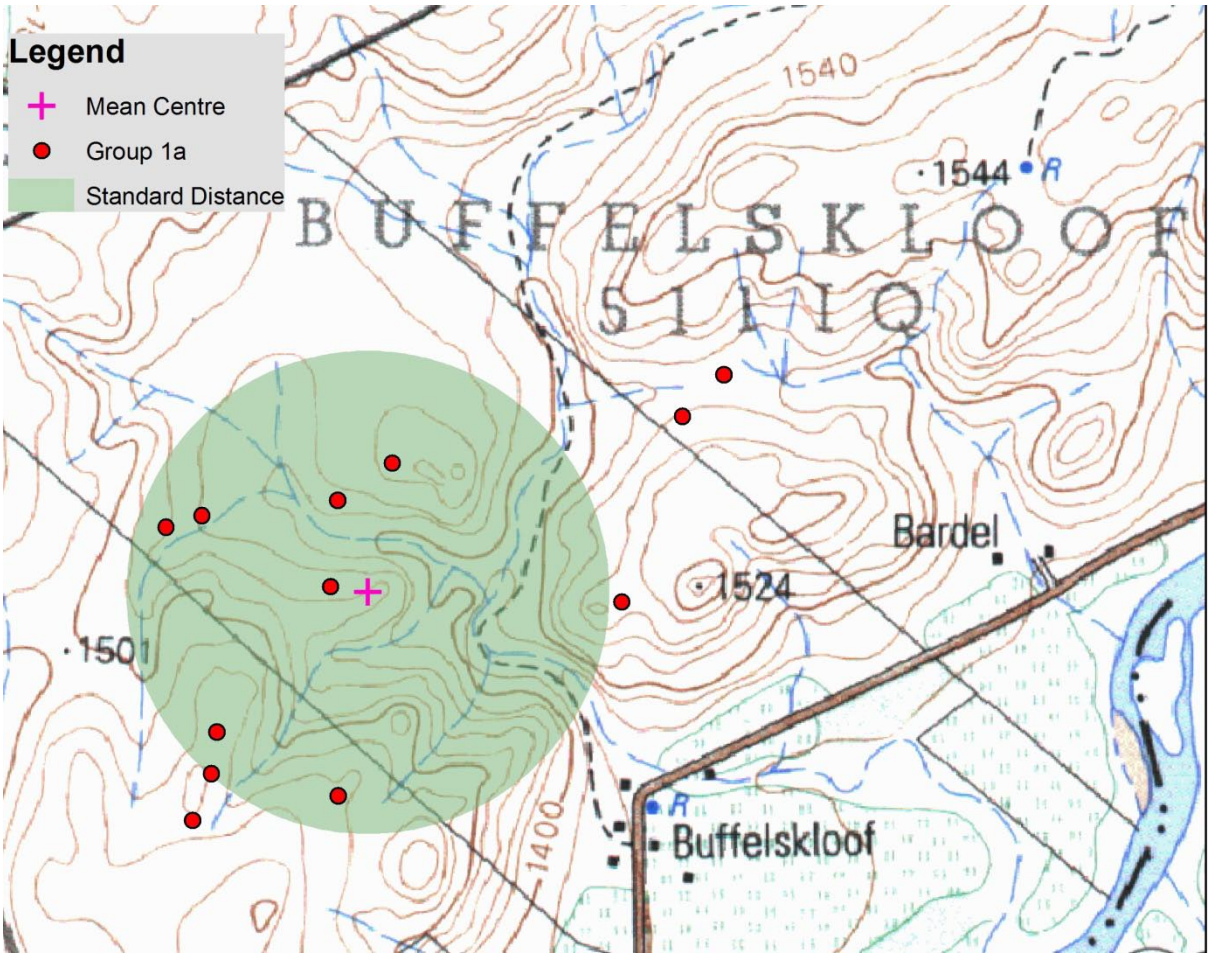


Figure 5.23 Geographic Mean Centre of Group 1a Sample

As well as a visual representation of one standard deviation of site distance.

Figure 5.23 shows us a measure of dispersal of Group 1a sites throughout the landscape. This is done by calculating a geographic mean centre of the Group 1a sample, and then calculating one standard deviation of the distance of sites from this centre. This provides us with a visual guide as to how concentrated or dispersed these sites are.

Group	Standard Distance in Meters
Group 1a	627
Group 1c	637
Group 3	531
Group 4	202

Table 5.1: Standard distance between site types in Meters.

Table 5.1 shows us the standard distance for the different Groups that had a large enough sample size to conduct this exercise. From this table we can see that Groups 1a, 1c and 3 are generally quite widely dispersed throughout the landscape. However, Group 4 sites are quite tightly concentrated in a small area, most of which fall on one central hill.

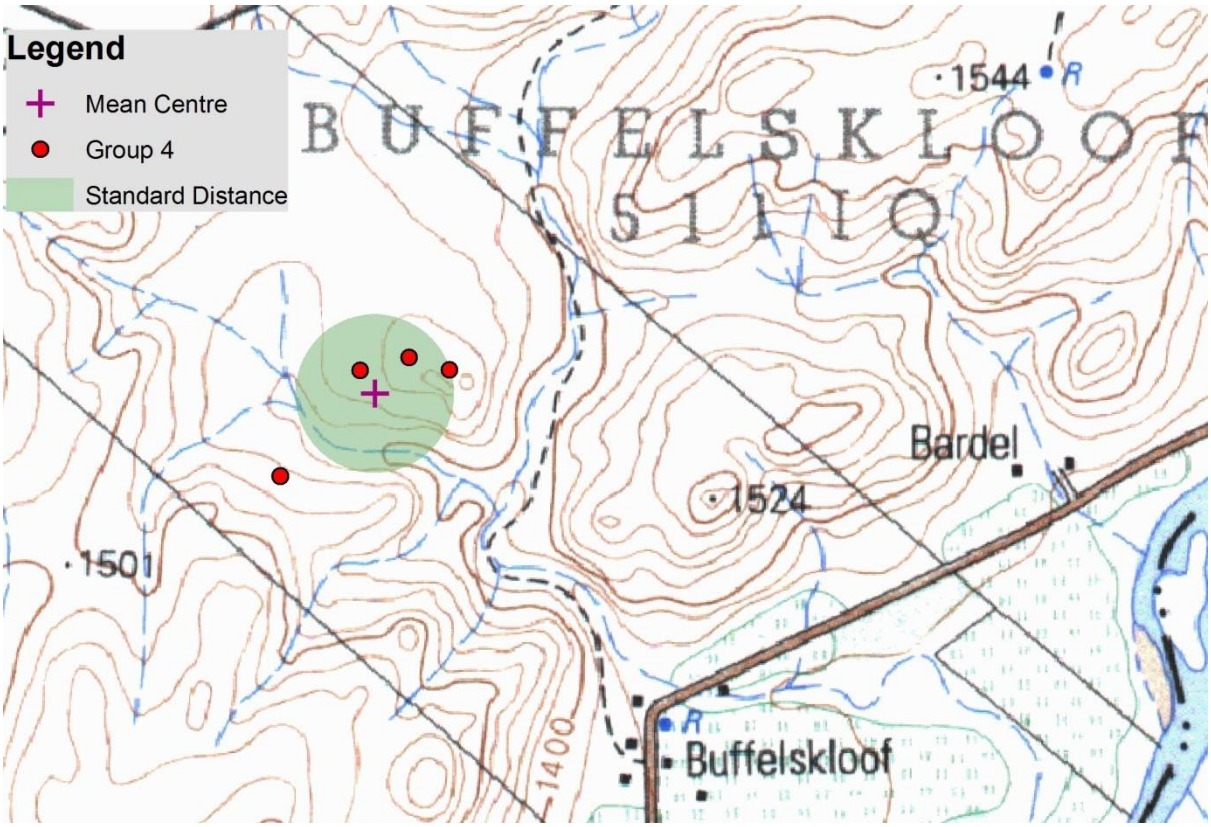


Figure 5.24 Standard Distance and Mean Centre of Group 4.

Note the much smaller standard distance, showing a tighter distribution.

Based on these data, an average nearest neighbour analysis could help us to see if we are dealing with a dispersed or clustered pattern for different Groups. This tool generates a Nearest Neighbour Ratio (NNR) based on the measured mean distance between features and expected

mean distances. These average distances are then compared to a theoretical randomly distributed feature set to see if the averages produced are similar to or different to this null hypothesis. This will allow us to see if site distribution is dispersed or clustered, and whether this distribution is the result of random chance or statistically significant. For the purposes of this study, the area of study was defined by a polygon which linked the outlying sites. This gave a study area of 1 520 000 m². NNR values greater than 1 increasingly represent a greater degree of systemic dispersal to a maximum of 2.1491, whilst NNR values less than 1 decreasingly represent tighter systemic clustering to a minimum value of 0. Then, in order to evaluate the statistical significance of this value, it is tested against a null hypothesis (randomly generated points). If the points conform to or differ from this null hypothesis, we can then reject or accept it. If we reject the null hypothesis we can then state that our pattern is statistically significant, or if we accept the null hypothesis we can state that the points resemble a random pattern and therefore have no statistical significance. The values generated to determine this are a z score and p-value. Z scores are a measure of standard deviation, showing how far a value is from the mean. Therefore a large positive or negative Z score falls within a larger standard deviation, and is therefore more likely. The p-value is the probability that you have falsely rejected the null hypothesis. Therefore, the smaller the p-value the lower the probability that a rejection of the null hypothesis is false.

Group	Observed Mean Distance	Expected Mean Distance	Nearest Neighbour Ratio	Z Score	p-value
Group 1a	210.76	177.95	1.18	1.22	0.22
Group 1c	193.33	217.94	0.89	-0.61	0.54
Group 3	568.8	308.22	1.85	3.23	0.0012
Group 4	170.87	308.22	0.55	-1.7	0.088

Table 5.2: output of nearest neighbour analysis.

Group 1a has a slightly dispersed pattern, but with a low Z score and a high p-value, there is a good chance that this represents a random pattern. Group 1c displays a slightly tighter cluster but the Z score and p-value mean that this is likely to be a random distribution. However, Group 3 displays a relatively high dispersal pattern, with a high probability that this pattern is not random. Group 4 exhibits a relatively high degree of clustering, with a reasonable possibility that this is not a random pattern. This conforms to the data generated by the standard distance tool.

Conclusion

The purpose of this chapter was to examine our data using various techniques available in GIS, against numerous variables. The following chapter is dedicated to discussing the significance of these findings.

6. Discussion

The first issue that we shall address is the division of Group I into three different sub classes. The initial separation between Groups 1a and 1c was done on a perceived difference in complexity of interior walling. Group 1a is defined as having fewer internal enclosures than Group 1c, which upon mapping consistently was 4 or below. Group 1c has more than four internal enclosures, up to ten in our sample. Four consistant differences between Groups 1a and 1c have been observed. Group 1c are all much larger sites than Group 1a, with the largest Group 1a site being 2670 m² and the smallest Group 1c site at 3824 m². Group 1c sites conform far more tightly to a northeast aspect, whilst Group 1a sites have a more widely distributed aspect. The total size of interior enclosures between Group 1a and Group 1c differ greatly, with a range maximum area of 245 m² for Group 1a vs. 680 m^2 for the lowest value of the inner area range for Group 1c. If we examine the areas of inner enclosures (livestock and storage) in a SWS as a percentage of the total area of the site, Group 1c comes in with a larger range of 15% to 34% when compared to Group 1a's 3% to 15%.

These four differences demonstrate a quantifiable difference between Group 1a and Group 1c based on the original distinction of interior enclosure complexity. This is despite the similar concept employed in their design, a clear circular perimeter containing some interior enclosures. Based on the maps Taylor (1979) produced of the Group 1 sites that he excavated, 2627 CD 3 cannot be readily distinguished as Group 1a or Group 1c, which would require more information, such as size and aspect, to firmly place. His site 2627 CD 4 lies firmly in the Group 1c subclass. This is the site that Taylor (1979) retrieved his sample for radiocarbon dating this Group, the oldest in the area. This raises the question as to whether Group 1a represents an earlier type, a later type, or whether the difference is functional.

The quantitative difference between sites of Groups 1a and 1c is based on complexity. Group 1c sites are larger and more complex than Group 1a sites. An interesting point to note is that whilst Group 1c sites are larger overall, the areas created by internal enclosures are also larger. Whilst specific excavations would be required to uncover the exact use of these internal enclosures, previous work (e.g. Maggs 1976) suggests that these internal enclosures are for keeping livestock whilst the perimeter wall either defines the boundaries of the settlement (Maggs 1971) or acts as a protective barrier, in order to keep out wild animals and contain children. This increase in holding capacity may be the cause of the increase in overall site size.

Interestingly however, the amount of space given to keeping livestock increases as a percentage of the overall space of a site as well, meaning that an increase in livestock does not automatically lead to a proportional increase in living space (i.e. site population). From these data, we can state that Group 1a sites represent smaller communities, with less livestock. Without specific dating, it is not possible to state whether Group 1a is contemporaneous with 1c. There are three possible hypotheses that we can imagine from current data. The first is that Group 1a represents an earlier phase, which became wealthier through time. The second scenario is that Groups 1a and 1c are contemporaneous and the difference represents a wealth gap, or functional difference (e.g. cattle post vs. primary settlement). The final scenario posits a later date for Group 1a, perhaps a reversal of fortune for Group 1c. Absolute dating on Group 1a and Group 1c sites is required to narrow down the list of possible scenarios, which is unfortunately not possible within the bounds of this project.

Groups 1a and 1c are widely distributed throughout the landscape, showing no clustering or systematic distribution. They do not seem to centre on any point in particular, and as such we can't identify a central node or cluster. Two Group 1c sites hold commanding positions on the tops of hills. However, one Group 1c site lies within a valley, meaning that there is no altitude or relative altitude rule for the positioning of these sites. Group 1a sites are widely spread out, with little consistency in site placement in terms of geographic features (e.g. hilltops, valleys).

Group 1b offers us an interesting proposition. Unfortunately, there are only two examples of this type in the survey area. However, based on the ratio of livestock to living area, Group 1b seems to be closely related to Group 1a sites rather than Group 1c sites. The sites fall within the same Group using our classification system based on morphology of SWS, but differ in a few key ways. The first is in construction. BFK SWS 22 seems to have been constructed with the Group 1a concept in mind. There is no evidence of missing walls where the sites intersect, suggesting that they were made this way. BFK SWS 1 however, appears to be built as distinct sites that were then joined, with one Group 1a site linked by a short wall to the main section of the site, which is composed of two Group 1a sites back to back, sharing a common wall. This suggests that the construction of the sites may have been staggered with new features added on as the site grows. It was not possible to establish what the sequence of construction was within the scope of the project. This Group may need to be revised based on this distinction. There is one other known example of the same layout as BFK SWS 22 in the Suikerbosrand (26°30'30.02"S 28°12'46.02"E).

There are four examples of Group 3 sites within these hills. These sites are geographically out of position, as according to Taylor's view they should fall at the base of the hills on the Potchefstroom side. These Group 3 sites are generally quite small and isolated. These sites show quite a high dispersal pattern, which contradicts Taylor's expectations of this Group's distribution (Taylor 1979).

Group 4 sites are an unexpected entity. These sites differ in construction in that they have no clear perimeter like Group 1 sites, nor do they have the inward facing scallops of Group II sites. They seem to have a more haphazard settlement pattern, with elements of the site spread out over a wide area, apparently disconnected. It is possible that these sites are the result of additions to older pre existing sites (most suggestive in BFK SWS 13). These sites are the most tightly clustered of any Group, centring mostly on the central hill of our survey zone. The irregular, almost haphazard layout of these sites makes this Group a possible candidate for *Difaqane* era refugee sites. We know that refugee sites did occur on mountain sites during this period (Legassick 1969), and this central hill does offer certain advantages for a defensive position.

Perhaps the biggest advantage this location offers is line of sight. As our viewshed analyses show, these sites are not visible from both the Vaal and Tygerfontein river valleys. These river valleys offer transport corridors, as discussed earlier. Passing bands would therefore not be able to see anyone taking refuge in these hills. The second line of sight advantage these sites offer is visual control of the area. With just a few well-placed observers, well within signalling or hailing distance of the sites, it is possible to keep an eye on a large portion of the surrounding landscape, especially the transport corridors. This means that it would be difficult for a marauding band to approach the area unnoticed. Navigating through these hills can be tricky, as evidenced by the cost path calculations, especially without specific knowledge of the terrain. Not only would an approaching band be highly visible, but they would also have difficulty navigating this landscape. The central hill offers an advantage in that it is easy to observe all possible approaches, but there are also multiple possible escape routes. Therefore, if a determined band did try to attack, multiple escape routes for the residents of the hills exist. Just the terrain itself, with steep slopes, rocky rugged terrain and dense vegetation would prove a challenge for an attacking party.

Group 5 sites also present a shift from the typical site arrangements in the area. They lack a central kraal enclosure. There is a single enclosure on the end of the perimeter wall. This suggests that these types of sites are functionally different to other Groups in the area. It is possible that the site did not contain much in the way of livestock (perhaps in the single outer enclosure), or the opposite is true and only contained livestock. These two sites both occur in close proximity to other, large sites. BFK SWS 8 lies close to the Group 4 site BFK SWS 07; and BFK SWS 24 lies close to the Group 3 site BFK SWS 25. Both of these Group 5 sites are orientated with their entrances facing towards the adjacent site, roughly 20m away. It is therefore possible that these sites are related to the other Groups, and have a functional difference.

BFK SWS 17 provides the sole example of Mason's (1986) Class 8 type site in the area. Mason's classification of this type is based on just one known example at Leeukop, east of Potchefstroom. Not much is known about this type as no work has been done on it. BFK SWS 17 provides us with a second example of the Class 8.

The lone circles found in the survey area don't tell us much about their purpose in terms of geographical location. Except, perhaps, for BFK LC 1, which is placed on the edge of a small cliff face with a good view down one of the major valleys in the landscape, on the same hill as the Group 4 sites. It is therefore possible that this site is related to the refugee sites, and functions as an observation post for the other sites.

Another type of structure in the region are long field walls. These follow along a contour line at the base of hills. It is unlikely that these walls are some kind of field terracing, related to agriculture. Mapping and examination of these walls bear this observation out. The walls themselves run in long (from 330 m to 130 m) stretches. They do not have connecting or adjacent walls that are present in agricultural terracing, and do not appear to form feasible terraces. They are not comparable to the dual walled cattle tracks that are seen in Mpumalanga. Whilst BFK FW 1 and BFK FW 2 occur on a gentle slope, BFK FW 3 and 4 are placed near the base of a much steeper slope, which would make access to any form of agricultural field troublesome. FW 1 and 2 are connected to the site BFK SWS 1, the Group 1b site, implying a relation to this site. All these walls are relatively low, usually between 1 m and 50 cm high, with little or no rock fall to indicate that they were once taller. As such, we can state

that these walls were most probably not of a defensive nature, as they are generally easy to climb over. After ruling out these possibilities, the next best interpretation of these walls is spatial demarcation, an extension of Mason's (1971) idea of walls enclosing cattle kraals. With quite a few large sites in a relatively small area, some kind of marker between neighbouring settlements may have been intended.

Taylor (1979:109) considers the hill sites of the Vredefort Dome to as an undesirable location for pre-colonial farmers. His conclusion was based on the data that in his survey zone, only Group 1 sites occurred in the hills, and so the hills must have offered a less desirable location than the open Potchefstroom plains, where all three site types occured. However, the density of sites as well as diversity of site types in this survey zone suggests that the hills indeed provided a desirable location. There is a lack of any Late Iron Age sites within the surveyed area of the Vaal River valley, which provides level ground near permanent water and close proximity to agricultural fields, suggesting some advantage to hill sites. Apart from the advantage offered in terms of a defensive position discussed earlier, there must have been other reasons for building here.

The potential of the hills for pasture is limited due to the sour nature of the local Bankenveld vegetation (Balkwill 2005). Today, the grazing potential of this area would be best in the summer months, as sour vegetation withdraws its nutrients as it approaches maturity (towards winter) making it unsuitable for grazing purposes (Ellery *et al*. 1995, Hardy 1999). This would have been less problematic in drier periods, as rainfall is a factor in the sourness of grass. The hills themselves are also particularly unsuited to agricultural activities, due to the poor soils that occur here, which are generally shallow, sandy, acidic and stony (Mulder *et al* 1974; Balkwill 2005). The local topography also limits the agricultural potential of the area, with many steep slopes that would require terracing to cultivate. If we consider the idea that some of the hill sites were cattle outposts, it is likely that they were only used in the summer months. The smallest site types (Group 1a) are a possible candidate for cattle posts while other site types are more complex and are unlikely to fall within this category. This follows the reasoning that whilst the larger/more complex sites have a larger livestock carry capacity, the relative complexity of these sites would require a larger amount of time and energy to construct that seems likely for a simple cattle post, which only requires a basic structure to be functional. Therefore we can speculate that there are more compelling reasons for building here.

Perhaps the largest advantage the hills offer is proximity and line of sight to potential agricultural areas. The pattern in this area generally involves a geographic dislocation between archaeological sites and agricultural fields, with sites elevated above fields on hills and outcrops (Nkhasi 2008). The lack of agricultural terracing, such as that found in Mpumalanga (see Delius & Schoeman 2008), suggests that this pattern holds true in the hills of the Dome. Two lower grindstones were uncovered during the survey, at sites BFK SWS 12 and BFK SWS 27. There are probably many more in the area, but would require substantial clearing of each site to find. As such, we can assume that there is the same dislocation from agricultural fields, and this presented no major disadvantage for these people. Possible reasons for choosing an elevated position over fields may be to maintain clear visibility over dispersed fields. This holds true for grazing areas, it would be possible to maintain visual control over dispersed herds of livestock from this elevated position, which would expand possible grazing range and minimise labour requirements for doing so.

Another possible explanation for the placement of SWS within the hills is metal working. The survey uncovered one furnace near (20 m away) BFK SWS 1. The only reason this furnace is visible is the severe erosion around it, exposing an edge to the surface. The furnace was initially surrounded by numerous chunks of slag as well as a tuyere. However, these items were unfortunately removed prior to the survey. The hills of the Vredefort dome are on the boundary of metal working areas, with none occurring south of the Vaal in the southern Highveld (Chirikure *et al* 2008). The Vredefort Dome falls on the boundary of this non metal producing region. There are two primary reasons why metal working doesn't occur in the Free State grasslands (Chirikure *et al* 2008). The first is the charcoal intensive nature of Iron Age smelting, which requires large amounts of wood to produce. The grasslands of the Free State don't have adequate supplies of wood. Iron Age people used cattle dung as fuel for everyday living, but this is inadequate for smelting (Chirikure *et al* 2008). The second reason is the scarcity of high quality iron and copper ore in the region. This treeless, ore poor region therefore relied on imported metals (Chirikure *et al* 2008).

The quartzite hills of the Vredefort Dome have both ore and wood. There is a greater abundance of trees within the hills of the Vredefort Dome, which are largely dependent on the specific geology of that particular area (Balkwill 2005). These indigenous forests tend to occur in valleys created by river ways, but give way to sparse grassy vegetation once clear of the valleys. Therefore there would be wood available for producing charcoal. The second factor is the availability of suitable ore for both iron (Waanders *et al* 2005) and to a lesser degree copper

(Jansen 1954; Clark 1972). A study on the slag nodules as well as Iron implements found in the area suggest a local source (within a few kilometres) for the iron ore used to produce local Iron implements (Waanders *et al* 2005). An archaeological study of iron implements from further south in the grasslands would tell us if these were produced by the same peoples and traded south.

Conclusion

To summarise, there are numerous different types of settlements within the hills of the Vredefort Dome. These settlements can be divided into different types based on various features involved in their construction. Based on several criteria, it is likely that these sites had different functions and/or their style of architecture changed through time. There are several disadvantages to this location from the strict agro/pastoralist point of view, but these are offset by other possible advantages such as increased security offered by the elevated position and rugged terrain, which would be required in the *Difaqane* period.

Future Directions for Continuing Research

There are a number of directions that this project can be taken forward in the future. The first of these is to expand the sample size of this project, mapping a larger portion of the Vredefort Dome. Whilst this has been done using aerial photography, it has been shown to be feasible using GPS technology, which would bypass problems of dense vegetation. Higher precision and future satellite technology such as DGPS, GLONASS, Galileo and Beidou will make this a more accurate exercise. This expanded dataset would eliminate the problem of a limited sample size that has occurred in this project, allowing for better spatial analysis (such as clustering) for more accurate speculation. This would also allow us to see if the typology stands up to a larger data set.

Another avenue of approach would be to conduct excavations on different site types in order to see if the perceived spatial differences translate into a difference in archaeological signatures. The hilly region of the Vredefort Dome has been rejected for excavations due to the poor deposits generally found here. Due to this factor, a goodly amount of testing (such as auger sampling, test pits etc.) would be required to find suitable sites for excavation. Excavations would be able to provide a more specific chronology through absolute dating techniques, and

determining functional variations between site types. Sites of interest are Group 4 sites, BFK SWS 17 (Mason Class 8) and a comparative study between Group 1a and Group 1c. Further study on metal types from surrounding regions (particularly in the southern grasslands), might allow us to see how far the iron (and copper) produced in this region travelled.

Finally, more advanced remote sensing techniques could be explored in order to address the vegetation problem experienced with initial aerial/satellite photograph surveys. High-resolution multiband satellite imagery offers different potential approaches to locating SWS. The initial problem of a high entry cost for these images from a commercial supplier could be mitigated via a partnership with the Council of Scientific and industrial Research (CSIR) satellite program (SumbandilaSat) which with a resolution of 6.25m per pixel, could potentially be suitable for such a study (CSIR 2011). Another remote sensing approach for the well funded would be to use LiDAR technology to scan the area. This high precision technology has been used in archaeology with varied success (e.g. Crow *et al.* 2007), which can help mitigate vegetation as well as provide a high precision DEM and land usage map.

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