

File Name: 1162.pdf

UNESCO Region: AFRICA

SITE NAME: Vredefort Dome

DATE OF INSCRIPTION: 15th July 2005

STATE PARTY: SOUTH AFRICA

CRITERIA: N (i)

DECISION OF THE WORLD HERITAGE COMMITTEE:

Excerpt from the Decisions of the 29th Session of the World Heritage Committee

Criterion (i): Vredefort Dome is the oldest, largest, and most deeply eroded complex meteorite impact structure in the world. It is the site of the world's greatest single, known energy release event. It contains high quality and accessible geological (outcrop) sites which demonstrate a range of geological evidences of a complex meteorite impact structure. The rural and natural landscapes of the serial property help portray the magnitude of the ring structures resulting from the impact. The serial nomination is considered to be a representative sample of a complex meteorite impact structure. A comprehensive comparative analysis with other complex meteorite impact structures demonstrated that it is the only example on earth providing a full geological profile of an astrobleme below the crater floor, thereby enabling research into the genesis and development of an astrobleme immediately post impact.

BRIEF DESCRIPTIONS

Vredefort Dome, approximately 120km south west of Johannesburg, is a representative part of a larger meteorite impact structure, or astrobleme. Dating back 2,023 million years, it is the oldest astrobleme found on earth so far. With a radius of 190km, it is also the largest and the most deeply eroded. Vredefort Dome bears witness to the world's greatest known single energy release event, which caused devastating global change, including, according to some scientists, major evolutionary changes. It provides critical evidence of the earth's geological history and is crucial to our understanding of the evolution of the planet. Despite their importance to the planet's history, geological activity on the earth's surface has led to the disappearance of evidence from most impact sites and Vredefort is the only example on earth to provide a full geological profile of an astrobleme below the crater floor.

1.b State, Province or Region: Northwest and Free State provinces

1.d Exact location: S26 52 00.0 E27 16 00.0

PROPOSAL:

VREDEFORT DOME

WORLD HERITAGE SITE

**FREE STATE PROVINCE
REPUBLIC OF SOUTH AFRICA**

**DEPARTMENT OF TOURISM, ENVIRONMENT AND
ECONOMIC AFFAIRS**

EXECUTIVE SUMMARY

The Vredefort Dome, in the Republic of South Africa, represents a unique geological phenomenon of international significance and is considered to qualify for listing, as set out in the "Operational Guidelines for Implementation of the World Heritage Convention" as a World Heritage Site. In addition to that, the area displays exceptional scenic beauty and is rich in biodiversity with remarkable animal and plant populations. Various cultural features also add to the conservation value of the area. As a result, the Vredefort Dome has an exceptional tourism potential, especially since it is situated approximately 100 km from the Johannesburg Metropolis and the Johannesburg International Airport.

In order to facilitate the listing of this phenomenon, it is proposed that a representative part of the structure, be demarcated for listing as a World Heritage Site.

Impact cratering is regarded as a fundamental geological process, affecting especially the inner planets of the solar system and their moons. These scars were caused by the impacts of meteorites, comets and asteroids from outer space. Not many impact craters are found on the surface of the earth (approximately 160). The Vredefort Dome represents the world's largest and the world's oldest impact crater (approximately 2 000-million years old). It also is the best recognisable and the easiest accessible structure of this kind. It still displays most of the features typical of impact structures. The Vredefort Astrobleme has now been universally recognised and described by numerous scientists of world stature over the last 60 years.

The Vredefort Structure qualifies for inscription in terms of the 'Operational Guidelines for the Implementation of the World Heritage Convention' (paragraph 43) as a 'natural feature consisting of physical ... formations ..., which are of outstanding universal value from the ... scientific point of view'.

Because of this unique geological phenomenon, an area has been created which is, ecologically speaking, unique and has unsurpassed beauty. The Dome is also unique in South Africa regarding its bird-, insect-, plant- and animal life, made possible by the diversity of very sensitive ecosystems and microhabitats in the area. The area is also rich in anthropological and archaeological heritage.

Although the area presently has no legal status yet, various instruments are available to ensure the integrity of the site. These include the Environmental Conservation Act, 1989 (Act No. 73 of 1989), the National Environmental Management Act, 1998 (Act No. 107 of 1998), the Minerals Act, 1991 (Act No. 50 of 1991), the Physical Planning Act, 1967 (Act No. 88 of 1967), the Subdivision of Agricultural Land Act, 1970 (Act No 70 of 1970), the Free State Township Ordinance, 1969 (Ord. No. 9 of 1969) and the Free State Nature Conservation Ordinance, 1969 (Ord. No. 8 of 1969). As soon as listing of the site as World Heritage Site is done, the World Heritage Convention Act, 1999 (Act No. 49 of 1999) also comes into effect.

The same area as proposed for listing as a World Heritage Site, was also proposed for listing as a National Heritage Site by the Department of Arts, Culture, Science and Technology in terms of the National Heritage Resources Act, 1999 (Act No. 25 of 1999). During December 2002 the South African National Heritage Resources Agency in principle decided to declare the demarcated area a National Heritage site in terms of Act 25 of 1999. The Act prescribes certain steps to be taken before an area can be declared a National Heritage site. These steps are in the process of being adhered to. The mentioned Act provides for protection pending the finalisation of the declaration of the area as a National Heritage site.

A preliminary strategic management and development plan for the area has been developed. This plan will be refined to ensure compliance with the World Heritage Convention Act of

South Africa and the World Heritage Convention. The initial financing of the initiative was, and is at present, by the Free State Province (Department of Tourism, Environment and Economic Affairs), whereas the Northwest Province made available funding for the development of a management plan. Other potential sources of financing have also been identified.

To ensure the long-term protection of this phenomenon and to optimise the tourism potential and viability of the area, it is suggested that a protected area (nature reserve) in multiple private ownership be developed, which will include the core area of the proposed World Heritage Site. The area will be managed in terms of the World Heritage Convention Act in close co-operation with the Dome Bergland Conservancy which represents private landowners.

INDEX

1	IDENTIFICATION OF THE PROPERTY	
	a Country	4
	b State, province or region	4
	c Name of property	4
	d Exact location on map and indication of geographical coordinates	4
	e Maps showing boundary of area proposed for inscription	4
	f Surface area of site proposed for inscription (ha)	5
2	JUSTIFICATION FOR INSCRIPTION	
	a Statement of significance	6
	b Possible comparative analysis	7
	c Authenticity / Integrity	8
	d Criteria under which inscription is proposed	8
3	DESCRIPTION	
	a Description of property	11
	b History and development	12
	c Form and date of most recent records of site	13
	d Present state of conservation	14
	e Policies and programmes related to the presentation and promotion of the property	14
4	MANAGEMENT	
	a Ownership	14
	b Legal status	16
	c Protective measures and means of implementing them	18
	d Agency with management authority	21
	e Level at which management is exercised and name and address of responsible person for contact purposes	22
	f Agreed plans related to property	23
	g Sources and levels of finance	24
	h Sources of expertise and training in conservation and management techniques	25
	i Visitors facilities and statistics	26
	j Site management plan and statement of objectives	27
	k Staffing levels	30
5	FACTORS AFFECTING THE SITE	
	a Development pressures	30
	b Environmental pressures	31
	c Natural disasters and preparedness	31

d	Visitor/ tourism pressures	31
e	Number of inhabitants within site	31
f	Other	32
6	MONITORING	
a	Key indicators for measuring state of conservation	32
b	Administrative arrangements for monitoring property	32
c	Results of previous reporting process	32
7	DOCUMENTATION	
a	Photographs and film/video	32
b	Copies of site management plans and other plans relevant to the site	33
c	Bibliography	34
d	Address where inventory, records and archives are held	37

PROPOSAL FOR LISTING THE VREDEFORT DOME AS A WORLD HERITAGE SITE

1. IDENTIFICATION OF THE PROPERTY

a Country:

Republic of South Africa

b State/province:

The proposed site extends across the boundary between the Northwest Province and the Free State Province.

c Name of property:

Vredefort Dome

d Exact location on map with geographical coordinates:

The proposed site is located in South Africa on the 1:50 000 South African Topocadastral Map Series on the maps:

2627CC Skandinawiedrif, and
2627CD Parys.

It is situated between 26° 56' and 26° 52' Southern Latitude, and between 27° 11' and 27° 26' Eastern Longitude.

"Thabela Thabeng", a river resort near the centre of the property, is situated at coordinates 26° 52' S and 27° 16' E.

e Maps/plans showing boundaries of proposed area:

See Appendix 1 for a map showing the boundaries of the area proposed for inscription.

f Surface area of site proposed for inscription:

The surface area of the land proposed for inscription is approximately 30 108 ha and is of high aesthetic value. It comprises mostly of agricultural land. In the last few years tourism has been growing in the area and many farms are converting to game farms and tourism. Due to the hugely positive interest from surrounding land owners who would like to be included in the proposed site, a buffer zone completely surrounding the proposed site of 14 422 ha has

been established. The total surface area for the site and buffer area comes to 44 530 ha. This will ensure adequate protection for the area. No formal towns exist in the area. The towns of Parys and Potchefstroom are nearby. This will assist to ensure that the demarcated area not be overdeveloped as proper infrastructure and tourism facilities exist in these towns.

Establishing of conservancies (a voluntary agreement amongst landowners to adhere to conservation principles) is being promoted. The Dome Bergland Conservancy already exists to which most of the landowners on the North West Province side of the demarcated area belong. Steps are being implemented to recruit landowners on the Free State side and the buffer zone. The development of a statutory guide plan for an area including, but extending beyond the boundaries of the proposed area, which will regulate development and land use in the area, is expected to be initiated in the near future.

2. JUSTIFICATION FOR INSCRIPTION

a Statement of significance

Impact cratering is now regarded to have been a fundamental geological process in the formation of especially, the inner planets of the solar system and their moons (Dence, 1972; Melosh, 1989, and authors mentioned therein). The surfaces of these bodies show the effects of impacts by meteorites, comets and asteroids. Not many impact craters are to be found on the surface of the earth, because much of the surface of our planet is covered by water and therefore exposed to the effects of erosion. The earth's impact record therefore consists mostly of recent craters, and a few old, but very large ones. Some of the impact events had an important effect on the evolution of life. About 65 million years ago, the impact of a large body from outer space formed an astrobleme ("star blemish;" Dietz, 1960) at Chicxulub, on the Yucatan Peninsula, Mexico (Alvarez et al., 1995). This crater and ring system is now buried below sediments and only geophysically visible. The impact caused an environmental disaster, entailing the extinction of the dinosaurs, but also heralding the ascent of the mammals (Alvarez et al., 1980; 1995). An evolutionary sequence was thus initiated, which culminated in the development of humans.

Other extinctions of species, but on a smaller scale, took place at about 35 million years ago, associated with two crater systems, Chesapeake Bay [North America, 80 km diameter] (Koeberl et al., 1996) and Popigai [Siberia, 100 Km] (Deutsch et al., 2000). The very largest astroblemes are classified as complex ring and crater systems (Smith and Sanchez, 1973; Melosh and McKinnon, 1978; Grieve and Pesonen, 1992; Melosh, 1995; Spray and Thompson, 1995; French, 1988). On the earth's surface, the three largest known are Chicxulub [180 Km, completely covered by sediments] (French, 1998), Sudbury, in Canada [originally about 200 Km, but deformed by later movement of the earth's crust and now almost unrecognisable even as an astrobleme] (Deutsch et al., 1995) and Vredefort, the world's largest [the furthest recognisable ring fault was found near Malmani in the North West Province, 195-200 Km from the centre, giving a diameter of about 400 Km] (Brink et al., 2000), and oldest [approximately 2 023 Ma] (Reimold and Gibson, 1996) known impact structure. Some of the structure has now been removed by 1 600 Ma of exposure to erosion, and a portion is buried under later sedimentary rocks of the Karoo Supergroup. However, it still displays most of the features typical of impact structures (French, 1998), and significantly, sufficient detail from which to decipher its evolution in the few seconds after impact (Brink et al., 1997; 2000). It is therefore of crucial importance to the understanding of the processes involved in the formation of astrobleme structures. Forming an integral part of the greater structure, the Vredefort Dome forms the central zone of the structure.

Its scenery is of great beauty, with excellent geological outcrops. Containing the gold and uranium mines of the Witwatersrand, the region surrounding the Dome in an arc from the northeast to the north, west and south is one of the most important in the world from an economic point of view (Reimold and Gibson, 1996). The arc of gold mines was preserved as an integral part of the greater Vredefort Structure, within the zone of folds and faults that comprise the outer rings of the structure. The Witwatersrand Supergroup was deposited about 900 Ma before the Vredefort event, and its upper surface was buried to a depth of more than 11 Km of subsequent sedimentation and lava flows. The impact event lifted these deeply buried auriferous beds to the surface. Had it not been for the impact, Witwatersrand gold would probably not have been discovered.

It has been argued that the anthropological history of South Africa could be indirectly linked to the catastrophic event. Recognisable crustal fractures formed weak zones in the dolomitic limestones of the Transvaal Supergroup, leading to the formation of caves (Brink et al., 2000), such as those found in the already proclaimed Sterkfontein World Heritage Site. These are the locations of important finds of hominid fossils. In a more modern sense, the Vredefort Dome is renowned for its archaeological (iron

age) and turn-of-the-century gold mining heritage. Early settler and Anglo-Boer War sites of interest are found in the area.

The Dome represents a significantly representative portion of the Vredefort Structure. Within the area, strata comprising the middle and upper zones of the earth's crust, developed over a period of more than 3 200 Ma, are exposed. All of the classical Vredefort-related characteristics of a large astrobleme are found within the area. These include the "shatter cone" phenomenon and associated striated joint surfaces (Nel, 1927; Dietz, 1961; Manton, 1962; 1965; Albat and Mayer, 1990); the shock-metamorphism-related lamellae found in quartz grains (Carter, 1965, 1968; Bohor et al., 1987; Reimold and Hörz, 1986; Alexopoulos et al., 1988; Carter et al., 1990; Grieve et al., 1990; Reimold, 1990; Leroux et al., 1994; and Kamo et al., 1995) and fluid inclusion trails along planar surfaces within quartz grains (Schreyer and Medenbach, 1981; Reimold, 1990); pseudotachylite (Shand, 1916; Nel, 1927; Bisschoff, 1962; Martini, 1978, 1991, 1992); rock types supposedly formed under extreme pressure, containing high pressure forms of quartz, such as coesite and stishovite, and a variety formed during or after pressure release; and intrusive rocks of basic granophyre (Hall and Molengraaff, 1925; Nel, 1927; Willemse, 1937; Bisschoff, 1962, 1992, 1996; Manton, 1962; Walraven et al., 1990; Kamo, 1995).

b Possible comparative analysis of similar sites

About 160 impact structures have been identified on the earth's surface (Deutsch et al., 2000). The three largest of these are Sudbury [200 Km] in Canada, Chicxulub [200 Km] in Mexico and Vredefort [approximately 400 Km] (Brink et al., 2000).

The remnant structure of Sudbury contains the original crater melt pool, now composed of various igneous rock types. Possibly the most important of these is quartz diorite, with an exploitable nickel, copper, platinum and other metal content. Because of its economic importance, the deposit was mined extensively, and many of its important characteristics were destroyed. The originally circular morphology of the structure was altered to a broken oval shape by subsequent tectonic movement of the earth's crust, thereby causing an endless controversy among geologists as to even whether the structure originally was an astrobleme.

Chicxulub lies buried under sediments and does not possess any recognisable surface expression at all.

To date, only one other large impact structure has been proclaimed a World Heritage Site, i.e. the Popigai Structure (35 Ma) in a remote part of northeastern Siberia (Deutsch et al., 2000). Possessing a diameter of 100 Km, Popigai is considerably smaller than Vredefort. Popigai was not subjected to the same erosional intensity as Vredefort. It is relatively young, and is probably the best preserved of the larger structures. Because it possesses a phenomenal quantity of diamonds, formed by the extreme pressures associated with impact, it was explored extensively by drilling and geophysical surveys. It is now regarded to be the type locality for impact-formed diamonds, but due to economic reasons, it cannot be exploited. Exploration has ceased more than a decade ago, due to the remote and inhospitable location, making new field studies virtually impossible. The area can presently only be accessed by helicopter.

Therefore, Popigai will never become an educational or tourism focal point.

Contrary to Popigai, Vredefort it is easily accessible and the natural heritage resources of the Vredefort Dome possesses great resources from the educational, scientific, recreational and tourism points of view. Although still largely pristine, it is located in the immediate vicinity of South Africa's economic heartland and this area is the home of some 16 million people.

c Authenticity / integrity

The Vredefort Astrobleme has now been universally recognised and described as such by numerous scientists of world stature (French, 1998, and authors mentioned therein; Reimold and Gibson, 1996, and authors mentioned therein). See attached bibliography. In a Ph. D. dissertation some 750 scientific publications on the Vredefort dome are mentioned.

d Criteria under which inscription is proposed

With reference to the UNESCO Document (WHC-97/2) entitled "Operational Guidelines for the Implementation of the World Heritage Convention," as issued by the National Department of Environmental Affairs and Tourism (February 1997), the following criteria are mentioned in paragraphs 43 and 44:

Paragraph 43 states: "natural features consisting of physical and biological formations or groups of such formations, which are of outstanding universal value from the aesthetic or scientific point of view;

geological and physiographical formations and precisely delineated area, which constitute the habitat of threatened species of animals and plants of outstanding universal value from the point of view of science or conservation;

natural sites or precisely delineated natural areas of outstanding universal value from the point of view of science, conservation or natural beauty".

(i) The Vredefort Structure – a natural geologic feature

A multi-ring structure (Smith and Sanchez, 1976; Melosh, 1978; French, 1998), centred around Vredefort, South Africa, is recognisable on maps compiled by the Council for Geosciences (1:250 000, West Rand Geological map, 1986) and on geophysical surveys (magnetic, gravity, vibroseis), described by authors such as Corner et al. (1986), Antoine et al. (1990) and Durrheim et al. (1991). The structure is also recognised to be the largest of these structures so far found on the surface of the earth (French, 1998). Impact structures are classified according to magnitude and complexity. The larger and most complex of these structures found on the inner planets and on the lunar surface are characterised by concentric ring systems that surround a central crater. Due to its age and exposure to more than 1 600 Ma of erosion, only the root remnant of the original Vredefort Structure is presently visible. Early discussions in literature referred only to the set of forms comprising the granitic core and the surrounding inner circle of hills, characterised by overturned strata, known as the Vredefort "Dome." However, it has subsequently been shown that the inner core and circle only constitute remnants of a still mapable, much larger, concentrically ringed structure (Reimold and Gibson, 1996; Brink et al., 2000b). Complex, multi-ring astroblemes are formed by the impacts of large bodies, such as asteroids or the cores of comets.

In the outer rings of large astroblemes, such as Vredefort, thrust faults are created when material is accelerated away from the point of impact (Brink et al., 2000a, b). Folds, distinguished from those of a "normal" compressional tectonic system by their concentric arrangement around the impact point, accompany the faults. As crustal material is driven away from the point of impact, thrust fault systems detach to move over the ramps provided by the impact ward-facing limbs of the anticlinal folds.

During the impact and the penetration of the earth's surface by the impactor, a first stage, transient crater is formed (Melosh, 1989; French, 1998). The walls of this first, temporary crater are unstable, and they immediately collapse inward. In the zone below the point of impact the strata are disrupted by the processes of spalling and the formation of impact breccias and melt breccias, shock structures such as shatter cones, megascopic shock planes and high pressure silica polymorphs (coesite and stishovite) are formed where the rocks are quartzitic. All of these features were recorded in the overturned collar strata of the inner ring and the granitoid core of the Vredefort Structure by the authors mentioned above. The collapse of the transient crater leads to the formation of a much wider, final crater, the shape of which may be modified by further isostatic uplift and erosion.

At Vredefort, nothing remains of the transient crater and the existence of the final crater is indicated only by centripetally-moving faults, such as the Potchefstroom Fault (Brink et al., 2000a) that were formed in its floor. However, even the remnant affords a unique opportunity for study of the exposed inner anatomy of an astrobleme, such as is not found anywhere else on earth. In the up- and overturned strata forming the inner ring, faults of pre-Vredefort Event age are exposed in section, thereby affording a key to the understanding of the evolution of these systems, which is extremely important in understanding the structural geology involved in the exploration for gold. In scientific publications, theories have been proposed that link the distribution of gold in the Witwatersrand Supergroup to the Vredefort Event (Reimold and Gibson, 1996). It is therefore important that the system must remain preserved and available for research.

The relationship between Vredefort-related thrust faulting and dolomitic cave formation, mentioned by Brink et al. (2000b) is interesting. Many of the caves of palaeo-anthropological importance are distributed in a zone around Sterkfontein and Kromdraai (already listed as a World heritage Site) west of Johannesburg, South Africa. Southward, the relationship is also seen in the dolomitic rocks overlying thrust faults in the Gatsrand between Potchefstroom and Carletonville, around Lindequesdrif north of Parys, and also along the Vaal River, in the area immediately west of the Dome. All of these are found in the dolomite, stratigraphically known as the Malmani Subgroup of the Transvaal Supergroup. Caves and other Karst characteristics developed in the nappes overlying the broken ramp zones of the thrust faults formed during the Vredefort Event. The connection between cave formation and nappes is too obvious to be fortuitous. The Vredefort Event may thus have been ultimately responsible for the formation of the caves in which our ancestors found their dwellings.

Of further interest is that the age of the impact event (about 2 000 Ma ago) coincides with that of the transition between prokaryotic and eukaryotic life forms (de Duve, 1994), indicating an evolutionary change similar to Vredefort and other large impact events. In causing the extinction of the dinosaurs, the impact event associated with Chicxulub in the Yucatan Peninsula heralded the change from predominantly Saurian to Mamalian forms of life (Alvarez et al., 1980, 1995).

(ii) The Vredefort Event – an outstanding moment in the earth's history

The Vredefort Impact Event happened near the end of the great accretionary period of the planets of the solar system (Glikson, 1993), when planets were built from the accretion of dust and rubble and ice revolving around the sun. Obviously, the coming together of this material entailed impacting, leaving the multitude of craters still visible on the surfaces of the planets situated closer to the sun, that are not covered by water or frozen gases. The earth can be

classified as being situated near the middle of this system, and its surface is partly covered by water. Most of the craters formed on its surface were therefore obliterated by erosion, or are now covered by subsequently deposited sediments. The processes of accretionary bombardment and the existence of ancient astroblemes, such as Vredefort, have only lately been recognised (French, 1990). According to estimates, more than 200 impact basins of greater than 200 km in diameter must have formed during the early stages of the world's creation. Having left the largest of the preserved astroblemes, the Vredefort impact must be regarded as representing probably the largest recorded episode of explosive energy release on the earth's surface. Obviously, all of the effects are not known yet, and the structure remains one of the greatest sources of future research and, hopefully, knowledge.

(iii) The Vredefort Structure – outstanding worth from a scientific point of view

Since the beginning of the 1900's, numerous international and local earth scientists have studied various aspects of the Vredefort Structure. In 1925, two geologists, Hall and Molengraaff stated: "To anyone occupying a suitable point within the central Vredefort granite, the grand simplicity of design at once suggests a correspondingly broad simplicity in the major cause." Noting the similar ring-like features displayed by the craters on the moon, Boon and Albritton (1937) suggested that the Vredefort Structure was the scar of an ancient meteorite impact. Since it was scientifically described for the first time, the literature on the structure has become voluminous.

The structure of Vredefort is fortuitously situated within the boundaries of the Central Rand Group of the Witwatersrand Supergroup, which is the greatest single gold deposit in the world. Since the discovery of the Witwatersrand around 1886, the greater Vredefort structure and the Dome area has been subjected to the search for new mineable areas on an intensive scale. This also entailed the drilling of hundreds of boreholes into the structure, as well as the obtaining of numerous geophysical profiles (Brink et al., 1997). It can be claimed that the Vredefort Structure is the best known and explored of all of the large astroblemes on earth. As their economic importance to various mining companies wanes, the results of all of this activity are only now becoming available to earth scientists doing research on the Vredefort Structure.

The structure has long been the focus of geological congresses, of which two of the more important ones may be mentioned. In 1987, an international workshop was held in Parys, South Africa, attended by earth scientists from over the world. The subject of the workshop was the so-called crypto-explosion structures that were then in the process of being found on the earth's surface in increasing numbers, with a special focus on the Vredefort Structure. During July 1999, the 62nd Annual Meteoritical Society Congress was held in Johannesburg, South Africa. A substantial part of this congress was devoted to the Vredefort Structure, with several excursions to the Dome, and numerous papers read on aspects of its formation and place in the realm of known impact sites. It is becoming obvious that, because of the superlative exposure of structural aspects, the Vredefort Structure must be considered as of outstanding universal scientific value.

3. DESCRIPTION

a Description of property

As it was indicated (paragraph 2 b), the entire Vredefort structure has a cross-section of 400 km, rendering it impossible to impose protection and management measures to include the entire structure. The reason for this being that a significant portion of three provinces would be included, as would some of the most densely populated and most industrialised areas in the country. Furthermore, the parts of the structure covered by sedimentary material are not visible and does not justify any measures being taken for conservation and management.

Considering the practicalities involved, it is proposed that the so-called Vredefort Dome, which represents a significantly representative portion of the Vredefort, structure, being taken as the point of departure. This represents the most conspicuous above ground and visible part of the structure, including a portion of the central granite core and the northwestern portion of the first concentric ring around the core, known as the Vredefort Hills. The Vaal River, forming the boundary between the Free State Province and the Northwest Province, bisects the Vredefort Hills.

The designated area proposed for inscription as World Heritage Site, is situated within the central part of the Vredefort Structure, covering a part of the central granite core and a considerable portion of the north-western part of the surrounding, concentric ring or 'collar' of overturned strata. The area was decided upon since it can easily be designated, by means of secondary provincial roads bordering the proposed site. This area extends over some 150 privately owned properties (farms) of which 89, covering a surface area of 18 857 ha, are situated in the Northwest Province and 57, covering 11 251 ha, are situated in the Free State Province. The total area proposed for listing as a world heritage site comprises 30 108 ha. The possibility exists for the extension of the area in the future and this should be kept in mind.

A number of sites have been identified where very specific characteristics of the "crater event" are illustrated magnificently. These sites, unfortunately, are situated outside the designated area of the proposed World Heritage Site. These sites are of exceptional scientific value and measures for their protection will be considered at a later stage. Currently these sites are situated in the buffer area surrounding the proposed world heritage site. Special measures are being considered to protect these isolated sites which consist mostly of isolated rocks that provide proof of the impact theory.

Because of this unique geological phenomenon, an area has been created which is, ecological speaking, unique and has unsurpassed beauty. The steepest natural gradient of the Vaal River is found where it courses through the Vredefort Hills, giving rise to the formation of many rapids, irregular stream patterns and islands, adding to the variety of habitats. The Dome is also unique in South Africa regarding its bird-, insect-, plant and animal life, made possible by the diversity of very sensitive ecosystems and microhabitats in the area. Because of its geology, fauna and flora, this area was already in 1984 identified by the National Parks Board of South Africa, managing a series of National Parks of which Kruger National Park is the best known internationally, as a possible site to establish a National Park and a comprehensive study was done in this regard. However, because of the exorbitant cost of acquiring the land, the project was shelved.

The unique geological structure of the Dome brought about a diversity of microhabitats and microclimates ensuring plant communities, which are exceptional and unique in South Africa. At least 99 plant species have been recorded from this area, but a complete floral checklist of the Dome does not exist. Valleys between the hills are well wooded and unspoilt, with springs and streams found in virtually all of

them. Even typical bushveld (a biome situated hundreds of kilometres to the northeast) trees, such as Bush willow species (*Combretum* spp.) and Red Ivory (*Berchemia zeyheri*) are found here, which are only found elsewhere some hundreds of kilometres away from this area. This also is the case with plant species such as the Tree Fern (*Cyathea dregei*), which occur in the many ravines in the area. Thick stands of Wild Olive trees (*Olea europaea* subsp. *africana*) are found on the koppies. The vegetation consists of grassveld, Bankenveld, riverine bush and specific vegetation types occurring on the pediment, summit, and a variety of slope types and in valleys. Numerous scientific studies of the vegetation of parts of the Dome area have been conducted. The Dome area is renowned for its bird life, also due to the diversity of habitats. In literature, it is indicated as an exceptional area for birding, which is foreseeable with more than 200 bird species to be found (Appendix 2). Approximately 50 species of small mammals, including eight "Red Data Species" of which one is endemic, can be found in the area (Appendix 2). Many game and other animal species, which occurred in the area, have disappeared as a result of farming activities, but there is evidence that even the "big five" (being African elephant, lion, leopard, African buffalo and the white rhinoceros) had occurred in the Dome (Appendix 2). Studies by entomologists have also indicated that unique and rare species occur in this area, but further research is still needed. It is known that more butterfly species occur in the Vredefort Hills than in the whole of the British Isles.

The Dome is also renowned in academic circles as an area, which is rich in anthropological and archaeological heritage. Many Stone Age caves exist, where skulls and tools have been found. An exceptional unique terrain, known as the "Askoppies" is at present being researched by academics, adjacent to the site. The "Askoppies" Iron Age site is a large settlement site consisting of extensive stonewalling, including cattle enclosures and huts. As the name suggests, one of the main features of the site is the large number of ash middens, some of which are huge and contain deep deposits of cultural material. Examples of rock art and Stone Age tools are found in the area, including rock art left behind by the Khoi-San (believed to be of the early inhabitants of the area). Different types of ruins left behind by other early inhabitants of the area are present, apparently representative of Sotho and Tswana speaking cultures (indigenous ethnic groups), as well as a period of interaction between the two.

A treasure of remnants from settlements during the nineteenth century exists, which needs further study. The area also is rich in history with regard to the early white settlement and the Anglo Boer War (a three-year war against Britain for independence at the turn of the previous century). Gold prospecting occurred in the area around 1888, but mining activities ceased during the 1920's as a result of the low gold content of the ore.

The designated area predominantly is utilised for agricultural purposes. In the Vredefort Hills, extensive grazing practices dominate, with scattered cultivated lands in the valleys and along the Vaal River. This however being a marginal farming area, cultivation is decreasing rapidly and the emphasis is rapidly moving towards tourism-orientated activities based on the scenic beauty of the area. The land situated on the granite core of the Vredefort structure, has a rolling topography, consisting of scattered, low granite "koppies" between intensively cultivated lands on deep sandy soils where maize predominantly is produced.

b History and development

Impact cratering has been a fundamental, if not the most important process in the Solar System. The effects of large comet, asteroid, and meteorite impacts on planetary surfaces since formation of the planets are obvious on every solid body in the Solar System.

Only Earth seems to have a limited impact crater record. However, impact of interterrestrial matter did leave its mark on Earth, and not only on solid matter. Evolution of life has been, at least once but probably repeatedly over the last 500 million years, been disrupted by catastrophic impact events.

What we see at present of the Vredefort Structure, are the eroded "roots" of this structure at a level approximately 17 km below the point of the original impact. The greater part of the structure had been removed by erosion taking place over 1 600 Ma, whereas a portion is buried under later sedimentary rocks of the Karoo Supergroup. The impact scar we see today measures approximately 140 km across and magnificently displays a variety of shock-induced features, which were recorded in the upturned collar strata, and the granitic gneiss core of the structure. Two surrounding concentric rings with diameter of approximately 160 km can also be observed. Nothing of the meteorite remained and the only information is the projection of the size of the original crater, which is estimated at approximately 90 km in diameter and more than 20 km in depth. Following American speculations, one might conceive a subject with a diameter of 4 to 5, or even up to 10 km in diameter striking the earth with a velocity of 30 km per second (108 000 km/hour).

On impact, a transitional crater is formed, which almost immediately is filled up by material falling from the steep sides. By this process, the diameter of the crater becomes enlarged. The thinner (and consequently lighter) crust of the earth at this point, becomes uplifted over a long period, floating higher on the heavier mantle material underneath the original crater. In the process when the crater is formed, immediately after impact, concentric rings are formed around the crater.

The event took place before the continents, as we know it today, moved apart. Life on earth at that stage probably was confined to the most primitive forms, being stromatolite-building bacteria, and no great extinction was recorded. Stromatolites survived this catastrophe, as well as other "great extinctions" and can still be found today. This most probably was because they were widespread, living under a protective layer of water. Free oxygen only appeared probably during the following 600 Ma, to which the primitive organisms had to adapt. Multi-cellular life appeared only about 600 to 700 Ma ago. It can be speculated that the appearance of eukaryotic life forms after this impact, might be analogous to the emergence of mammals after the Chixculub impact some 60 Ma ago.

It has been argued that the anthropological history of South Africa could be indirectly linked to the catastrophic event. Recognisable crustal fractures formed weak zones in the dolomitic limestones of the Transvaal Supergroup, leading to the formation of caves (Brink et al., 2000), such as those found in the already proclaimed Sterkfontein World Heritage Site. These are the locations of important finds of hominid fossils.

In a more modern sense, the Vredefort Dome is renowned for its archaeological (iron age) and turn-of-the-century gold mining heritage. Ultimately, the modern history is linked to the landforms existing in this region, which, of course, are a consequence of the impact event. Early settler and Anglo-Boer War sites of interest are also found in the area. In the relict town of Venterskroon a rich cultural heritage is maintained in the form of the distilling of "witblits", a highly potent, locally brewed, alcoholic beverage, as well as the traditional making of soap and producing of home made candles, etc.

c Form and date of most recent records of site

Scientific and popular literature on the different aspects of the Vredefort Dome is voluminous (please refer to the bibliography). According to Ph.D. dissertation analysing the scientific literature on the Vredefort structure, some 750 scientific documents were produced. The area still remains the theme of research by various

institutions, universities, mine-houses and individual scientists with topics ranging from mineral mining to anthropology, hydrology, the origins of the structure, aspects of biodiversity, etc. Please refer to the bibliography.

d Present state of conservation

Since the major features of the proposed site are related to the landscape and geological characteristics of the area, this can broadly be considered to be intact. Minor disturbances, which can be identified, include the turn-of-the-century gold mining, actually adding to the romantic qualities of the area. The recent mining for "granite" fortunately can mainly be found outside the demarcated area.

The biodiversity of the area has been influenced by agricultural practices, which mainly was limited to extensive grazing and to a lesser degree the cultivation of crops in low-lying parts of the area. This resulted in the disappearance of the indigenous large mammals since conflicts with the agricultural activities developed. Although influenced by the agricultural activities, the diversity and uniqueness of the vegetation was maintained and it can be considered to be in a good and well-conserved condition. Although no complete checklist of plants exists, it is known that 99 plant species have been recorded in a part of the area. The small mammal populations, avifauna and invertebrate populations are however believed to be less influenced and remaining in a relatively well-conserved condition, as illustrated by the exceptional diversity presently still in existence. Approximately 50 species of small mammals should be encountered, including 8 species appearing in the "Red Data List". The area is considered to be an excellent "birding area" where more than 200 bird species could be seen. Please refer to Appendix 2. Little is known about the invertebrates of the area, although it is known that more butterfly species occur here than in the whole of the British Isles.

The moving of activities towards a more ecotourism orientated approach, also created a greater awareness of the natural features and natural biota and the importance thereof, and this awareness is increasing. Landowners have also expressed interest in the reintroduction of at least some of the larger game animals, which disappeared from the area.

It should also be noted that more than eighty percent of the 18 800 ha of the land situated in the Northwest Province is included in the "Dome Bergland Conservancy", which represents a voluntary agreement between the landowners to adhere to conservation principles in the management of their activities. Although not providing any legal status, this illustrates the commitment of the landowners to the cause and ensures the protection of the natural phenomena. Efforts are on its way to either establish conservancies in the part of the area situated in the Free State Province or to convince the landowners to join the Dome Bergland Conservancy.. An official had been seconded to the area and will be moved there permanently in future. His sole duty is to unite landowners in a conservancy that already exists on the Northwest side.

e Policies and programmes related to the presentation and promotion of the property

Since this area received no formal recognition in the past, except in scientific circles, no formal interpretation activities to present the area exists. It however should be noted that the structure has long been the focus of scientific proceedings. In 1987, an international workshop took place at Parys (South Africa), a town adjacent to the presently proposed area, which was attended by earth scientists from over the world. The subject of the workshop was the so-called crypto-explosion structures that were then in the process of being found on the earth's surface in increasing numbers, with a special focus on the Vredefort Structure. During July 1999, the 62nd Annual

Meteoritical Society Congress in Johannesburg (South Africa), a substantial part of the proceedings was devoted to the Vredefort Structure, with several excursions to the Dome, and numerous papers read on aspects of its formation and place in the realm of known impact sites.

On an informal basis, attention is focussed on the area during youth camps, of which several are hosted in the area annually. Many interest groups, such as hiking clubs and bird clubs utilise the area extensively, promoting an increasing awareness of the features of the structure. Some of the landowners in the area who are involved in ecotourism have some exhibition in their reception areas, showing some of the interesting facts and features of the structure. In their marketing campaigns they also highlight features of the area.

The strategic management and development plan for the area has been completed and broadly defines policy for the area. Negotiations between the provinces are currently underway to expand on this broad policy guidelines by developing detailed plans policies and guidelines for the management of the area. It is believed to be inevitable that an interpretation centre, as well as educational facilities will have to be incorporated in the future plans of the area. This especially is the case since the area will have to rely strongly on tourism and the promotion of the area as a tourism destination, will be based on the unique features of the structure.

The cultural aspect of the proposed area is also receiving attention with funding secured during the last quarter of 2003 to undertake a cultural study early in 2004 that will culminate in a development and management plan for the cultural aspect of the area. A decision in principal, to declare the area as a National Heritage Site, had already been taken by the Board of the South African Heritage Resource Agency (SAHRA) in December 2002 on condition that such a cultural study being done.

4. MANAGEMENT

a) Ownership:

Both the demarcated areas forming the core of the proposed site as well as the buffer zone consists of mostly agricultural land, which is mostly privately owned and consists in total 146 farms, of which 89 are situated in the Northwest Province and 57 in the Free State Province.. Approximately 600 hectares are state owned. The individual owners all have title deeds to their property. A list of land owners appear as appendix 3 to the application. Based on the postal addresses of the landowners, it appears as if 45% of the landowners are living permanently in the area, whereas 55% live elsewhere and visit their properties periodically. This tendency however differs considerably between the portions of the area situated in the two provinces. In the portion situated in the Free State Province, approximately 60% of the landowners live on their properties, with 40% living elsewhere, whereas in the portion of the area situated in the Northwest Province approximately 35% of the landowners live in the area and 65% live elsewhere. It also is interesting to note that the average surface area of the properties of individual landowners in the portion of the proposed site situated in the Northwest Province is approximately 175 ha, ranging from 0,5 ha to 950 ha.

Their ownership however is not unlimited and they are all subject to the limitations imposed by legislation. In this regard the following legislation is *inter alia* applicable: The World Heritage Convention Act 49 of 1999; the National Heritage Resources Act 25 of 1999; the National Environmental Managements Act 107 of 1998 and the Physical Planning Act 88 of 1967. All of the above are national legislation enacted by national government. Copies of the above Acts, together with short summaries of the content thereof are attached hereto as appendix 7a to 7d.

On a provincial level both the Northwest and Free State Provinces, in which the area and buffer area fall have applicable nature conservation ordinances regulating environmental aspects of the area. On local government level the demarcated area falls within the municipal areas of Potchefstroom in the Northwest Province and Parys in the Free State Province. Both these town councils have the necessary by-laws to regulate the area.

Should the area be declared a World Heritage site, the ownership of the land will remain unchanged. The ownership will however be subject to in particular the provisions of the the World Heritage Convention Act 49 of 1999.

b) Legal status:

The private owners of land in the Northwest Province part of the demarcated area have already in 1997 constituted a Conservancy for the area. This was done by means of a voluntary association with legal personality. The main objects of the Conservancy is to convert the area into a co-operation nature reserve and conserve the geological, cultural, ecological and similar unique aspects of the area. During the Conservancy's Annual General Meeting held on 2 August 2003 it was decided to convert the Conservancy into a section 21 Company in terms of the Company's Act 61 of 1973. Such a company is a company incorporated not for gain. This company is open for all owners of immovable property in the demarcated area, including the area in the Free State Province. A copy of the company's articles of association and statutes are attached hereto marked Appendix "7e". Once again the company's objectives are to conserve the area, including the geological, cultural and other important aspects of the area and to convert it in a cooperation nature reserve.

In terms of the Local Government: Municipal Systems Act 32 of 2000 South Africa has so-called wall-to-wall Local Government. This means that the Local Town Councils of the municipal areas in which the demarcated area are situated can promulgate by-laws to ensure the protection of the area. The private ownership of the demarcated area is therefore subject to the provisions of the mentioned act and can the relevant municipal authorities exercise jurisdiction over the demarcated area. In the spatial development plans for the relevant local authorities the demarcated area has already been identified as an area to be protected because of its unique geology.

During December 2002 the South African National Heritage Resources Agency in principle decided to declare the demarcated area a National Heritage site in terms of Act 25 of 1999. The Act prescribes certain steps to be taken before an area can be declared a National Heritage site. These steps are in the process of being adhered to. The mentioned Act provides for protection pending the finalisation of the declaration of the area as a National Heritage site.

Should the nomination of the area as a World Heritage site be accepted by Unesco, it would be declared as such in terms of the World Heritage Convention Act 49 of 1999. The management will be done in terms of the provisions of the act in close co-operation with the land owners and the Dome Bergland Conservancy. This Act will have the following implications for the area:

- An Authority will be established for the area in terms of sec 9 of the Act to manage the area.
- The Authority will have to prepare and implement an integrated management plan for the World Heritage Site under its control to fulfil Articles 4 and 5 of the Convention. It will have to conduct its affairs in accordance with an

integrated management plan and will have to have due regard for, and seek to integrate and harmonise that integrated management plan with the requirements of the Convention and the Operational Guidelines, and with applicable

- (a) plans in terms of the National Environmental Management Act, 1998, the National Heritage Resources Act, 1999, the Cultural Institutions Act, 1998 (Act No. 119 of 1998), the Development Facilitation Act, 1995, and the National Parks Act, 1976 (Act No. 57 of 1976);
- (b) provincial government planning and development plans;
- (c) regional planning and development plans;
- (d) local government planning and development plans; and
- (e) existing planning and development plans of an existing organ of state

- The object of every integrated management plan is to ensure the protection and management of the World Heritage Site concerned in a manner that is consistent with the objectives and principles of this Act. In addition to the requirements of the Convention, the Operational Guidelines and the directives of the Minister, every integrated management plan must contain, at least—
 - (a) a co-ordinated policy framework;
 - (b) such planning measures, controls and performance criteria as may be prescribed;
 - (c) a programme for the implementation of the plan;
 - (d) procedures for public participation;
 - (e) procedures for participation by nature conservation, tourism and other relevant experts;
 - (f) cultural or nature conservation components required by—
 - (i) applicable law; and
 - (ii) the directives of the Minister;
 - (g) provisions regarding the—
 - (i) activities allowed within a particular geographical area;
 - (ii) terms and conditions for conducting activities;
 - (iii) prohibition of activities prescribed by the Minister;
 - (iv) control over the frequency, size, impact or manner of conducting activities in a particular geographical area, including without limitation, the use of, or access to, structures;
 - (v) a description of the World Heritage Site concerned, an assessment of its significance and an evaluation of material threats to its significance; and
 - (vi) alienation, lease or encumbrance of movable and immovable property referred to in section 13 (1) (j) in accordance with this Act, if applicable.
- An Authority must submit its first integrated management plan to the Minister for approval within six months of the establishment of that Authority or such later date set by the Minister.
- The World Heritage Site must be managed as prescribed pending the approval by the Minister of the integrated management plan.
- An integrated management plan becomes effective once approved by the Minister.
- Subject to applicable law, an Authority may receive and raise monies from any legal source, as the Minister may prescribe with the concurrence of the Minister of Finance, including—
 - (a) contract for goods and services;
 - (b) loan;
 - (c) donor funding from inside or outside the Republic;
 - (d) interest;
 - (e) joint venture income;

- (f) fees, including, without limitation, fees related to—
- (i) turnover;
- (ii) rights granted by an Authority; or
- (iii) services provided by an Authority;
- (g) sale income;
- (h) income from the development or leasing of its assets;
- (i) subsidies from any organ of state; or
- (j) appropriation by Parliament or a provincial legislature.

c) Protective measures and means of implementing it:

The protective measures regarding the demarcated area can be divided in the measures prior to the declaration of the area as a World Heritage site and the protective measures applicable thereafter.

Prior to the formal declaration of the demarcated area as a World Heritage the provisions of the National Environmental Management Act 107 of 1998 protect the area. This Act provides for co-operative environmental governance and establishes principles for decision-making on matters affecting the environment, institutions that promote cooperative governments and procedures for coordinating environmental functions exercised by organs of state and to provide for the prohibition, restriction or control of activities, which are likely to have a detrimental effect on the environment. The national environmental management principles is set out in Chapter 1 (section 2) of the Act. In terms of section 11 of the Act all provinces and all local authorities are obliged to prepare an environmental implementation plan for the area under their jurisdiction. Both the provincial provinces departments of environmental affairs as well as the local authorities within who's jurisdiction the demarcated area falls are taking into account the possibility of the declaration of the area as a World Heritage site in the development of their mentioned plans. The demarcated area as present consists primarily of agricultural land. Should any change of land use be necessary, the necessary permission has to be granted by the relevant authorities including the provincial departments of Environmental Affairs. Should there therefore be any proposed activities to the detriment of the demarcated area the provincial departments of Environmental Affairs will be able to prevent such changes of land use in terms of the National Environmental Management Act.

The National Heritage Resources Act 25 of 1999 also provides for the protection and management of heritage resources in Chapter 2 thereof. At this stage the demarcated area, in principle, has been accepted as a National Heritage site. The necessary protection and management of the heritage resources is the duty of SAHRA, which is a state, body and funded by the State. Before the area is formally declared a National Heritage site the prerequisites of the Act, *inter alia* giving notice to all landowners, consultation with all affected and interested parties and similar actions need to be adhered to.

SAHRA has the authority to, by notice in the government gazette, provisionally protect for a maximum period of 2 (two) years any area as a heritage resource if the need arise as provided in section 29 thereof.

All the abovementioned institutions are state bodies and funded by the state and operate within a budget, which is revised every year. The abovementioned state organs do have the manpower and capacity to enforce the applicable legislation.

As soon as the area is declared a National Heritage site it will fall under the authority of SAHRA, which will have the duty to manage the area in accordance with the provisions of the Act. In terms of section 9 all branches of the State and supported bodies must give SAHRA such assistance in the performance of its functions as is reasonably practical. In terms of the same section each State Department and

supported body must maintain and conserve the heritage resources under its control in accordance with the standards and procedures set out in the regulations by SAHRA, submit annually to SAHRA a report on the maintenance and development of such resources, and on the request of the Minister and in accordance with regulations prepare management plans for specified heritage resources. The same section also provides that the title deeds of the property that fall within an area declared a National Heritage site must be endorsed with the particulars thereof.

SAHRA is funded by National Government, do have permanent staff and has the power to obtain assistance from all State Departments to enable it to fulfill its functions.

The Environmental Conservation Act, 1989 (Act No.73 of 1989) is aimed at managing negative impacts on the environment. Activities, which might impact negatively on the environment, have been listed and it is required from prospective developers to conduct environmental impact assessments and to develop environmental management plans, which also include extensive public participation processes. Any prospective development, which might impact negatively on the site, consequently would be identified beforehand and could be managed according to the powers provided for in the Act. Since this is a national act, it is applicable on the areas situated in both the Northwest Province and the Free State Province. The act is implemented at provincial level, but in order to coordinate the implementation thereof in the area, it has been agreed that any applications received in the Northwest Province will be referred to the Free State Province before issuing any permit.

The Physical Planning Act, 1967 (Act No. 88 of 1967) regulates any development not considered to be an agricultural activity. This national Act is enforced at provincial level, and in the Free State the Department of Local Government and Housing is the responsible organ of state. Good co-operation between the relevant departments ensures that any prospective developments are referred to the environmental departments before any permit for development is issued in the area of the Vredefort Dome. Township development is regulated in the Free State by the Township Ordinance, 1969 (Ord. No. 9 of 1969) also enforced by the Department of Local Government and Housing and by close inter-departmental co-operation, this kind of development in the area is managed. Although enforced by the national Department of Agriculture, the Subdivision of Agricultural Land Act, 1970 (Act No. 70 of 1970) provides that any application for subdivision of agricultural land for any non-agricultural purpose, be referred to the provincial Department of Local Government and Housing before any permit may be issued.

The existing Nature Conservation Ordinance, 1969 (Ord. No.8 of 1968) for the Free State provides for the protection of indigenous fauna and flora and also regulates the import of invasive exotic species. This legislation however, is in the process of being revised. Although this legislation is only applicable to the area situated in the Free State, very much the same situation applies to the area situated in the Northwest Province.

Any application for mining is regulated by the Minerals Act, 1991 (Act No. 50 of 1991). This Act requires an extensive application process in which environmental matters have to be addressed thoroughly. The Department of Minerals and Energy is enforcing this legislation and has been made aware of the application for listing this area as a World heritage Site.

An informal measure providing some protection to a portion of the area situated in the Northwest Province is the fact that this area constitutes the Dome Bergland Conservancy. The conservancy concept comprise of a voluntary mutual agreement between the landowners involved to adhere to conservation principles in their agricultural and other activities in the area. Although informal in nature, this kind of association has considerable credibility and negotiating powers. Such a representative body also facilitates negotiations with landowners. Attempts are being

made to establish conservancies in the Free State portion of the area as well or to join the Dome Bergland Conservancy..

After the declaration of the area as a World Heritage site the provisions of the World Heritage Convention Act 49 of 1999 will apply to this area. In terms of the Act the Minister will either declare an existing organ of state as an authority under the Act (section 8) or establish a new authority by notice in the government gazette (section 9). In this instance as no existing authority exists which solely deals with the management of the area a new authority for the area will be established by the Minister in terms of section 9 of the Act. This authority will exercise its powers and duties through a board or an executive staff component or both as determined by the Minister.

The powers and duties of such an authority is set out in section 13 of the Act *inter alia* all the necessary rights to implement the World Heritage Site Convention, including to ensure the protection, conservation, presentation and transmission of the cultural and natural heritage for future generations and to ensure that effective and active measures are taken for the effective protection, conservation and presentation of the cultural and natural heritage. Such an authority also has the power to obtain funds, to employ people or entities on a permanent or temporary basis and to make rules in connection with the World Heritage site under its jurisdiction.

In terms of section 21 of the Act every authority must prepare and implement an integrated management plan for the World Heritage site under its control to fulfill articles 4 and 5 of the Convention. Such an authority must then conduct its affairs in accordance with an integrated management plan. Such integrated management plan has to be harmonized with the necessary legislation as well as provincial, regional and local government development plans. The object of such an integrated management plan is to ensure the protection and management of the World Heritage site concerned in a manner that is consistent with the objectives and principles of the Act.

Section 24 of the Act sets out the contents of the integrated management plan. Section 25 provides that such an authority must submit its first integrated management plans to the Minister for approval within 6 (six) months of the establishment of that authority.

Chapter 6 of the Act provides for finances including allocation by parliament or the provincial legislature. In terms of section 36 an annual financial plan must be submitted to the Minister for approval in which it is set out and explained the proposed operations, projects, activities and other objectives of the authority.

In terms of section 37 a strategic 5 (five) year plan must be submitted to the Minister within 30 (thirty) days before the end of its financial year.

The necessary legislation, funding and expertise are available in the state to ensure that the objects of the World Heritage Convention are realized.

The protective measures are contained in the following Acts: the World Heritage Convention Act 49 of 1999; the National Heritage Resources Act 25 of 1999; the National Environmental Management Act 107 of 1998; the Physical Planning Act 88 of 1967 and the Local Government: Municipal Systems Act 32 of 2000.

d) Agencies with management authority:

Within the broader framework of national, provincial and local legislation, the demarcated area is at present managed on a voluntary basis by the Dome Bergland Conservancy, which will soon be converted into a section 21 Company.

The area is at present indirectly managed by the provisions of the National Environmental Management Act, which is the responsibility of the departments of nature conservation of the Free State and Northwest Provinces, as well as the Physical Planning Act and Local Government Municipal Systems Act which is the responsibility of the local governments of the municipal areas in which the demarcated area falls. In terms of the Physical Planning Act 125 of 1991 the Republic of South Africa is divided into regions to promote the physical development of the country by means of national development plans, regional development plans, regional structure plans and urban structure plans by the authorities responsible for physical planning. All the local authorities in whose areas of jurisdiction the demarcated area fall is in the process of including the Vredefort Dome to be conserved as part of their policy and regional structure plans developed in terms of the Act. Chapter 4 of the Act provides for the enforcement of such plans, which in effect ensure the protection of the area in accordance with the plans as developed.

In terms of the National Heritage Resources Act 25 of 1999, a national system for the management of heritage resources is applied throughout the Republic. There is a three-tier system for heritage resources management, which in national level functions are the responsibility of the South African Heritage Resources Agency ("SAHRA"), provincial level functions are the responsibility of provincial heritage resources authorities and local level functions are the responsibility of local authorities. It has in principle been decided to declare the area a National Heritage site.

The national Department of environmental Affairs and Tourism and the Northwest and Free State Provinces agreed the Free State Department of Tourism, Environment and Economic Affairs would lead the process for proposing the site for listing as World Heritage Site. In this capacity the said Department also co-ordinates all activities aimed at the interim protection and development of the area.

A Vredefort Dome Forum was established with representation from landowners, involved government departments and local government bodies, as well as other interest groups. Membership of the Forum however remains open to any interested parties. A Steering Committee was elected from the members of the Forum to take the process forward. The Steering Committee appointed a consultant to develop an over-arching management plan for the demarcated area, which was completed during February 2002.

Should the area be declared a World Heritage site the World Heritage Convention Act 49 of 1999, which incorporates the World Heritage Convention into South African law, will be applicable. The Minister of Environmental Affairs and Tourism is the responsible person for enforcing and implementing the Act. In terms of section 8 the Minister may where an existing organ of state is already lawfully managing or involved in a World Heritage site declare that such organ of state is an authority under this Act and give additional powers or duties to such organ of state in relation to the World Heritage site. The Minister may also establish a new authority with the powers and duties as set out in the Act. In view of the fact that the demarcated area falls under the jurisdiction of two different provinces and different local authorities it is envisaged that the Minister will establish a new World Heritage Authority for the Vredefort Dome in terms of the mentioned Act. The powers and duties of such authorities are set out in section 13 of the Act. Such a authority will be run by a board

as set out in section 14 of the Act and appoint executive staff to the authority in terms of section 17 of the Act. They will be responsible for the day to day control of the site and will money be allocated by the Department of Environmental Affairs in this regard.

e) **Level at which management is exercised, and name and address of responsible person for contact purposes:**

At present management is exercised by the Vredefort Dome Conservancy in the North West Province on a private voluntary level, by the local authorities on local government level and on provincial and national level by the departments of environmental affairs.

A Vredefort Dome Forum was established in 2001 to facilitate the development of the area and the application for World Heritage status. The Vredefort Dome Forum comprises of all stakeholders including private landowners, State Departments, local authorities and other interested and effected parties.

As soon as the area is declared a World Heritage site a World Heritage Authority for the area will be constituted in terms of the World Heritage Convention Act 49 of 1999. In terms of the mentioned Act such an authority is responsible to the Minister of Environmental Affairs and Tourism. Such an authority will be responsible for the day to day management of the area and will be situated on or near the site.

On listing as a World Heritage Site, the national Department of Environmental Affairs and Tourism will be the authority responsible for international liaison and for reporting on the site. At a regional level, the Northwest Province and the Free State Province will be responsible for regulating and facilitating development in the area, as well as for law enforcement. The environmental authorities of the provinces will specifically be responsible for advising on, and facilitating the active management of the site. Several local government bodies, such as the Northern Free State District Council and the Potchefstroom Local Municipality also are important stakeholders, which will contribute to the development and management of the area.

An Authority however, will be assigned or established by the national Minister of Environmental Affairs and Tourism [in terms of the World Heritage Convention Act, 1999 (Act No. 49 of 1999)] for the day-to-day management of the site on listing of the site. This Authority will be a juristic person and will have the following responsibilities:

- Develop measures for the cultural and environmental protection and sustainable development of, and related activities within the site;
- Promote, manage, oversee, market and facilitate tourism in relation to the site;
- Identify cultural and natural heritage that must be transmitted to future generations;
- Take effective measures for the protection, conservation and presentation of the natural and cultural heritage;
- Facilitate steps that encourage investment and innovation;
- Facilitate programmes that encourage job creation;
- take measures that ensure that the values of the Convention are promoted;
- establish and implement an Integrated Management Plan;
- initiate steps regarding research, education, training, awareness raising and capacity building; liaison with and be sensitive to the needs of communities living in or near to the site.

The person in the Department of Environmental Affairs and tourism who is responsible for World Heritage sites in South Africa is at present:
mr M Magolo,
Sub Directorate Heritage and Bio diversity
Department of Environmental Affairs

P/Bag x447
Pretoria
0001
South Africa

The following contact persons exist:

Vredefort Dome Forum and Dome Bergland Conservancy

Adv SP de la Harpe
PO Box 1344
POTCHEFSTROOM, 2520
Tel. +2718 297-0109
Fax +2718 294-6475
E-mail pvrspdlh@puknet.puk.ac.za

Department of Environmental Affairs Free State Province:

Mr C Erasmus
PO Box 264
BLOEMFONTEIN, 9300
Tel.: +27514033021
Fax: +27514033023/4

Local Authority:

Mr P Labuschagne
PO Box 113
POTCHEFSTROOM, 2520
Tel.: +27182995111
Fax: +27182970477
E-mail council@potch.co.za

f) Agreed plans related to the property:

The Dome Bergland Conservancy is converting into a section 21 Company. A copy of its articles of association appears as Appendix "7e" hereto which has as its objects the converting of the area in a co-operation nature reserve.

During 2002 the Northwest Parks and Tourism Board funded the compilation of a strategic management and development plan by independent consultants. A copy of this strategic management and development plan is attached hereto marked Appendix "7f". This is a broad general principled exposition of a management plan and will be further developed.

The following is addressed in the Plan:

- Background to the project
- Environmental Impact Assessment requirements
- Legal issues surrounding land ownership, access and servitudes
- Community awareness and participation
- Market analysis, including trends and gaps
- Tourism marketing and development requirements
- Social and Economic Impact Assessment requirements
- Research, information and interpretation requirements / strategies
- Project cost and capital requirements
- Funding requirements
- Proposed Communication Strategy requirements
- Infrastructure and operational requirements
- Opportunities for private sector involvement and strategic alliances
- World heritage Site application requirements

- Proposed developments, including but not limited to job creation, SMME development and community and black economic empowerment
- Proposed institutional and financial models to manage the project in a sustainable fashion

The consultant identified the deliverables originating from the brief to include the following components:

- Background
- Situational analysis:
 - Geological aspects and biophysical description
 - Market trends and gaps and potential market types
 - Tourism attributes, potential products and capacities
 - Current tourism and supporting infrastructure
 - Socio-economic environment
 - Land tenure, rights and use
 - Potential as a World Heritage Site
 - Possible land ownership and institutional models
- Mission and objectives
- Development Plan
- Operational Visions, Objectives, Policies and Guidelines
- Legal and Institutional Arrangements
- Implementation Programme
- Financial analysis
- Socio-economic benefits

The Northern Free State District Council commissioned an investigation with regard to the current tourism activities and potential of a larger area, including the proposed site, but this was limited to the Free State side of the boundary. A similar investigation however, was done on the Northwest side of the boundary.

Based on the work presently being done, a long-term management and development plan and strategy will be developed for the area.

It will be ensured that the management and development plan complies with the World Heritage Convention Act and the Convention itself.

A situation report was also compiled by the consultants and is attached hereto as appendix "7g". Statistics are set out herein. This report will also be taken into account in further planning.

The Potchefstroom Local Council has accepted a tender proposal by the Potchefstroom Local Municipality, Maxim Planning Solutions and the Potchefstroom University for Christian Higher Education for the development of a Vrededorp Dome development and management plan. A copy of the tender proposal is attached hereto marked appendix "7h". The necessary funding (approximately R737 000 (\$90 000)) has been allocated for the execution of this tender by the North West Department responsible for Environmental Affairs. In particular the terms of reference has orally been amended to give priority to the development of a management plan setting out in detail the institutional framework and all the requirements as set out by Unesco. The management plan will be forwarded as soon as it is available. The spatial development and other plans by the provinces and local authorities will also be forwarded as soon as available.

g) Sources and levels of finance:

At present the sources of funding available to the area are those of the local authorities and provincial departments of environmental affairs. The necessary capacity does exist in the stated departments on national and provincial level as well as with the local authorities for the proper development of management plans for the

area and the implementing of such plans. At this stage no separate budget for the area exists but do the expenses form part of the general budgets for the relevant authorities. In this regard the Northwest Province's Department of Environmental Affairs has allocated R737 000,00 (± \$ 90 000,00) for the compilation of a development and management plan for the demarcated area.

As soon as a World Heritage Authority is constituted in terms of the World Heritage Convention Act 49 of 1999 such an authority will be able to obtain the necessary funds for management of the area. In particular World Heritage sites form part of the budget of the National Department of Environmental Affairs. Financing will also be available from the Provincial Departments of Environmental Affairs as well as from the relevant local authorities. Further funds will be available from SAHRA in view of the fact that SAHRA has in principle decided that the area should be declared a National Heritage Site.

The mentioned State Departments and local authorities do have the funding, capacity and legislative powers to obtain funding for the management of the area. Enough capacity exists in the mentioned State Departments and local authorities for a transfer of skills, funds and training to ensure the proper management of the area.

Private institutions have also shown an interest in funding the development of the area as soon as it has been declared a World Heritage site.

The Development Bank of South Africa also committed themselves to the funding of studies, which might be needed in developing management and development plans for the area.

A South African Commercial Bank expressed their interest in the project and indicated a desire to become involved in financing of the project. As the project develops and the financial needs become clear, the matter will be followed up

As the demarcated area forms an important and integral part of the development and management plans of the relevant local authorities and has been identified as a development node and prime tourist destination of both the Free State and Northwest Provinces the viability of the World Heritage Authority on the long term is ensured.

h) Sources of expertise and training in conservation and management techniques:

A wide variety and high levels of expertise is available in the Departments of Environmental Affairs in the National Government, Provincial Governments and also in Local Authorities regarding the conservation of the area. The area is also an important area in the field of research for the Northwest University Potchefstroom campus, which is approximately 20 km away from the demarcated area, the University of the Witwatersrand in the Gauteng Province and the University of the Free State in the Free State Province, especially in the fields of earth sciences and biological sciences. Many private consultants with highly skilled personnel are available to contribute.

Regarding the training of people in conservation and management skills the facilities of the nearby Northwest University Potchefstroom campus, is available and the necessary expertise also exist in the various State Departments and Local Authorities. It will be possible to provide the expertise for the immediate needs of the World Heritage Authority as soon as it is constituted and also for the long-term needs including training in conservation and management.

i) Visitor facilities and statistics:

The demarcated area is nearly exclusively privately owned with state land only comprising approximately 600 hectares out of a total of more than 30 000 hectares. Because of the uniqueness of the area private landowners have started to convert their activities into eco-tourism. Many facilities regarding tourism do exist in the area. Outside of the demarcated area the nearby town of Parys and Potchefstroom also have accommodation, information and other facilities available. The transformation of the area into a tourist attraction only occurred during the last few years. From the strategic management and development plan Appendix "7f" hereto and the situation report appendix "7g" hereto, the following statistics are available. During the year 2001, the greater Vredefort Dome/Parys area had 66 tourism establishments and sold a total of 104635 bed nights and 15969 sight nights per annum. 80% of all accommodation sold were beds and 20% camping facilities. In the region of 54% of all bed nights sold were related to conference and other group events and 46% were leisure related. In total the area attracted in the region of 110,000 visitors, of which 59% stayed overnight and 41% were day visitors. 48% of all day visitors to the area were related to conferences and events.

36 out of the 66 tourism products are located within the boundaries of the proposed demarcated area representing a total of 1135 beds (53,198 bed nights sold) in the Northwest side and 162 beds (12958 bed nights sold) in the Free State side of the demarcated area in 2001. This means 64% of the regional beds were sold inside the boundaries of the demarcated area. A total of 34275 conference delegate days (54%) and only 730 camping nights (4,6%) were sold within the demarcated area.

The total number of overnight visitors to the demarcated area per year was estimated at 42000 with another 27500-day visitors, totaling 69500 or 63% of the total number of visitors to the greater Vredefort Dome/Parys area.

The calculated bed density for the demarcated area was 38 beds per 1000 hectares.

At this stage save for privately owned interpretation information explanations etc. very little has been done from the state's side to promote the area. This aspect will however be addressed in the management plan.

There does not exist a site, museum or visitor or interpretation centre in the area save for the privately owned information and sights in the area itself. There is a definite need for such a site museum and interpretation centre and will be addressed in the management plan.

Sufficient overnight accommodation exist in the area on privately owned property as well as in the nearby towns of Parys and Potchefstroom which are within a half an hour's drive by car from the demarcated area. The potential does exist to increase the accommodation facilities in the area, which will be left to private individuals. The private landowners have indicated their intention to further develop the area as a tourism attraction.

Basic refreshment and restaurant facilities do exist in the area although there is still potential for further development. The nearby towns of Parys and Potchefstroom are able to fulfill this need.

Save for 2 (two) shops with very basic facilities no shops exist in the area but does the nearby towns fulfill this need.

Because of the vastness of the area parking is not a problem.

Sufficient ablution facilities exist at the present areas of development. Further development will be subject to the provision of adequate facilities.

Adequate facilities for search and rescue exist in the nearby towns of Parys and Potchefstroom, which have the necessary capacity, manpower, equipment, medical and other facilities to provide the necessary assistance.

j) Site management plan and statement of objectives:

Contour Project Managers, independent consultants compiled a strategic development and management plan during February 2002 for the Vredefort Dome Conservancy(VDC), working with the Vredefort Dome Forum, which comprises the demarcated area. The Northwest Parks and Tourism Board sponsored this strategic development and management plan. A copy thereof is attached hereto marked appendix "7f". The essence of the strategic management and development plan are the following:

(The reference to the Vredefort Dome Conservancy (VDC) in the document is a reference to the demarcated area and not the association of land owners.)

MISSION STATEMENT

VALUES AND OBLIGATIONS

VDC (Vredefort Dome Conservancy) is recognised by scientists as the oldest and largest visible meteorite impact site on the globe. When developing and managing VDC, all the policies, plans and actions must contribute towards;

- conserving and promoting the geological significance and scientific value of the Vredefort Dome Structure and its archaeological, historical and natural assets;
- behaving responsibly and in line with internationally accepted norms and standards in protecting a site of such outstanding global value;
- fully capitalising on the unique geology, international interest and tourism values of the area; and
- complying with a number of important specific values and obligations ensuing from:
 - The intended listing as a World Heritage Site
 - The intended compliance with IUCN criteria for managing a Protected Area
 - Commitments made to landowners, operators and other affected parties during the planning and development of the Conservancy

KEY OBJECTIVES

The key objective or purpose of the Vredefort Dome Conservancy is;

- To specifically protect in perpetuity a representative sample of the unique geological phenomenon of the Vredefort Dome Impact Structure and to allow opportunities for related research;
- To generally conserve, promote and optimally interpret the area's unique geology, the system's biodiversity and abiotic resources, biophysical processes, unique landscape and cultural heritage;
- While at the same time capitalising on the area's scientific significance, its tourism potential and its renewable natural resources for the enduring socio-economic benefit of the landowners, operators and neighbouring communities primarily, and international, national and provincial stakeholders secondarily.

CHALLENGE

The challenge is to achieve these objectives without compromising on the set values and obligations.

VISION

By achieving its objectives, VDC becomes an area with the following characteristics:

- A single, functional, self-sustainable and professionally managed land unit managed along the principles of a Conservancy with co-operation amongst all the different

stakeholders

- An internationally recognised site of scientific significance (World Heritage Listing)
 - The unique geology, biodiversity, biophysical processes, non-renewable resources and landscapes and the cultural heritage of VDC is well conserved through a consistently applied adaptive management process founded on up-to-date scientific knowledge and state of the art technology and systems
 - Internationally recognised as a uniquely interpreted and excitingly informative destination with high enjoyment, educational and scientific value
 - Nationally recognised as an adventure destination with diverse products
 - Regionally recognised as an important socio-economic contributor
 - The unique tourism and educational potential of the VDC is optimally developed and utilised whilst the natural experience is not unduly impaired and the conservation values are not compromised
 - The visitor facilities and services meet international standards
 - Development and management is undertaken according to mutually beneficial and synergistic relationships between landowners, operators and their employees
 - Land ownership and benefits from VDC is shared equitably
 - Development and management is facilitated and controlled in accordance with a well-developed Strategic Plan and Constitution
 - VDC is established as an internationally renowned field centre for geological research -particularly Impact Structure research
-
- An extension service and support mechanism is in place to assist landowners and operators within VDC to meet internationally accepted environmental, conservation and tourism standards of operation
 - VDC is financially self-sustaining through a combination of revenue sources such as grants, donor funding, entrance fees, member contributions, levies, concession fees, sale of natural resources and trading.

STRATEGIES

After consideration of all the strengths, weakness, opportunities and threats and the critical issues identified during consultation with stakeholders, the following key strategies were identified:

Conservation Management

To sustainably manage the natural, cultural, historical and other heritage resources of VDC in accordance with agreed policies, strategies and operational guidelines, so that the unique, vulnerable, valuable and sensitive environmental assets of VDC would be conserved.

Tourism Management

To optimally facilitate and manage tourism developments and operations in accordance with agreed policies, objectives and strategies and within agreed tourism operating guidelines for the enduring benefit of landowners, operators and the region.

Development Plan

To organise and manage developments within VDC in accordance with an accepted zoning plan and development guidelines, cognisant of its conservation value and tourism market potential, to ensure that its unique attributes are protected and the tourism potentials are optimally utilised.

Institutional Framework

To develop an equitable institutional framework and constitution that together with the VDC Strategic Plan will provide the majority of landowners with the necessary mechanisms and security to willingly join the Vredefort Dome Conservancy.

Internal Communications

To implement a communications strategy that will adequately and effectively provide all landowners and operators inside VDC with relevant information, to the extent that they

will appreciate the value of joining VDC and support its policies, objectives, strategies and activities.

Marketing and Interpretation

To market and interpret VDC, its unique attributes and its products to identified target markets, so that VDC could be recognised amongst all the identified markets and could be optimally utilised.

Socio-economic Development

To contribute towards the socio-economic development of the region and its recognised stakeholders, by ensuring that local spin-offs and appropriate economic empowerment is facilitated.

Funding

To procure and manage appropriate financial resources that are necessary to efficiently and effectively implement the strategies of VDC.

Potchefstroom Municipality has accepted a tender for the further development of a Vredefort Dome development and management plan. A copy of the tender proposal is attached hereto marked Annexure "7h". The full report and a summary thereof will be forwarded as soon as possible.

The major features of the site that are to be protected are the landscape and the geological characteristics of the area. However, closely related to these, are the biological component of the environment, which forms an integral part of the scenic beauty and attractiveness of the site

In order to address these, the strategy envisaged to ensure the protection of the phenomena and to optimise the economic opportunities in the area consists of:

- (i) working towards the listing of the demarcated area as a World Heritage Site;
- (ii) obtaining National Heritage status which had already being approved in principal by the South African Heritage Resource Agency (SAHRA)
- (ii) promoting the concept of having the demarcated land included in a protected area (nature reserve) in multiple private ownership;
- (iii) encouraging individual landowners to engage into tourism-related entrepreneurships in a co-ordinated manner.

The strategy as proposed would:

- ensure effective protective measures for the features, which need to be protected;
- provide improved, and in many instances, more viable economic opportunities to the landowners;
- contribute to the creation of employment opportunities in a region with a high unemployment rate;
- stimulate economic growth in the region, including the neighbouring towns;
- encourage neighbouring landowners to join their land to the site, which will contribute to the protection of a larger portion of the structure.

The strategy, as suggested, implies that strategic plans will need to be developed to address different aspects, which include:

- A management plan for the protection and management of the Vredefort dome phenomenon;
- A management plan for the protected area (nature reserve);
- A master plan and management plan for the development and co-ordination of the tourism facilities and tourism activities

- A financial and operational plan to regulate income and expenditure and to ensure the equitable sharing of benefits by the contributing landowners

The area will be managed by the authority as provided for in the World Heritage Convention Act. This will be done in close co-operation with the landowners including the Dome Bergland Conservancy.

k. Staffing levels:

No permanent or full-time personnel presently are employed for this project, since the needs in this regard will only become clear as the process unfolds and strategic plans are developed. Currently the Free State Department of Tourism, Environment and Economic Affairs is leading the process with adequate personnel to address the immediate needs. At present it is expected that full-time personnel will be appointed as soon as an Authority for the area has been assigned or established.

FACTORS AFFECTING THE SITE

Since the land proposed for listing as a World Heritage Site is situated in a predominantly marginal agricultural area, mainly extensive grazing and to a limited extent, cultivation of crops were practiced. Consequently the negative effects on the features in the area were negligible. Presently a strong notion to engage in eco-tourism activities can be detected, with its distinctive effects.

a Development pressures

Development pressures, which have been, or might influence the site, are the following:

(i) Mining for gold

Shallow deposits of low quality gold ore are present in parts of the area, explaining the gold mining ventures at the turn-of-the-century. With improved technology, exploitation of these might be viable to a limited extent by implementing opencast mining techniques. This would have a strong negative visual impact on the area and would also influence the underground water regime drastically. Adequate legal measures however exist to manage pressures of this kind.

(ii) Mining for "granite"

Opencast mining for "granite" occurred at a number of sites within the designated area in the past. This kind of mining takes place sporadically depending on the international demand and price of the commodity. The activity however, is more often encountered in the area directly adjacent to the site on the "floor" of the structure. This has a considerable negative visual impact on the environment. This mining process however is regulated by the Department of Minerals and Energy.

(iii) Agriculture

As indicated before, the agricultural activities in the designated area have a negligible effect on the features of the area, except for the fact that the larger species of wildlife virtually disappeared from the area in the past. In the area directly adjacent to the site in a southerly direction, intensive crop production takes place on the deeper soils.

b Environmental pressures

No major environmental pressures are evident in the proposed area, despite the proximity of the highly industrialised Witwatersrand area. There is some concern with regard to the water quality of the Vaal River, which is running through the area. This however, is closely monitored by the Department of Water Affairs and Forestry and other authorities.

A matter of concern is the invasion of the banks of the Vaal River by species of the exotic Blue Gum trees (*Eucalyptus* spp.) to the detriment of the indigenous riverbank vegetation. Although the infestation is not out of control, steps have been taken to get funding from an existing programme for the control of these.

c Natural disasters

The area is not prone to natural disasters. Geologically speaking, this is a relatively stable area. Natural floods might occur from time to time, but will mainly be controlled flooding since storage dams are situated upstream in the river. Accidental veld fires might occur periodically, but usually is localised, not causing serious and permanent damage to the natural vegetation.

d Visitor/ tourism pressures

As indicated before, eco-tourism is progressively replacing agriculture as the main economic activity in this area. This can be attributed to the natural beauty and tranquillity of the area and the close proximity of the densely populated Witwatersrand area (one hour's driving on main roads). Although tourism development is considered to be the best viable option for this area, this needs to be regulated and co-ordinated to prevent it from threatening its own resource base. The possible uncoordinated and indiscriminate development of tourism facilities is presently considered to be the most likely threat to the integrity of the site.

An investigation commissioned by the Northern Free State District Council to establish the tourism status in an area including the designated land. There also are a clear indication that measures would come into place to regulate tourism and other developments in the area inter-provincially in a co-ordinated manner.

Although it is estimated that some 90 000 overnight visitors and 20 000 day visitors enter the area annually, it is believed that the area can accommodate a considerable growth in tourist numbers without any detrimental effect on the resources.

e Numbers of inhabitants within the site

Since this area primarily is a rural agricultural area, it consequently is sparsely populated. No formal population figures are available for this area specifically. Assuming a figure of four members per family unit and four farm workers per farm, it is estimated that the area could accommodate not less than 1 800 inhabitants. It should however be kept in mind that some properties are not permanently inhabited, whereas more employment opportunities might exist on properties where tourism facilities and activities are provided. On weekends, a considerable number of

landowners occupy their weekend retreats and many visitors from the cities take to the area.

f Other

None

6. MONITORING

a Key indicators for measuring state of conservation

Considering that the main features of the area, which need to be protected, are the landscape, the geological characteristics and the wilderness character, the major threat to these would be any development or activity, which might have a visually unacceptable impact. For this reason it is believed that all developments and especially the development of tourism-related infrastructure and facilities should be closely monitored with regard to its visual acceptability.

Closely related to the wilderness character of the area is the status of the indigenous biota. Major changes in the composition or vitality of populations would be a good indicator of changing conditions.

A matter of some concern is the water quality of the Vaal River as a result of effluents upstream of this area. Monitoring however is done regularly by different authorities, as well as in the biomonitoring as part of the River Health Programme. The catches of Largemouth Yellowfish, a much sought-after angling fish could also serve as a good indicator of the water quality.

The encroachment or decline, when control measures has commenced, of the exotic Blue Gum trees on the banks of the Vaal River also needs attention and could be monitored.

With the further development of the process it, however is believed that additional threats, and consequently monitoring indicators would be identified.

b Administrative arrangements for monitoring

Although arrangements have been made for regulating any developments in the area, no formal arrangements presently exist for the monitoring of the property. This however will come into place as soon as the management structures and management plans have been developed.

c Results of previous reporting exercises

No previous monitoring reports have been compiled.

7. DOCUMENTATION

a Photographs and video

Photographs are attached as Appendix 4 to illustrate pre-history, historic events, crater formation, mining impacts, eco-tourism and recreational potential. The accompanying video material was compiled to enhance the submission visually, illustrate the impact event and the scenic beauty of this area.

Additional photographic material, especially for promotion purposes will be generated in the near future and will be made available.

b Copies of site management plans and other relevant plans to the site

A management plan that provides broad management guidelines has been compiled. See appendix 7f hereto. A process to develop detailed management plans from this general plan has started and the funding has already been approved by the Department of Environmental Affairs Northwest Province.. The two provinces involved namely Northwest- and the Free State Province, provincial departments are also developing spatial development and management plans for the managing of development adjacent to the Vaal River flowing through the site. The Northern Free State District Council, in whose area of jurisdiction this area falls, had already completed their spatial development plan

c Bibliography

The following references were consulted:

- Baldwin, R.B., 1949. The face of the moon. Univ. Chicago Press, Chicago. 239pp.
- Boon, J.D. and Albritton, C.E.(Jr.), 1936. Meteorite craters and their possible relationship to 'Cryptovolcanic Structures'. *Field and Laboratory*, 5: 53-64.
- Brock, B.B., 1965. Discussion of paper by W.I. Manton. *Annals of the New York Academy of Sciences*, 123: 1048-1049.
- Bucher, W.H., 1921. Crypto volcanic structure in Ohio of the type of the Steinheim basin. *Bull. Geol. Soc. Am.*, 32: 74.
- Bucher, W.H., 1965. The largest so-called meteorite scars in three continents as demonstrably tied to major terrestrial structures. *Annals of the New York Academy of Sciences*, 123: 897-903.
- Carter, N.L., 1965. Basal quartz deformation lamellae – a criterion for the recognition of impactites. *Am. J. Sci.*, 263: 786-806.
- Carter, N.L., 1968. Dynamic deformation of quartz. In: French, B.M. and Short, N.M. (ed.), *Shock metamorphism of natural materials*. Mono Book Corp., Baltimore: 453-474.
- Chao, E.C.T., E.M. Shoemaker and B.M. Madsen, 1960. First natural occurrence of Coesite. *Science*, 132: 220-222.
- Daly, R.A., 1947. The Vredefort Ring-structure of South Africa. *Jour. Geol.*, 55: 125-145.
- Dietz, R.S., 1946. The meteoritic impact origin of the Moon's surface features. *Jour. Geol.*, 54: 359-365.
- Dietz, R.S., 1959. Shatter cones in cryptoexplosion structures (meteorite impact?). *Jour. Geol.*, 67: 496-505.
- Du Preez, P.J., 1986. Ekologie van die Boommegeskappe van die Vredefort-distrik, Oranje-Vrystaat. Unpublished M.Sc dissertation, University of the Orange Free State, Bloemfontein, South Africa
- Du Toit, A.L., 1954. *Geology of South Africa*. Oliver and Boyd, Edinburgh and London, (3rd Ed.), 611pp.
- French, B.M. and Short, N.M., 1968. *Shock metamorphism of natural materials*. Mono Book Corp., Baltimore. 644 pp.
- Hall, A.L. and Molengraaff, G.A.F., 1925. The Vredefort Mountain Land in the southern Transvaal and the northern Orange Free State. *Verhandelingen der Koninklijke Akademie van Wetenschappen te Amsterdam*. 24, 183pp.
- Henkel, H. and Reimold, W.U., 1996. Integrated gravity and magnetic modelling of the Vredefort impact structure – Reinterpretation of the Witwatersrand Basin as the erosional remnant of an impact basin. *Econ. Geol. Res. Unit. Inf. Circ.*, 299, 89pp.

- King, P.B., 1930., The geology of the Glass Mountains, Texas. Part 1. Descriptive geology: Sierra Madera. Univ. Texas Bull. 3038: 123-125.
- Nicolaysen, L.O., 1972. North American cryptoexplosion structures: Interpreted as diapirs which obtain release from strong lateral confinement. Geol. Soc. Am. Memoir, 132: 605-620.
- Manton, W.I., 1965. The orientation and origin of shatter cones in the Vredefort Ring. Annals of the New York Academy of Sciences, 123: 1017-1049.
- Martini, J.E.J., 1978. Coesite and stishovite in the Vredefort Dome, South Africa. Nature, 272: 715-717.
- Nel, L.T., 1927. The geology of the country around Vredefort. Geol. Surv. S. Afr. Spec. Publ. 6, 134pp.
- Penny, F.W., 1914. The Vredefort Granite in relation to the Witwatersrand Basin. J. Geol. Soc. Lond., 70: 328-335.
- Poldervaart, A., 1962. Notes on the Vredefort Dome. Trans. Geol. Soc. S. Afr., 65: 231-251.
- Sawyer, A.R., 1898. The South Rand Coalfield and its connection with the Witwatersrand Banket Formation. Transactions of the Institute of Mining Engineering, 14: 312-327.
- Shand, S.J., 1916. The pseudotachylite of Parijs, (O.F.S.) and its relation to the 'trap-shotten gneiss' and 'flinty crushrock'. Quarterly Journal of the Geological Society of London, 72: 198-221.
- Stöffler, D., 1972. Deformation and transformation of rock-forming minerals by natural and experimental shock processes: 1. Behaviour of minerals under shock compression. Fortschritte der Mineralogie, 49: 50-113.
- Stow, G.M., 1879. Report of the Geological Survey of the Orange Free State from 18th April to 17th December, 1878. Bloemfontein 1879: 18-24.
- Wilshire, H.G., 1971. Pseudotachylite from the Vredefort Ring, South Africa. Jour. Geol., 79: 195-206.

Bibliography

References not consulted:

- Alvarez, L.W., W. Alvarez, F. Asaro and H.V. Michel, 1980. Extraterrestrial cause for the Cretaceous-Tertiary extinction. Science, 208: 1095-1108.
- Alvarez, W., P. Claeys and S.W. Kieffer, 1995. Emplacement of Cretaceous-Tertiary boundary shocked quartz from Chicxulub Crater. Science, 269: 930-935.
- Antoine, L.A.G., L.O. Nicolaysen and S.L. Niccol, 1990. Processed and enhanced gravity and magnetic maps over the Vredefort Structure and their interpretation. Tectonophysics, 171: 63-74.
- Boon, J.D. and Albritton, C.E.(Jr.), 1936. Meteorite craters and their possible relationship to 'crypto volcanic structures'. Field and Laboratory, 5: 53-64.
- Brink, M.C., F.B. Waanders, A.A. Bisschoff and N.C. Gay, 2000a. The Foch Thrust – Potchefstroom Fault structural system, Vredefort, South Africa: a proposed

- model for impact-related tectonic movement over a pre-existing barrier. *J. Afr. Earth. Sci.*, 30: 99-117.
- Brink, M.C., F.B. Waanders and A.A. Bisschoff, 2000b. The Katdoornbosch-Witpoortjie Fault: a ring thrust of Vredefort Event age. *S. Afr. J. Geol.*, 103(1): 15-31.
- Corner, B., R.J. Durrheim and L.O. Nicolaysen, 1986. The structural framework of the Witwatersrand Basin as revealed by gravity and aeromagnetic data. *Geocongress 86 extended abstracts. Geol Soc. S. Afr.*: 27-30.
- De Duve, C., 1994. *Vital Dust*. Basic Books, Harper & Collins, 362 pp.
- Dence, M.R., 1972. The nature and significance of terrestrial impact structures. *Proc. 24th Int Geol. Congress. Montreal, Canada. Sect.*, 15: 77-89.
- Deutsch, A., R.A.F. Grieve, M. Avermann, C. Bischoff, P. Brockmeyer, D. Buhl, R. Lakomy, V. Müller-Mohr, M. Ostermann and D. Stöffler, 1995. The Sudbury Structure (Ontario, Canada); a tectonically deformed multi-ring impact basin. *Geologische Rundschau*, 84: 697-709.
- Deutsch, A., V.L. Masaitis, F. Langenhorst and R.A.F. Grieve, 2000. Popigai, Siberia – well preserved giant impact structure, national treasure, and world's geological heritage. *Episodes*, 23(1): 3-11.
- Du Preez, P.J., 1990. The Phytosociology of the Woody Vegetation in the southern part of the Vredefort Dome, Part 1: Communities of the Plains, Riverbanks and Islands. *J. Sth. Afr.Bot.* 56 (6): 631 – 636.
- Du Preez, P.J., 1990. The Phytosociology of the Woody Vegetation in the southern part of the Vredefort Dome, Part 2: Communities of the Hills. *J. Sth. Afr.Bot.* 56 (6): 637 – 644.
- Durrheim, R.B., L.O. Nicolaysen and B. Corner, 1991. A deep seismic reflection profile across the Archaean-Proterozoic Witwatersrand Basin, South Africa. *American Geophysical Union Geodynamic Series*, 22: 213-224.
- French, B.M., 1990. 25 Years of the impact-volcanic controversy: is there anything new under the sun or inside the Earth? *Eos Trans. AGU*, 71: 411-414.
- Glikson, A.Y., 1993. Asteroids and early Pre-Cambrian crustal evolution. *Earth. Sci. Rev.*, 35: 285-319.
- Grieve, R.A.F., J. Rupert, J. Smith and A. Therriault, 1995. The record of terrestrial impact cratering. *GSA Today*, 5: 193-196.
- Koeberl, C., C.W. Poag, W.U. Reimold and D. Brand, 1996. Impact origin of the Chesapeake Bay structure and the source of the North American tectites. *Science*, 271: 1263-1266.
- Reimold, W.U. and Gibson, R.L. 1996. Geology and evolution of the Vredefort Impact Structure, South Africa. *Jour. Afr. Earth Sci.*, 23(2): 125-162.

d Address where inventory , records and archives are held

Department Of Tourism, Environmental and Economic Affairs
Fountain Towers
Cnr Markgraaff &Zastron Streets
Po Box 20801
Bloemfontein, 9300
Free State Province
South Africa

SIGNATURE ON BEHALF OF THE STATE PARTY

Signature:

Name:

Designation:

Date:

ACKNOWLEDGEMENTS

We would like to thank everybody that contributed to the compilation of this document. A special word of thanks to Mr J van der Merwe and his family for their valuable input, hospitality and their never ending willingness to assist in any regard. Also to Adv. S de la Harpe and his wife, Hanri a warm word of thanks to both of you for all your help.

For the video material and much more, we would like to thank Dr M Brink and everyone that assisted him in his efforts.

A word of thanks also to the many scientists, other professional people, and everyone who did research of any kind and who generously made their information available to us for this purpose.

Also, since this is not just a submission, it is now a growing passion to those involved, we would like to thank the Lord for the inspiration and endurance to all of us involved in compiling this submission.

Introduction

This chapter gives a short introduction to South Africa: its provincial delineation, boundaries and shape.

Throughout this atlas, the emphasis has been placed on the ability of the maps to portray an environmental story through their colours and reference attributes. Cumbersome and technical text has been reduced to a minimum with the descriptive text kept brief and concise. The reader is encouraged to study and identify features and information shown on the maps, but which have not necessarily been explicitly described in the accompanying text. Each text page contains one or more *supplementary maps* which either add clarification to the main map, show the input components, or show derived information from the main map.

Provinces and boundaries of South Africa

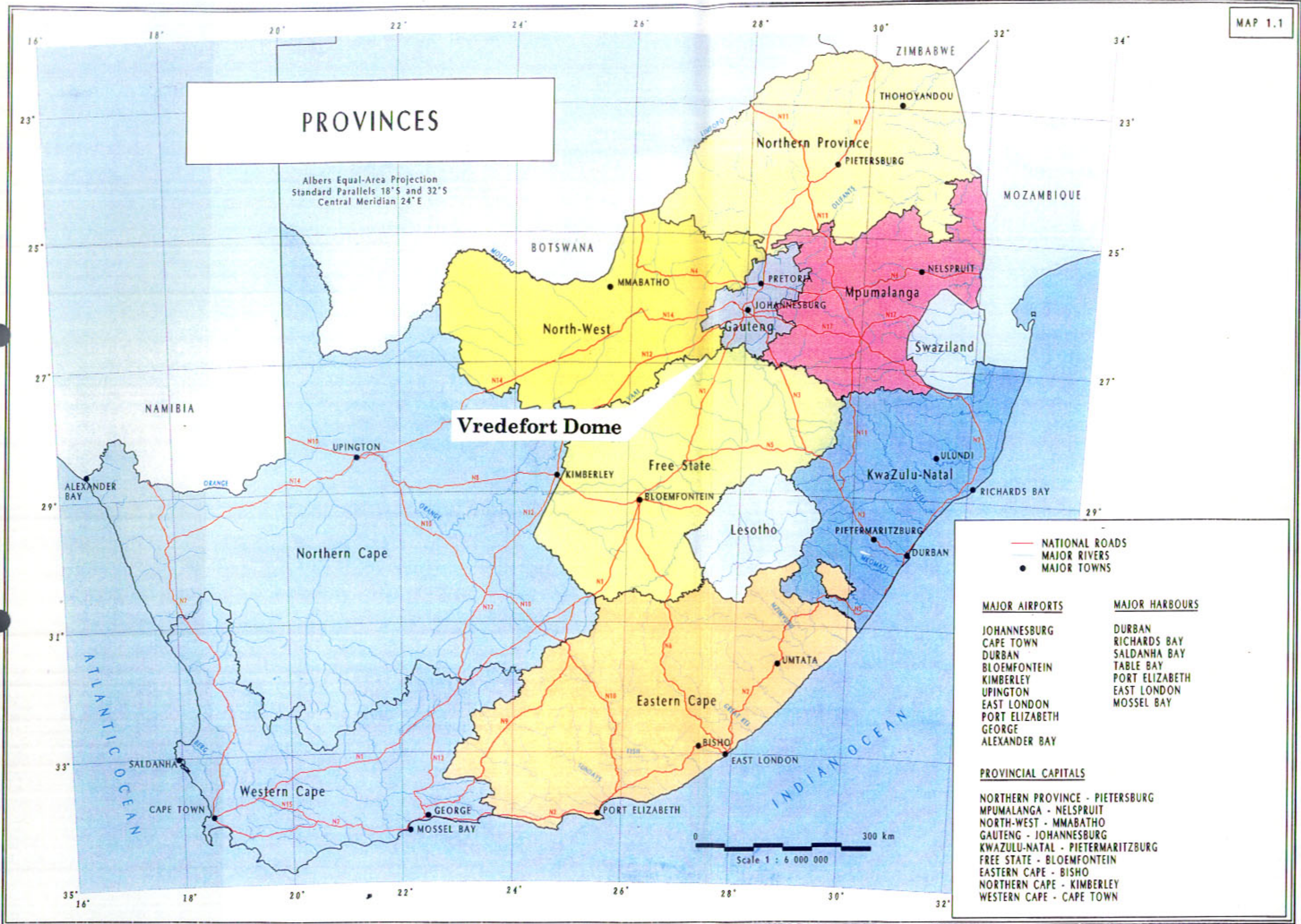
The Republic of South Africa is situated at the southern tip of the African continent, as shown on the locality map on this page. It covers a total surface area of approximately 1,2 million square kilometres, and has an extensive coastline (approximately 3 200 km) constituting the western, southern and eastern boundaries of the country. The northern boundary runs along the Orange, Molopo and Limpopo rivers, with deviations along the Lebombo Mountains in the north-east and a meridian or line of longitude (20 degrees east) in the north-west.

South Africa is divided into nine provinces, the boundaries of which can be seen on **Map 1.1**. The provinces comprise groupings of magisterial districts. Their outer boundaries therefore constitute the outer boundaries of the magisterial districts in the various provinces. Some of these boundaries follow rivers or other geographic features, but the most suitable boundary delineation from an environmental point of view, is the *watershed boundary*, also known as a *catchment boundary*. The reason for this is that environmental resources such as water, and control measures such as pollution control, can be more effectively managed within a single catchment.

The current position where provincial boundaries rarely coincide with catchment boundaries means that catchments cannot be managed as complete environmental units situated in a single province. This necessitates effective inter-provincial co-operation in matters relating to water catchment and environmental management, as well as co-ordination of these aspects at a national level.

THE POSITION OF SOUTH AFRICA IN AFRICA

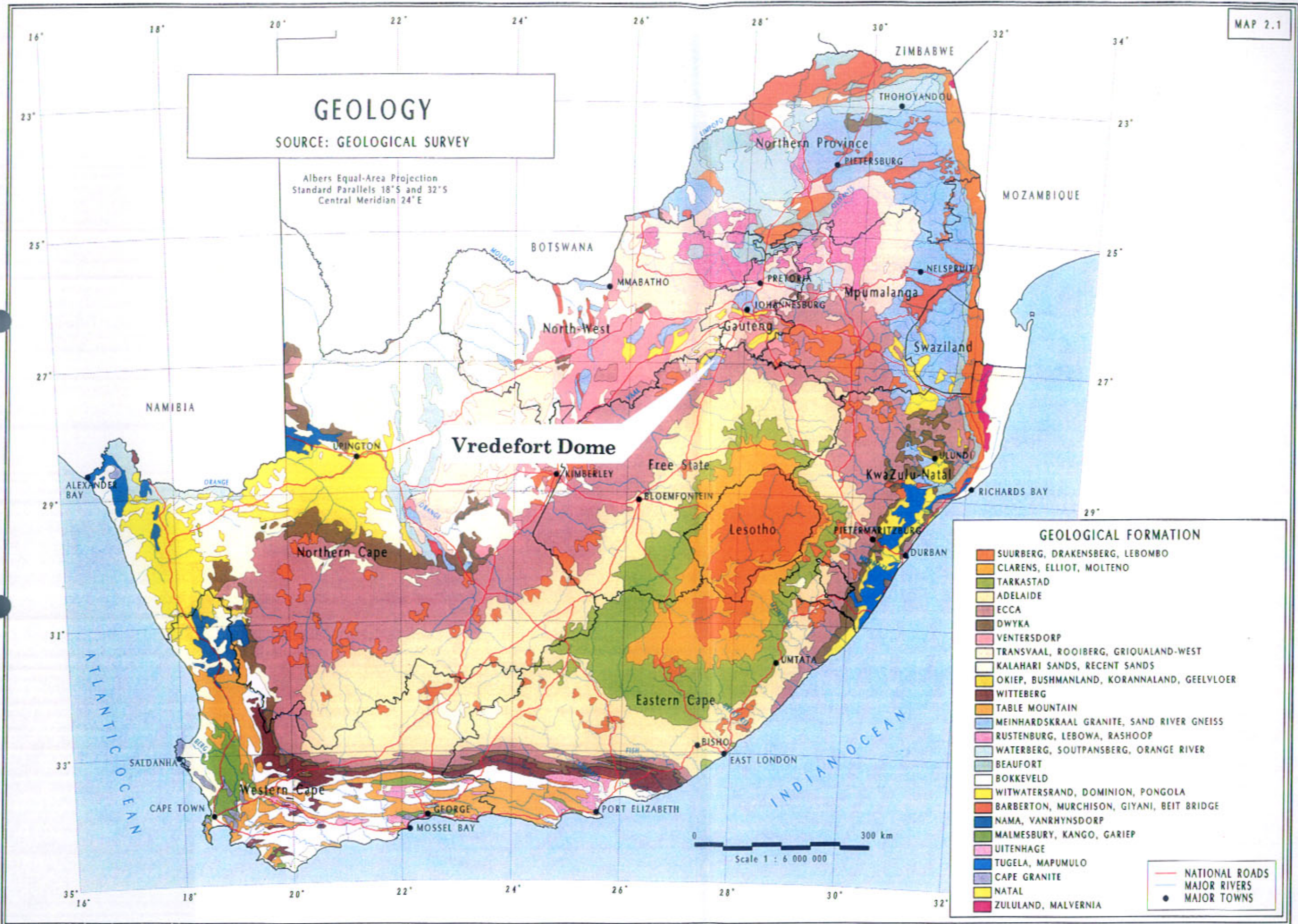




GEOLOGY

SOURCE: GEOLOGICAL SURVEY

Albers Equal-Area Projection
Standard Parallels 18°S and 32°S
Central Meridian 24°E



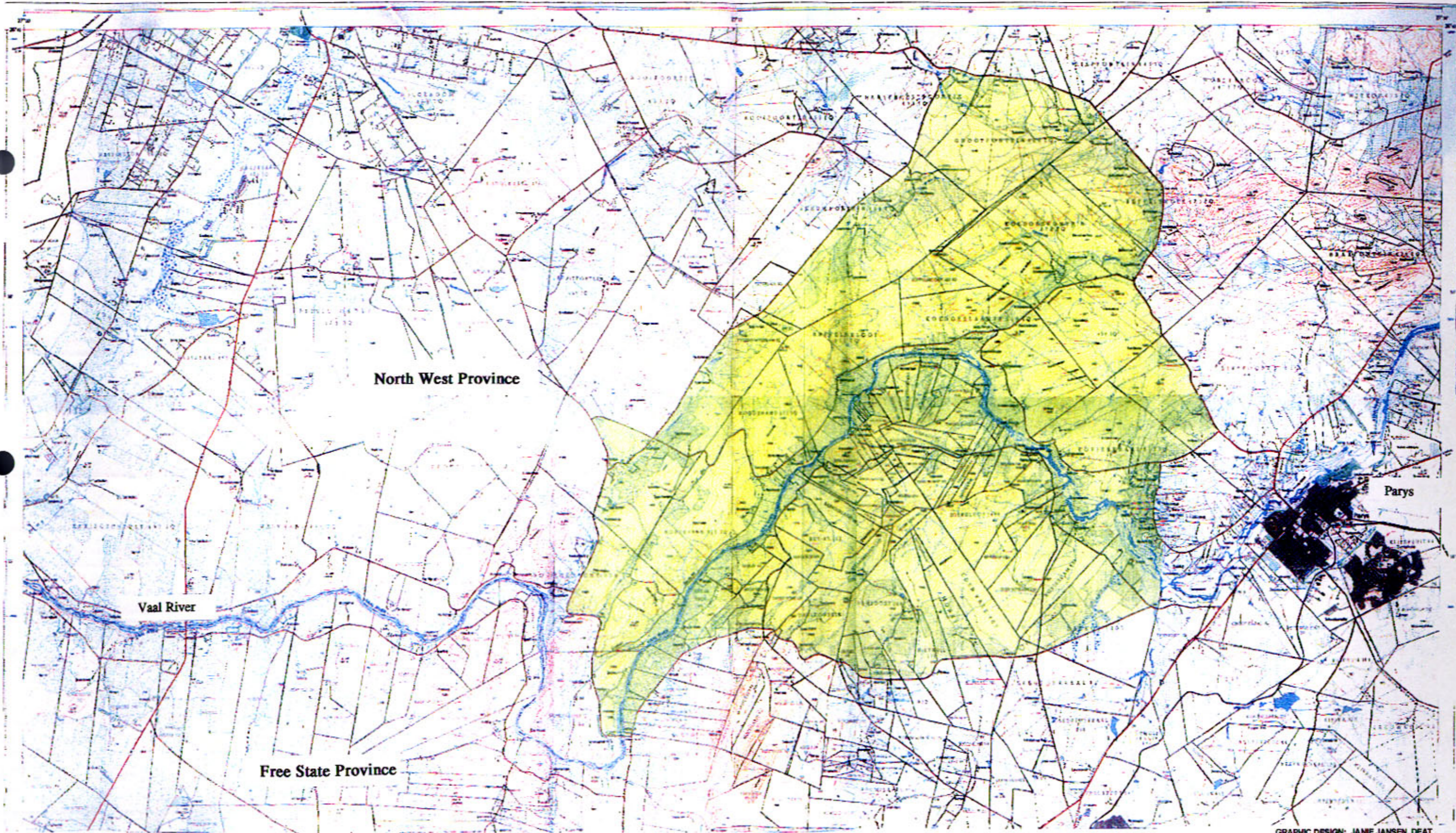
GEOLOGICAL FORMATION

- SUURBERG, DRAKENSBERG, LEBOMBO
- CLARENS, ELLIOT, MOLTENO
- TARKASTAD
- ADELAIDE
- ECCA
- DWYKA
- VENTERSDORP
- TRANSVAAL, ROOIBERG, GRIQUALAND-WEST
- KALAHARI SANDS, RECENT SANDS
- OKIEP, BUSHMANLAND, KORANNALAND, GEELVLOER
- WITTEBERG
- TABLE MOUNTAIN
- MEINHARDSKRAAL GRANITE, SAND RIVER GNEISS
- RUSTENBURG, LEBOWA, RASHOOP
- WATERBERG, SOUTPANSBERG, ORANGE RIVER
- BEAUFORT
- BOKKEVELD
- WITWATERSRAND, DOMINION, PONGOLA
- BARBERTON, MURCHISON, GIYANI, BEIT BRIDGE
- NAMA, VANRHYNSDORP
- MALMESBURY, KANGO, GARIEP
- UITENHAGE
- TUGELA, MAPUMULO
- CAPE GRANITE
- NATAL
- ZULULAND, MALVERNIA

- NATIONAL ROADS
- MAJOR RIVERS
- MAJOR TOWNS

VREDEFORT DOME

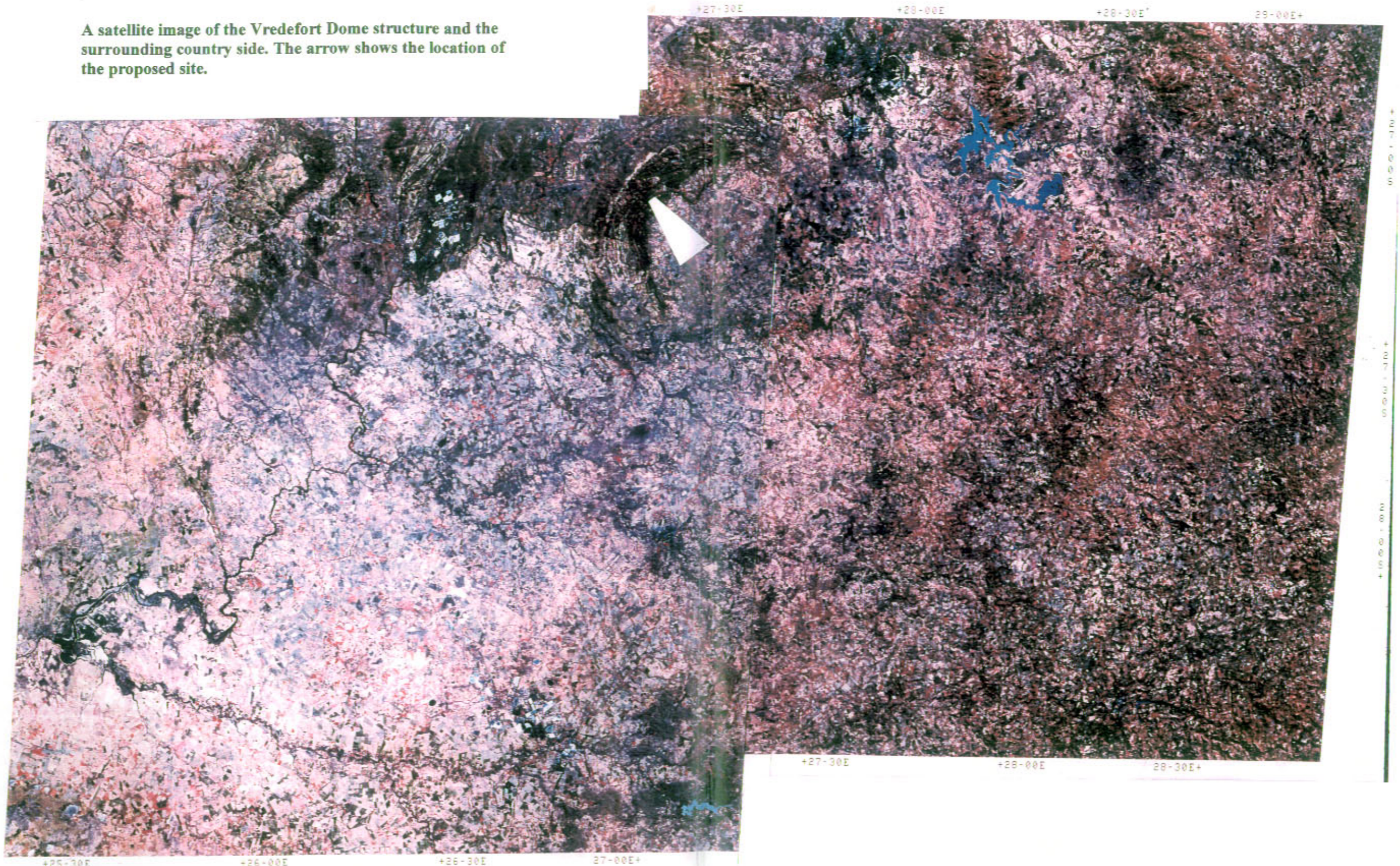
PROPOSED WORLD HERITAGE SITE, FREE STATE AND NORTH-WEST PROVINCES, SOUTH AFRICA



Vredefort

GRAPHIC DESIGN: JAMIE JANSEN, DEAT

A satellite image of the Vredefort Dome structure and the surrounding country side. The arrow shows the location of the proposed site.



SATELLITE REMOTE SENSING CENTRE, LANDSAT5-MSS, SCENE ID: 50080-07365, DATE: 28-MAY-84
WRS: 171-79, BANDS: 4, 7, CENTRE: 27-30E, 26-32E, SUN EL: 28
MAGNIFICATION X1, HOP, SEG: 0, LINE NUMBER: 0000, SCALE: 0 20 40 KM

TREES RECORDED IN THE VREDEFORT DOME AREA

<i>Salix capensis</i>	Salicaceae	River Willow
<i>Celtis africana</i>	Ulmaceae	Camdeboo Stinkwood
<i>Protea caffra</i>	Proteaceae	Common Sugarbush
<i>Osyris lanceolata</i>	Santalaceae	Transvaal Sumach
<i>Boscia albitrunca</i>	Capparaceae	Shepard's Tree / Caper Bush
<i>Maerua caffra</i>	Capparaceae	Common Bush-cherry
<i>Pittosporum viridiflorum</i>	Pittosporaceae	Cheesewood
<i>Acacia caffra</i>	Fabaceae	Common Hook-thorn
<i>Acacia erioloba</i>	Fabaceae	Camel Thorn
<i>Acacia hebeclade</i> subsp. <i>hebeclada</i>	Fabaceae	Candle Thorn
<i>Acacia hereroensis</i>	Fabaceae	Mountain Thorn
<i>Acacia karroo</i>	Fabaceae	Karoo Thorn
<i>Acacia robusta</i> subsp. <i>robusta</i>	Fabaceae	Ankle Thorn
<i>Acacia tortilis</i> subsp. <i>heteracantha</i>	Fabaceae	Umbrella Thorn
<i>Dichrostachys cinerea</i> subsp. <i>africana</i>	Fabaceae	Sickle Bush
<i>Mundulea sericea</i>	Fabaceae	Cork Bush
<i>Fagara capense</i>	Rutaceae	Small Knobwood
<i>Calendodendrum capense</i>	Rutaceae	Cape Chestnut
<i>Croton gratissimus</i> var. <i>gratissimus</i>	Euphorbiaceae	Lavendar Feverberry
<i>Rhus lancea</i>	Anacardiaceae	Karree
<i>Rhus leptodictya</i>	Anacardiaceae	Mountain Karree
<i>Rhus pyroides</i>	Anacardiaceae	Common Wild Current
<i>Rhus undulata</i>	Anacardiaceae	Kuni Bush
<i>Ilex mitis</i>	Aquifoliaceae	Cape Holly
<i>Maytenus heterophylla</i>	Celastraceae	Common Spike-thorn
<i>Maytenus undata</i>	Celastraceae	Koko Tree
<i>Cassine burkeana</i>	Celastraceae	Transvaal Kooboo-berry
<i>Cassinopsis ilicifolia</i>	Icacinaceae	Lemon Thorn
<i>Pappea capensis</i>	Sapindaceae	Wild Plum
<i>Ziziphus mucronata</i> subsp. <i>mucronata</i>	Rhamnaceae	Buffalo Thorn
<i>Berchemia zeyheri</i>	Rhamnaceae	Red Ivory
<i>Rhoicissus tridentata</i> subsp. <i>cuneifolia</i>	<i>Vitaceae</i>	<i>Bushman's Grape</i>
<i>Grewia flava</i>	Tiliaceae	Velvet Raisin
<i>Grewia occidentalis</i>	Tiliaceae	Crossberry
<i>Dombeya rotundifolia</i>	Sterculiaceae	Common Wild Pear
<i>Kiggelaria africana</i>	Flacourtiaceae	Wild Peach
<i>Scolopia zeyheri</i>	Flacourtiaceae	Thorn Pear
<i>Combretum molle</i>	Combretaceae	Velvet Bushwillow
<i>Cussonia paniculata</i> var. <i>sinuata</i>	Araliaceae	Mountain Cabbage Tree
<i>Heteromorpha trifoliata</i>	Umbelliferae	Parsley Tree
<i>Myrsine africana</i>	Myrsinaceae	Cape Myrtle
<i>Englerophytus magalismsontanus</i>	Sapotaceae	Transvaal Milkplum
<i>Euclea crispa</i> var. <i>crispa</i>	Ebenaceae	Blue Guarri
<i>Euclea undulata</i> subsp. <i>myrtina</i>	Ebenaceae	Small-leaved Garri
<i>Diospyros lyciodes</i> subsp. <i>lyciodes</i>	Ebenaceae	Karoo Bluebush
<i>Diospyros lyciodes</i> subsp. <i>guerkei</i>	Ebanaceae	Transvaal Bluebush
<i>Diospyros whyteana</i>	Ebenaceae	Bladder-nut
<i>Olea europaea</i> subsp. <i>africana</i>	Oleaceae	Wild Olive
<i>Nuxia congesta</i>	Loganiaceae	Common Wild Elder
<i>Buddleja saligna</i>	Loganiaceae	False Olive
<i>Buddleja salviifolia</i>	Loganiaceae	Sagewood
<i>Ehretia rigida</i>	Boraginaceae	Puzzle Bush
<i>Halleria lucida</i>	Scrophulariaceae	Tree Fuchsia
<i>Vangueria infausta</i> subsp. <i>infausta</i>	Rubiaceae	Wild Medler
<i>Tapiphyllum parvifolium</i>	Rubiaceae	Mountain Medler
<i>Pavetta gardeniifolia</i> var. <i>gardeniifolia</i>	Rubiaceae	Common Bride's Bush
<i>Pavetta zeyheri</i>	Rubiaceae	Small-leaved Bride's Bush
<i>Brachylaena rotundata</i>	Asteraceae	Mountain Silver Oak
<i>Tarchonanthus camphoratus</i>	Asteraceae	Wild Camphor Bush

CHECKLIST OF PLANTS: VREDEFORT DOME

[As recorded by: Du Preez, P.J., 1986. Ekologie van die Boomgemeenskappe van die Vredefort-distrik, Oranje-Vrystaat. Unpublished M.Sc. Dissertation, University of the Orange Free State, Bloemfontein, South Africa]

PTERIDOPHYTA

SELAGINELLACEAE

Selaginella dregei (Presl) Hieron.

EQUISETACEAE

Equisetum ramosissimum Desf.

SCHIZAEACEAE

Mohria caffrorum (L.) Desf.

ADIANTACEAE

Cheilanthes hirta Swartz

C. viridis (Forssk.) Swartz

Pellaea calomelanos (Swartz) Link

ANGIOSPERMAE

MONOCOTYLEDONAE

TYPHACEAE

Typha capensis (Rohrb.) N.E. Br.

POACEAE

Urelytrum agropyroides (Hack.) Hack.

Hemarthria altissima (Poir.) Stapf & C.E. Hubb.

Elionurus muticus (Spreng.) Kunth

Schizachyrium sanguineum (Retz.) Alst.

Andropogon appendiculatus Nees

Cymbopogon plurinodis (Stapf) Stapf ex Burt Davy

Hyparrhenia hirta (L.) Stapf

Hyperthelia dissoluta (nees ex Steud.) Clayton

Heteropogon contortus (L.) Roem. & Schult.

Themeda triandra Forssk.

Digitaria eriantha Steud.

D. tricholaenoides Stapf

Alloteropsis semialata (R.Br.) Hitchc.

Brachiaria serrata (Thunb.) Stapf

Paspalum dilatatum Poir.

Urochloa panicoides Beauv.

Panicum schinzii Hack.

Setaria lindenberghiana (Nees) Stapf

S. spaciolata (Schumach.) Moss

S. verticillata (L.) Beauv.

Rhynchelytrum nerviglume (Franch.) Chiov.

R. repens (Willd.) C.E. Hubb.

Ehrharta erecta Lam.

Tristachya rehmannii Hack.

Loudetia simplex (Nees) C.E. Hubb.

Phragmites australis (Cav.) Steud.

Agrostis lachnantha Nees

Polypogon monspeliensis (L.) Desf

Stipagrostis obtusa (Del.) Nees

Aristida canescens Henr.

A. congesta Roem. & Schult.

A. diffusa Trin.

Tragus koelerioides Aschers.

Sporobolus discosporus Nees

S. fimbriatus (Trin.) Nees

Eragrostis biflora Hack. ex Schinz

E. capensis (Thunb.) Trin.

E. chloromelas Steud.

E. curvula (Schrad.) Nees

E. gummiflua Nees

E. obtusa Munro ex Fical. & Hiern

E. plana Nees

E. racemosa (Thunb.) Steud.

E. superba Peyr.

Cynodon dactylon (L.) Pers.

C. hirsutus Stent

Chloris virgata Swartz

Eustachys paspaloides (Vahl) Lanza & Mattei

Eleusine indica (L.) Gaertn.

Pogonarthria squarrosa (Roem. & Schult.) Pilg.

Bewisia biflora (Hack.) Goossens

Triraphis andropogonoides (Steud.) Phill.

Trichoneura grandiglumis (Nees) Ekman

Enneapogon scoparius Stapf

Bromus unioloides H.K.B.

CYPERACEAE

Cyperus aristatus Rottb.

C. bellus Kunth

C. haematocephalus Broeck. ex C.B.Cl.

C. longus L.

C. marginaticeps Vahl

C. obtusiflorus Vahl

C. rotundus L.

C. sphaerospermus Schrad.

Mariscus capensis (Steud.) Schrad.

Kyllinga alba Nees

Bulbostylis burchellii (Fical. & Hiern) C.B.Cl.

Coleochloa setifera (Ridley) Gilly

COMMELINACEAE

Commelina africana L.

C. benghalensis L.

C. eckloniana Kunth

Cyanotis speciosa (L.F.) Hassk.

PONTEDERIACEAE
Eichornia crassipes (Mart.) Solms-Laub.

ASPHODELACEAE
Aloe davyana Schönl.
A. transvaalensis Kuntze
Anthericum angulicaule Bak.
A. fasciculatum Bak.
A. trichophlebium Bak.
Bulbine abyssinica A. Rich.
Trachyandra asperata Kunth.
T. saltii (Bak.) Oberm.

ASPARAGACEAE
Protasparagus africanus Lam.
P. laricinus Burch.
P. suaveolens Burch.

ERIOSPERMACEAE
Eriospermum burchellii Bak.
E. cf. E. galpinii Schinz

HYACINTHACEAE
Albuca setosa Jacq.
Dipcadi viride (L.) Moench.
Scilla nervosa (Burch.) Jessop
Ornithogalum juncifolium Jacq.
O. ornithogaloides (Kunth) Oberm.
Drimiopsis cf. D. burkei Bak.
Ledebouria luteola Jessop
L. marginata (Bak.) Jessop

AMARYLLIDACEAE
Haemanthus nelsonii Bak.
Scadoxus puniceus (L.) Friis & Nordal
Boophane disticha (L.f.) Herb.

HYPOXIDACEAE
Hypoxis argentea Harv. Ex Bak.
H. rigidula Bak.
H. rooperi S. Moore

IRIDACEAE
Gladiolus ecklonii Lehm.
G. permeabilis Delaroché subsp. *edulis* (Burch. ex Ker-Gawl.) Oberm.

ORCHIDACEAE
Bonatea speciosa (L.f.) Willd.

DICOTYLEDONAE

SALICACEAE
Salix babylonica L.
S. capensis Thunb.

ULMACEAE

Celtis africana Burm.f.
PROTEACEAE
Protea caffra Meisn.

LORANTHACEAE
Tapinanthus rubromarginatus (Engl.) Danser

VISCACEAE
Viscum rotundifolium L.f.

SANTALACEAE
Osyris lanceolata Hochst. & Steud.
Thesium cf. T. spartioides A.W. Hill
T. utile A.W. Hill

POLYGONACEAE
Rumex conglomeratus Murb.
R. lanceolatus Thunb.
Polygonum amphibium L.
P. salicifolium Willd.

CHENOPODIACEAE
Chenopodium album L.
C. ambrosioides L.
C. botryodes SM.
C. murale L.

AMARANTHACEAE
Amaranthus caudatus L.
Cyathula globulifera Moq.
Pupalia lappacea (L.) Juss.
Aerva leucura Moq.
Achyranthus aspera L.
Brayulinea densa (Willd.) Small
Alternanthera repens (L.) O.Ktze.
Gomphrena celosioides Mart.

NYCTAGINACEAE
Commicarpus pentandrus (Burch.) Heimerl

AIZOACEAE
Limeum viscosum (Gay) Fenzl

MESEMBRYANTHEMACEAE
Delosperma cooperi (Hook. f.) L. Bol.
Ruschia putterillii (L. Bol.) L. Bol.

PORTULACACEAE
Talinum caffrum (Thunb.) Eckl. & Zeyh.
Anacampseros subnuda V. Poelln.
Portulaca oleracea L.
P. quadrifida L.

ILLECEBRACEAE
Pollichia campestris Ait.
CARYOPHYLLACEAE
Dianthus mooiensis I. Williams

CERATOPHYLLACEAE

Ceratophyllum demersum L.

RANUNCULACEAE

Clematis brachiata Thunb.

MENISPERMACEAE

Antizoma angustifolia (Burch.) Miers. Ex Harv.

PAPAVERACEAE

Argemone subfusiformis G.B. Ownbey

BRASSICACEAE

Lepidium africanum (Burm.f.) DC.

Rorippa nasturtium-aquaticum (L.) Hayek

CAPPARACEAE

Cleome monophylla L.

C. rubella Burch.

Boscia albitrunca (Burch.) Gilg & Ben.

CRASSULACEAE

Kalanchoe paniculata Harv.

K. rotundifolia (Haw.) Haw.

Crassula capitella Thunb.

C. setulosa Harv.

C. transvaalensis (Kuntze) K. Schum.

Adromischus umbraticola C.A. SM.

MYROTHAMNACEAE

Myrothamnus flabellifolia (Sond.) Welw.

FABACEAE

Acacia caffra (Thunb.) Willd.

A. erioloba E. Mey.

A. hebeclada DC.

A. hereroensis Engl.

A. karroo Hayne

A. robusta Burch.

Elephantorrhiza elephantina (Burch.) Skeels

Cassia biensis (Steyaert) Mendonca & Torre

C. quarrei (Ghesq.) Steyaert

Lotononis cxalycina (E. Mey.) Benth.

L. mucronata Conrath

Pearsonia cajanifolia (Harv.) Polhill subsp. *cajanifolia*

P. sessilifolia (Harv.) Dummer

Argyrolbium pauciflorum Eckl. & Zeyh.

A. rupestre (Eckl. & Zeyh.) Walp.

Melilotis indica (L.) All.

Indigofera alternans DC.

I. hilaris Eckl. & Zeyh.

I. longipes N.E. Br.

Indigofera melanadenia Benth. Ex Harv.

I. setiflora Bak.

Psoralea pinnata L.

Tephrosia burchellii Burt Davy

T. capensis (Jacq.) Pers.

T. elongata E. Mey.

T. longipes Meisn.

T. multijuga R.G.N. Young

Mundulea sericea (Willd.) A. Chev.

Sesbania punicea (Cav.) Benth.

Zornia milneana Mohl.

Neorautanenia ficifolius (Benth.) C.A. Sm.

Erythrina zeyheri Harv.

Rhynchosia caribaea (Jacq.) DC.

R. nervosa Benth. & Harv.

R. totta (Thunb.) DC.

Eriosema cordatum E. Mey.

Dolichos linearis E. Mey.

GERANIACEAE

Monsonia angustifolia E. Mey. Ex A. Rich.

M. burkeana Planch. Ex Harv.

Pelargonium luridum (Andr.) Sweet

P. myrrhifolium (L.) L'Herit.

OXALIDACEAE

Oxalis corniculata L.

O. depressa Eckl. & Zeyh.

ZYGOPHYLLACEAE

Tribulus terrestris L.

RUTACEAE

Zanthoxylum capense (Thunb.) Harv.

MALPIGHIACEAE

Sphedamnocarpus transvalicus (Kuntze) Burt Davy

POLYGALACEAE

Polygala amatymbica Eckl. & Zeyh.

P. hottentotta Presl.

EUPHORBIACEAE

Phyllanthus glaucophyllus Sond.

P. incurvus Thunb.

P. maderaspatensis L.

P. parvulus Sond.

Leidesia procumbens (L.) Prain

Acalypha angustata Sond.

A. caperonioides Baill.

Tragia rupestris Sond.

Jatropha zeyheri Sond.

Clutia pulchella L.

Euphorbia inaequilatera Sond.

ANACARDIACEAE

Rhus lancea L.f.

R. leptodictya Diels

R. magalismsontana Sond.

R. pyroides Burch.

R. rigida Mill.

R. undulata Jacq. var. *undulata*

CELASTRACEAE

Maytenus heterophylla (Eckl. & Zeyh.) N.K.B.
Robson

M. tenuispina (Sond.) Marais
Cassine aethiopica Thunb.

SAPINDACEAE

Pappea capensis Eckl. & Zeyh.

RHAMNACEAE

Ziziphus mucronata Willd.
Z. zeyheriana Sond.
Berchemia zeyheri (Sond.) Grubov.
Helinus integrifolius (Lam.) Kuntze

VITACEAE

Rhoicissus tridentata (L.f.) Wild & Drum.

TILIACEAE

Corchorus asplenifolius Burch.
Grewia flava DC.
G. occidentalis L.
Trumfetta sonderi Fical. & Hiern

MALVACEAE

Abutilon angulatum (Guill. & Perr.) Mast.
A. sonneratianum (Cav.) Sweet
Sida cordifolia L.
S. dregei Burt Davy
S. rhombifolia L.
Pavonia burchellii (D.C.) R.A. Dyer
Hibiscus calyphyllus Cav.
H. engleri K. Schum.
H. microcarpus Garcke
H. pusillus Thunb.
P. trionum L.

STERCULIACEAE

Melhania prostrata DC.
M. rehmannii Szyszyl.
Dombeya rotundifolia (Hochst.) Planch.
Hermannia depressa N.E. Br.
H. grandistipula (Buchinger ex Hochst.) K. Schum.
H. lancifolia Szyszyl.
H. tomentosa (Turcz.) Schinz ex Engl.

FLACOURTIACEAE

Kiggelaria africana L.
Scolopia zeyheri (Nees) Harv.

CACTACEAE

Opuntia vulgaris Mill.

THYMELEACEAE

Gnidia burchellii (Meisn.) Gilg
G. caffra Meisn.
G. capitata L.f.

COMBRETACEAE

Combretum molle R.Br. ex G. Don

ONAGRACEAE

Ludwigia stolonifera (Guill. & Perr.) Raven
Oenothera rosea L'Herit. Ex Ait.

ARALIACEAE

Cussonia paniculata Eckl. & Zeyh.

APIACEAE

Heteromorpha arborescens (Spreng.) Cham. & Schlechtd.
Apium leptophyllum (Pers.) F. Muell.

MYRSINACEAE

Myrsine africana L.

PLUMBAGINACEAE

Plumbago auriculata Lam.

EBENACEAE

Euclea crispa (Thunb.) Guerke subsp. *crispa*
E. undulata Thunb. Var. *myrtina* (Burch.) Hiern
Diospyros lycioides Desf.
D. whyteana (Hiern) F. White

OLEACEAE

Olea europaea L. subsp. *africana* (mill.) P.S. Green
Menodora africana Hook.

LOGANIACEAE

Nuxia congesta R.Br. ex Fresen.
Buddleja saligna Willd.
B. salviifolia (L.) Lam.

GENTIANACEAE

Chironia palustris Burch.

PERIPLOCACEAE

Ectadiopsis oblongifolia (Meisn.) Schltr.
Raphionacme hirsuta (E. Mey.) R.A. Dyer ex Phill.
R. dyeri Retief & Venter
R. galpinii Schltr.

ASCLEPIADACEAE

Xysmalobium parviflorum Harv. Ex Scott Elliot
Scizuglossum glabrescens Schltr.
Cordylogyne globosa E. Mey.
Pachycarpus schinzianus (Schltr.) N.E. Br.
Asclepias adscendens (Schltr.) Schltr.
A. aurea (Schltr.) Schltr.
A. burchellii Schltr.
A. eminens (Harv.) Schltr.
A. fruticosa L.
Pentarrhinum insipidum E. Mey.
Orthanthera jasminiflora (Decne.) Schinz
Riocreuxia torulosa Decne.

Orbeopsis lutea (N.E.Br.) Leach subsp. *lutea*

CONVOLVULACEAE

Cuscuta campestris Yunck.

Dichondra repens J.R. & G. Forst.

Convolvulus sagittatus Thunb. Var. *ulosepalus*
(Hallier f.) Verdc.

Merremia tridentata (L.) Hallier f.

Ipomoea bathycolpos Hallier f.

I. bolusiana Schinz

I. gracilisepala Rendle

I. magnusiana Schinz

I. ommaneyi Rendle

I. purpurea (L.) Roth

Turbina oblongata (E. Mey. ex Choisy) A. Meeuse

BORAGINACEAE

Ehretia rigida (Thunb.) Druce

Cynoglossum enerve Turcz.

VERBENACEAE

Verbena bonariensis L.

Lantana rugosa Thunb.

Lippia scaberrima Sond.

Chascanum adenostachyum (Schauer) Moldenke

LAMIACEAE

Teucrium trifidum Retz.

Acrotome hispida Benth.

Leonotis microphylla Skan

Stachys hyssopoides Burch. ex Benth.

Mentha longifolia (L.) Huds.

Aeollanthus canescens Guerke

Plectranthus madagascariensis (Pers.) Benth.

Becium angustifolium (Benth.) N.E. Br.

B. obovatum (E. Mey. ex Benth.) N.E. Br.

SOLANACEAE

Withania somnifera (L.) Dun.

Solanum coccineum Jacq.

S. incanum L.

S. panduriforme E. Mey.

S. retroflexum Dun.

S. sodomaeodes Kuntze

S. supinum Dun.

Datura ferox L.

Cestrum laevigatum Schlecht.

SCROPHULARIACEAE

Aptosimum depressum Burch.

A. indivisum Burch.

Nemesia fruticans (Thunb.) Benth.

Diclis reptans Benth.

Halleria lucida L.

Manulea paniculata Benth.

Sutera atropurpurea (Benth.) Hiern

S. caerulea (L.f.) Hiern

S. crassicaulis (Benth.) Hiern

S. floribunda (Benth.) Kuntze

S. palustris Hiern

Zaluzianskya lychnidea Walp.

Veronica anagallis-aquatica L.

Striga elegans Benth.

SELAGINACEAE

Walafrida densiflora (Rolfe) Rolfe

PEDALIACEAE

Pterodiscus speciosus Hook.

Sesamum triphyllum Welw. ex Aschers.

ACANTHACEAE

Thunbergia dregeana Nees

Chaetacanthus burchellii Nees

C. costatus Nees

Crabbea acaulis N.E. Br.

Barleria macrostegia Nees

B. obtuse Nees

Blepharis integrifolia (L.f.) E. Mey. ex Schinz

B. squarrosa (Nees) T. Anders.

Hypoestis verticillaris (L.f.) R. Br. Ex C.B.Cl.

Justicia anagalloides T. Anders.

RUBIACEAE

Kohautia amatymbica Eckl. & Zeyh.

K. aspera (Heyne ex Roth) Brem.

Oldenlandia herbacea (L.) Roxb.

Pentanisia angustifolia (Hochst.) Hochst.

Vangueria infausta Burch.

Pygmaeothis zeyheri (Sond.) Robyns

Tapiphyllum parvifolium (Sond.) Robyns

Canthium ciliatum (Klotzsch) Kuntze

Pavetta zeyheri Sond.

Anthospermum hispidulum E. Mey. ex Harv. &
Sond.

A. rigidum Eckl. & Zeyh.

Rubia horrida (Thunb.) Puff

DIPSACACEAE

Scabiosa columbaria L.

CUCURBITACEAE

Kedrostis hirtella (Naud.) Cogn.

Acanthosicyos naudinianus (Sond.) C. Jeffrey

Citrullus lanatus (Thunb.) Matsumura & Nakai

Cucumis africanus L.f.

C. zeyheri Sond.

Trichomeria debilis (Sond.) Hook.f.

Peponium caledonicum (Sond.) Engl.

Coccinia sessilifolia (Sond.) Cogn.

LOBELIACEAE

Lobelia decipiens Sond.

ASTERACEAE

Vernonia galpinii Klatt
V. natalensis Sch. Bip.
V. oligocephala (Dc.) Sch. Bip. Ex Walp.
V. poskeana Vatke & Hildebr. Var. *poskeana*
V. staehelinoides Harv.
Aster harveyanus Kuntze
Felicia muricata (Thunb.) Nees
Nidorella hottentotica DC.
Conyza bonariensis (L.) Cronq.
C. pinnata (L.f.) Kuntze
C. podocephala D.C.
Conyza scabrida D.C.
Brachylaena rotundata S. Moore
Tarchnanthus camphorates L.
Blumea cafra (DC.) O. Hoffm.
Ifloga glomerata (Harv.) Schltr.
Gnaphalium oligandrum (DC.) Hilliard & Burt Davy
Helichrysum cerastioides DC.
H. kraussii Sch. Bip.
H. nudifolium (L.) Less.
H. rugulosum Less.
H. setosum Harv.
Stoebe vulgaris Levyns
Athrixia elata Sond.
Geigeria aspera Harv.
Zinnia peruviana (L.) L.
Bidens pilosa L.
Schkuhria pinnata (Lam.) Cabr.
Tagetes minuta L.
Artemisia afra Jacq. Ex Willd.
Pentzia globosa Less.
Brachymeris athanasioides Hutch.
Lopholaena coriifolia (Sond.) Phill. & C.A. Sm.
Cineria aspera Thunb.
C. geifolia (L.) L.
Senecio affinis DC.
S. burchellii DC.
S. coronatus (Thunb) Harv.
S. erubescens Ait.
S. oxyriifolius DC.
S. venosus Harv.
Euryops empetrifolius DC.
Ursinia nana DC.
Haplocarpha scaposa Harv.
Gazania krebsiana Less.
Berkheya Montana Wood & Evans
B. pinnatifida (Thunb.) Thell.
B. radula (Harv.) De Wild.
Dicoma anomale Sond.
D. macrocephala DC.
Sonchus dregeanus DC.
S. nanus Sond. Ex Harv.
S. oleraceus L.
Lactuca capensis Thunb.

CHECKLIST OF BIRDS OF THE VREDEFORT DOME

<i>Tachybaptus ruficollis</i>	Dabchick	<i>Amaurornis flavirostris</i>	Black Crake
<i>Phalacrocorax carbo</i>	Whitebreasted Cormorant	<i>Porphyrio porphyrio</i>	Purple Gallinule
<i>P. africanus</i>	Reed Cormorant	<i>Gallinula chloropus</i>	Common Moorhen
<i>Anhinga rufa</i>	Darter	<i>Fulica cristata</i>	Redknobbed Coot
<i>Ardea cinerea</i>	Grey Heron	<i>Actophilornis africanus</i>	African Jacana
<i>A. melanocephala</i>	Blackheaded Heron	<i>Charadrius tricollaris</i>	Threebanded Plover
<i>A. goliath</i>	Goliath Heron	<i>Vanellus coronatus</i>	Crowned Plover
<i>Egretta alba</i>	Great White Egret	<i>V. armatus</i>	Blacksmith Plover
<i>Egretta garzetta</i>	Little Egret	<i>V. senegallus</i>	Wattled Plover
<i>E. intermedia</i>	Yellowbilled Egret	<i>Actitis hypoleucos</i>	Common Sandpiper
<i>Bubulcus ibis</i>	Cattle Egret	<i>Tringa glareola</i>	Wood Sandpiper
<i>Ardeola ralloides</i>	Squacco Heron	<i>T. stagnatilis</i>	Marsh Sandpiper
<i>Nycticorax nycticorax</i>	Blackcrowned Night Heron	<i>T. nebularia</i>	Greenshank
<i>Ixobrychus minutas</i>	Little Bittern	<i>Himantopus himantopus</i>	Blackwinged Stilt
<i>Scopus umbretta</i>	Hamerkop	<i>Larus cirrocephalus</i>	Greyheaded Gull
<i>Ciconia ciconia</i>	White Stork	<i>Chlidonias hybridus</i>	Whiskered Tern
<i>C. abdimii</i>	Abdim's Stork	<i>C. leucopterus</i>	Whitewinged Tern
<i>Mycteria ibis</i>	Yellowbilled Stork	<i>Columba guinea</i>	Rock Pigeon
<i>Threskiornis aethiopicus</i>	Sacred Ibis	<i>Streptopelia semitorquata</i>	Redeyed Dove
<i>Hagedashia hagedash</i>	Hadeda Ibis	<i>S. capicola</i>	Cape Turtle Dove
<i>Platalea alba</i>	African Spoonbill	<i>S. senegalensis</i>	Laughing Dove
<i>Dendrocygna viduata</i>	Whitefaced Whistling Duck	<i>Oena capensis</i>	Namaqua dove
<i>D. bicolor</i>	Fulvous Duck	<i>Cuculus gularis</i>	African Cuckoo
<i>Alopochen aegyptiacus</i>	Egyptian Goose	<i>C. solitarius</i>	Redchested Cuckoo
<i>Tadorna cana</i>	South African Shelduck	<i>Clamator jacobinus</i>	Jacobin Cuckoo
<i>Anas undulata</i>	Yellowbilled Duck	<i>Chrysococcyx klaas</i>	Klaas's Cuckoo
<i>A. sparsa</i>	African Black Duck	<i>C. caprius</i>	Diederik Cuckoo
<i>A. erythrorhyncha</i>	Redbilled Teal	<i>Centropus burchellii</i>	Burchell's Coucal
<i>A. smithii</i>	Cape Shoveller	<i>Tyto alba</i>	Barn Owl
<i>Netta erythrophthalma</i>	Southern Pochard	<i>Bubo africanus</i>	Spotted Eagle Owl
<i>Sarkidiornis melanotos</i>	Knobilled Duck	<i>Caprimulgus pectoralis</i>	Fierynecked Nightjar
<i>Plectropterus gambensis</i>	Spurwinged Goose	<i>C. rufigena</i>	Rufouscheeked Nightjar
<i>Sagittarius serpentarius</i>	Secretarybird	<i>C. tristigma</i>	Freckled Nightjar
<i>Gyps coprotheres</i>	Cape Vulture	<i>Apus apus</i>	Eurasian Swift
<i>G. africanus</i>	Whitebacked Vulture	<i>A. barbatus</i>	Black Swift
<i>Milvus migrans</i>	Yellowbilled Kite	<i>A. caffer</i>	Whiterumped Swift
<i>M. migrans</i>	Black Kite	<i>A. horus</i>	Horus Swift
<i>Elanus caeruleus</i>	Blackshouldered Kite	<i>A. affinis</i>	Little Swift
<i>Aquila verreauxi</i>	Black Eagle	<i>Cypsiurus parvus</i>	Palm Swift
<i>A. rapax</i>	Tawny Eagle	<i>Colius striatus</i>	Speckled Mousebird
<i>Haliaeetus vocifer</i>	African Fish Eagle	<i>C. colius</i>	Whitebacked Mousebird
<i>Buteo buteo</i>	Steppe Buzzard	<i>Urocolius indicus</i>	Redfaced Mousebird
<i>Accipiter ovampensis</i>	Ovambo Sparrowhawk	<i>Ceryle rudis</i>	Pied Kingfisher
<i>A. minullus</i>	Little Sparrowhawk	<i>Megaceryle maxima</i>	Giant Kingfisher
<i>Micronisus gabar</i>	Gabar Goshawk	<i>Alcedo semitorquata</i>	Halfcollared Kingfisher
<i>Melierax canorus</i>	Pale Chanting Goshawk	<i>A. cristata</i>	Malachite Kingfisher
<i>Falco peregrinus</i>	Peregrine Falcon	<i>Halcyon albiventris</i>	Brownhooded Kingfisher
<i>F. biarmicus</i>	Lanner Falcon	<i>Merops apiaster</i>	Eurasian Bee-eater
<i>F. amurensis</i>	Eastern Redfooted Kestrel	<i>M. persicus</i>	Bluecheeked Bee-eater
<i>F. tinnunculus</i>	Rock Kestrel	<i>M. hirudineus</i>	Swallowtailed Bee-eater
<i>F. rupicoloides</i>	Greater Kestrel	<i>Coracias garrulous</i>	Eurasian Roller
<i>F. naumanni</i>	Lesser Kestrel	<i>C. caudate</i>	Lilacbreasted Roller
<i>Francolinus levailanthoides</i>	Kalaharipatrys	<i>Upupa Africana</i>	African Hoopoe
<i>F. natalensis</i>	Natal Francolin	<i>Phoeniculus purpureus</i>	Redbilled Woodhoopoe
<i>F. swainsonii</i>	Swainson's Francolin	<i>Rhinopomastus cyanomelas</i>	Scimitar-billed Woodhoopoe
<i>Coturnix coturnix</i>	Common Quail		
<i>Numida meleagris</i>	Helmeted Guinea-fowl	<i>Lybius torquatus</i>	Blackcollared Barbet

<i>Trichlaema leucomelas</i>	Pied Barbet	<i>Sigelus silens</i>	Fiscal Flycatcher
<i>Trachyphonus vaillantii</i>	Crested Barbet	<i>Batis molitor</i>	Chin-spot Batis
<i>Indicator indicator</i>	Greater Honeyguide	<i>Batis pririt</i>	Pirit Batis
<i>Indicator minor</i>	Lesser Honeyguide	<i>Terpsiphone viridis</i>	Paradise Flycatcher
<i>Prodotiscus regulus</i>	Sharpbilled Honeyguide	<i>Motacilla aguimp</i>	African Pied Wagtail
<i>Campethera ambingoni</i>	Goldentailed Woodpecker	<i>M. capensis</i>	Cape Wagtail
<i>Dendropicus fuscescens</i>	Cardinal Woodpecker	<i>Anthus cinnamomeus</i>	Grassveld Pipit
<i>Thripias namaquus</i>	Bearded Woodpecker	<i>Macronyx capensis</i>	Orangethroated Longclaw
<i>Jynx ruficollis</i>	Redthroated Wryneck	<i>Lanius minor</i>	Lesser Grey Shrike
<i>Mirafra africana</i>	Rufousnaped Lark	<i>L. collaris</i>	Fiscal Shrike
<i>M. sabota</i>	Sabota Lark	<i>L. collurio</i>	Redbacked Shrike
<i>Calandrella cinerea</i>	Redcapped Lark	<i>L. atrococcineus</i>	Crimsonbreasted Shrike
<i>Hirundo rustica</i>	Eurasian Swallow	<i>Dryoscopus cubla</i>	Puffback
<i>H. albicularis</i>	Whitethroated Swallow	<i>Nilaus afer</i>	Brubru
<i>H. semirufa</i>	Redbreasted Swallow	<i>Tchagra australis</i>	Threestreaked Tchagra
<i>H. cucullata</i>	Greater Striped Swallow	<i>Telophorus zeylonus</i>	Bokmakierie
<i>H. spilodera</i>	South African Cliff Swallow	<i>Spreo bicolor</i>	Pied Starling
<i>H. fuligula</i>	Rock Martin	<i>Creatophora cinerea</i>	Wattled Starling
<i>Delichon urbica</i>	House Martin	<i>Cinnyricinclus leucogaster</i>	Plumcoloured Starling
<i>Riparia riparia</i>	Sand Martin	<i>Lamprotornis nitens</i>	Glossy Starling
<i>R. paludicola</i>	Brownthroated Martin	<i>Onychognathus morio</i>	Redwinged Starling
<i>R. cincta</i>	Banded Martin	<i>Nectarinia famosa</i>	Malachite Sunbird
<i>Campephaga flava</i>	Black Cuckooshrike	<i>N. afra</i>	Greater Doublecollared Sunbird
<i>Dicrurus adsimilis</i>	Forktailed Drongo	<i>N. talatala</i>	Whitebellied Sunbird
<i>Oriolus larvatus</i>	Blackheaded Oriole	<i>N. amethystine</i>	Black Sunbird
<i>Corvus capensis</i>	Black Crow	<i>Zosterops pallidus</i>	Cape White-eye
<i>C. albus</i>	Pied Crow	<i>Plocepasser mahali</i>	Whitebrowed Sparrowweaver
<i>Parus cinerascens</i>	Ashy Tit	<i>Passer domesticus</i>	House Sparrow
<i>Pycnonotis nigricans</i>	Redeyed Bulbul	<i>P. melanurus</i>	Cape Sparrow
<i>Turdus olivaceus</i>	Olive Thrush	<i>P. diffusus</i>	Greyheaded Sparrow
<i>T. litsitsirupa</i>	Groundscraper Thrush	<i>Petronia supercilialis</i>	Yellowthroated Sparrow
<i>Oenanthe monticola</i>	Mountain Chat	<i>Sporopipes squamifrons</i>	Scalyfeathered Finch
<i>O. pileata</i>	Capped Wheatear	<i>Ploceus velatus</i>	Masked Weaver
<i>Cercomela familiaris</i>	Familiar chat	<i>Quelea quelea</i>	Redbilled Quelea
<i>Thamnolaea cinnamomeiventris</i>	Mocking Chat	<i>Euplectes orix</i>	Red Bishop
<i>Mymecocichla formicivora</i>	Anteater Chat	<i>E. afer</i>	Golden Bishop
<i>Saxicola torquata</i>	Stonechat	<i>E. albonotatus</i>	Whitewinged Widow
<i>Cossypha caffra</i>	Cape Robin	<i>E. ardens</i>	Redcollared Widow
<i>C. humeralis</i>	Whitethroated Robin	<i>E. progné</i>	Longtailed Widow
<i>Erythropygia paeon</i>	Kalahari Robin	<i>Pytilia melba</i>	Melba Finch
<i>Sylvia borin</i>	Garden Warbler	<i>Lagonosticta rubricata</i>	Bluebilled Firefinch
<i>S. communis</i>	Whitethroat	<i>L. rhodopareia</i>	Jameson's Firefinch
<i>Parisoma subcaeruleum</i>	Titbabbler	<i>L. senegala</i>	Redbilled Firefinch
<i>Hippolais icterina</i>	Icterine Warbler	<i>Uraeginthus angolensis</i>	Blue Waxbill
<i>H. olivetorum</i>	Olivetree Warbler	<i>U. granatinus</i>	Violeteared Waxbill
<i>Acrocephalus arundinaceus</i>	Great Reed Warbler	<i>Estrilda astrild</i>	Common Waxbill
<i>A. baeticatus</i>	African Marsh Warbler	<i>Ortygospiza atricollis</i>	Quail Finch
<i>A. gracilirostris</i>	Cape Reed Warbler	<i>Sporaeginthus subflavus</i>	Orangebreasted Waxbill
<i>Bradypterus baboecala</i>	African Sedge Warbler	<i>Amadina erythrocephala</i>	Redheaded Finch
<i>Phylloscopus trochilus</i>	Willow Warbler	<i>Spermestes cucullatus</i>	Bronze Mannikin
<i>Apalis thoracica</i>	Barthroated Apalis	<i>Vidua macroura</i>	Pintailed Whydah
<i>Sylvietta rufescens</i>	Longbilled Crombec	<i>V. paradisaea</i>	Paradise Whydah
<i>Eremomela icteropygialis</i>	Yellowbellied Eremomela	<i>V. funerea</i>	Black Widowfinch
<i>Cisticola juncidis</i>	Fantailed Cisticola	<i>V. chalybeata</i>	Steelblue Widowfinch
<i>C. lais</i>	Wailing Cisticola	<i>Serinus atroglaris</i>	Blackthroated Canary
<i>C. chiniana</i>	Rattling Cisticola	<i>S. flaviventris</i>	Yellow Canary
<i>C. tinniens</i>	Levaillant's Cisticola	<i>Emberiza flaviventris</i>	Goldenbreasted Bunting
<i>C. fulvicapilla</i>	Neddicky	<i>E. capensis</i>	Cape Bunting
<i>Prinia flavicans</i>	Blackchested Prinia	<i>E. tahapisi</i>	Rock Bunting
<i>Muscicapa striata</i>	Spotted Flycatcher		

SMALL MAMMALS OF THE VREDEFORT DOME

<i>Elephantulus myurus</i>	Rock Elephant Shrew
<i>Atelerix frontalis</i>	African Hedgehog
<i>Suncus infinitesimus</i>	Least Dwarf Shrew
<i>Crociduramariquensis</i>	Swamp Musk Shrew
<i>C. cyanea</i>	Reddish-grey Musk Shrew
<i>Amblysomus hottentotus</i>	Hottentot Golden Mole
<i>Rhinolophus clivosus</i>	Geoffroy Horseshoe Bat
<i>Epitesicus capensis</i>	Cape Serotine
<i>Miniopterus schreibersii</i>	Schreiber Longfinger Bat
<i>Tadarida aegyptiaca</i>	Egyptian Free Tailed Bat
<i>Papio ursinus</i>	Cape Baboon
<i>Ceropithecus aethiops</i>	Vervet Monkey
<i>Manis temminckii</i>	Pangolin
<i>Vulpes chama</i>	Cape Fox
<i>Canis mesomelas</i>	Black Backed Jackal
<i>Ictonyx striatus</i>	Skunk
<i>Poecilogale albinucha</i>	Stripe Weasel
<i>Lutra maculicollis</i>	Spotted-necked Otter
<i>Aonyx capensis</i>	Cape Clawless Otter
<i>Genetta genetta</i>	Small-spotted Genet
<i>G. tigrina</i>	Large-spotted Genet
<i>Suricata suricatta</i>	Suricate
<i>Cynictis penicillata</i>	Yellow Mongoose
<i>Galerella sanguinea</i>	Slender Mongoose
<i>Atilax paludinosus</i>	Watermongoose
<i>Proteles cristatus</i>	Aardwolf
<i>Hyaena brunnea</i>	Brown Hyaena
<i>Felis lybica</i>	African Wildcat
<i>Felis nigripes</i>	Blackfooted Cat
<i>Felis serval</i>	Serval
<i>Orycteropus afer</i>	Aardvark
<i>Procavia capensis</i>	Rock Hyrax
<i>Sylvicarpa grimmia</i>	Common duiker
<i>Raphicerus campestris</i>	Steenbuck
<i>Lepus capensis</i>	Cape Hare
<i>L. saxatilis</i>	Scrub Hare
<i>Pronolagus randensis</i>	Jameson's Red Rock Rabbit
<i>Cryptomys hottentotus</i>	Common Molerat
<i>Hystrix africae-australis</i>	Porcupine
<i>Xerus inauris</i>	Cape Ground Squirrel
<i>Pedetes capensis</i>	Springhare
<i>Graphiurus murinus</i>	Woodland Dormouse
<i>Dendromus melanotis</i>	Grey Climbing Mouse
<i>Malacothrix typica</i>	Large-ear Mouse
<i>Mystromys albicaudatus</i>	White Tailed Rat
<i>Saccostomys campestris</i>	Pouched Mouse
<i>Steatomys krebsii</i>	Krebs Fat Mouse
<i>Aethomys namaquaensis</i>	Namaqua Rock Mouse
<i>A. chrysophilus</i>	Red Veld Rat
<i>Mus munitoides</i>	Dwarf Mouse
<i>Mastomys coucha</i>	Multimammate Mouse
<i>Rhabdomys pumilio</i>	Striped Mouse
<i>Otomys irroratus</i>	Vlei Rat
<i>Tatera leucogaster</i>	Bushveld Gerbil
<i>T. brantsii</i>	Highveld Gerbil

**LARGE MAMMALS WHICH PROBABLY OCCURRED IN THE VREDEFORT
DOME AREA**

Spotted Hyaena	<i>Crocuta crocuta</i>
Leopard	<i>Panthera pardus</i>
Lion	<i>Panthera leo</i>
Cheetah	<i>Aunonyx jubatus</i>
African Elephant	<i>Loxodonta africana</i>
White Rhinoceros	<i>Ceratotherium simum</i>
Burchell's Zebra	<i>Equus burchellii</i>
Hippopotamus	<i>Hippopotamus amphibius</i>
Giraffe	<i>Giraffa camelopardalis</i>
Oribi	<i>Ourebia ourebi</i>
Mountain Reedbuck	<i>Redunca fulvorufula</i>
Springbuck	<i>Antidorcas marsupialis</i>
Blesbuck	<i>Damaliscus dorcas phillipsi</i>
Red Hartebeest	<i>Alcelaphus buselaphus</i>
Black Wildebeest	<i>Connochaetes gnou</i>
Kudu	<i>Tragelaphus strepsiceros</i>
Eland	<i>Taurutragus oryx</i>
African Buffalo	<i>Syncerus caffer</i>

OWNERSHIP OF LAND IN THE DEMARCATED AREA OF THE VREDEFORT DOME

FREE STATE PROVINCE

FARM NAME	LANDOWNER	POSTAL ADDRESS	CONTACT NUMBERS
KLEIN SWEETHOME 893	N.A.Marks	PO Box 131073 Northmead 1511	Tel. (05692-) 2521 (011-) 425 3069 Fax. (011-) 425 5033
Subdivision DEELFONTEIN 19	W.C. Greeff	PO Box 276 Vredefort 9595	Tel. (05692-) 1204
Sudivision DEELFONTEIN 19	A. Cloete	PO Box 334 Vredefort 9595	Tel. (05962-) 1202 Cell. 082 808 1837
Subdivision DEELFONTEIN 19	T. Greeff	PO Box 263 Vredefort 9595	Tel. (0568-) 18 1558
Subdivision DEELFONTEIN 19	A. Rheeder	PO Box 246 Vredefort 9595	Tel. (056-) 931 0411 Fax. (056-) 931 0063 (att. Rheeder)
Subdivision DEELFONTEIN 19	M. Greeff	PO Box 190 Vredefort 9595	Tel. (05692-) 2611 Fax. (011-) 364 7056 Cell. 083 701 5215
Subdivision DEELFONTEIN 19 ERFDEEL 499	J. van Biljon	PO Box 148 Vredefort 9595	Tel. (05692-) 2511
PARSON'S RUST 465	G. Gillespie	PO Box 2309 Parys 9585	Tel. (056-) 818 1220 Cell. 083 407 1899
SKURWEDRAAI 382	A.C. Kotze	PO Box 284 Parys 9585	Tel. (056-) 817 6548
STEENKAMPSBERG 127	L. Lindeque	PO Box 237 Parys 9585	Tel. (05692-) 2713 Cell. 083 384 7158
HELENA 780	S.L.J. Jansen van Rensburg	PO Box 290 Vredefort 9595	Tel. (056-) 818 1351 Cell. 083 626 2762
ELIZA 972	S.P. Papavarnavas	PO Box 29 Parys 9585	Tel. (056-) 817 7786 (W) (056-) 811 3052 (H)
EDENVALE 407	J.J. Danhauser	PO Box 456 Parys 9585	Tel. (056-) 81 4584 Cell. 083 655 0125
DASKOP 1103 TARENDAALKOP 1103	W.R. Dedwith	PO Box 53 Parys 9585	Tel. (056-) 818 1352
RENSBURGSDRIFT 432 THEUNISSEN 1081	A. Dedwith	PO Box 53 Parys 9585	Tel. (056-) 818 1352

FARM NAME	LANDOWNER	POSTAL ADDRESS	CONTACT NUMBERS
EERSTE GELUK 515	P.A. Gericke	PO Box 152 Vredefort 9595	Tel. (05692-) 2620 Cell. 082 367 4045
Subdivision DAMPOORT 699	A.J. Wiegand	PO Box 40 Vredefort 9595	Tel. (05692-) 2711
HEIMBACH 500 DRIEHOEK 329 FONTEIN 501	H.J. van Zyl	PO Box 327 Vredefort 9595	Tel. (05692-) 2704 Cell. 083 408 2787
Subdivision DAMPOORT 699	C.D. Reitz	PO Box 259 Vredefort 9595	Tel. (05692-) 2721
SKURWEDRAAI SKOOL 382	F. van der Merwe	PO Box 191 Mt Pellen Glenvista Johannesburg	Tel. (056-) 811 4054 (011-) 682 3614
BET EL 267	R. Dixon	PO Box 335 Parys 9585	Cell. 082 650 4488
Sudivision REBOKKOP 290	P.J. Muller	PO Box 205 Vredefort 9595	Tel. (05692-) 2621
ZUID-WITBANK 433 SPITZKOP 1060 DIEPSLOOT 1186	K. Marx	PO Box 70793 De Wlgers 0041	Cell. 082 459 6877
BOSCHRANT 849	G. Potgieter	PO Box 112 Vredefort 9595	Tel. (056-) 818 1426 (neighbours)
AASVOGELRANT 249 UNION 440 PIESANHOEK 617 DE NOON 294 BERGPLAAS 420 GROOTFONTEIN 421 MAARA 618 TOAL 819 TOAL 1 820 TOAL2 482 TOAL 3 471 MOUNT SINAI 292 RIETKUIL 110 DAMPOORT 699 VAN VUURENSKOP 457	J. van Aswegen	PO Box 591 Sasolburg	Cell. 082 554 9030 Fax. (016-) 973 1534
AASVOGELRANT-OOS 281 BYEBOER	E. Erasmus	PO Box 21198 Nooer Brug Potchefstroom	Tel. (018-) 297 4831 Fax. (018-) 299 2316 Cell. 082 801 2874
HYDOCKSRUST 1403 ORTLEPP 1098	M. Prinsloo	PO Box 1734 Parys 9585	Tel. (056-) 818 1425
RIVERVIEW 393	S. Hill	PO Box 2188 Parys 9585	Tel. (056-) 818 1558

FARM NAME	LANDOWNER	POSTAL ADDRESS	CONTACT NUMBERS
DE TUIN 422 (WONDEROORD)	J. Senekal	PO Box 1109 Parys 9585	Tel. (056-) 811 4129
VENTERSRANT 394 DE TUINE 394	D. Kriel	PO Box 131 Alberton 1450	Tel. (011-) 861 3338 Fax. (011-) 861 3361 Cell. 083 442 3745
OUDEWERF (VAAL HACKLE)	R. Strydom	PO Box 154 Ifafi 0260	Tel. (012-) 259 0453 Fax. (012-) 259 0330 Cell. 083 271 1483
FONTEIN 501	A. Jacobs	PO Box 84 Vredefort 9595	Tel. (05692-) 2503
DASKOP 1103	J. de Lange	PO Box 69 Parys 9585	Tel. (056-) 818 1726
WITBANK (RIVERSIDE) 433 DIMALACHITE	H. Pretorius	PO Box 270 Vredefort 9595	Tel. (056-) 818 1860 (056-) 818 1616
WITBANK 433	A. Smith	PO Box 1339 Parys 9585	Tel. (056-) 818 1204
BOOMPLAATS 1005	R. Petzer	PO Box 793 Parys 9585	Tel. (056-) 811 4053 (016-) 933 6012
BARNARDSRUS 1003	A.P.S. Meyer	PO Box 1855 Parys 9585	Tel. (056-) 818 1355
HOENDERLAND 1002	J. van der Merwe	PO Box 667 Alberton 1450	Tel. (011-) 869 4604
DOORNHOEK 1000	G. Meyer	PO Box 2691 Vanderbijlpark 1900	Tel. (056-) 811 5040 (016-) 9311 7201 Cell. 082 449 8411
NOOITGEDACHT 89	J. Bronkhorst	PO Box 22 Vredefort 9595	Tel. (05692-) 1731
BASKOP 461 VIRGINIA 517 RUST EN VREDE 109	S. Engelbrecht	PO Box 4149 Pretoria 0001	Cell. 083 625 4175 Fax. (012-) 664 7795
KOMANDONEK 1185	W. de Vries	PO Box 1248 Mafikeng 2745	Cell. 083 459 8933
VENTERSKLOOF 424	G. Lachmann	38 Lupine Street Potchefstroom 2531	Tel. (018-) 290 5863
BET EL 267 SLANGKOP 423	N. Conradie	PO Box 543 Potchefstroom 2520	Tel. (018-) 294 8828
Subdivision B1110 REBOKKOP 290	H.S. du Preez	PO Box 19598 Noordbrug (Potchefstroom) 2522	Tel. (018-) 290 5619

FARM NAME	LANDOWNER	POSTAL ADDRESS	CONTACT NUMBERS
Subdivision 931 REBOKKOP 290	Prof. A. Heyns	PO Box 6778 Baileypark (Potchefstroom) 2526	Tel. (018-) 290 5146
S KLIP 496	S.H. Moorcroft	104 Newlands Road Newlands Johannesburg 2092	Tel. (05692-) 2702 (011-) 477 7129
GOEDGEDAG 971 VYFERSRUST 971	M.B. van Biljon	PO Box 286 Vredefort 9595	Tel. (0568-) 18 1980
THEUNISRUST 290 THESENSRUST	W.H.van Biljon	20 Straus Street Vanderbijlpark 1911	Tel. (016-) 982 1104
REIDSRUST 46	J.P. van Biljon	16 Gillespe Street Vanderbijlpark 1911	Tel. (016-) 933 3090
SWEETHOME 893	J.A. van Wyk	PO Box 664 Viljoenskroon 9520	Tel. (011-) 837 5329
Subdivision REBOKKOP 290	Prof. V.E. Dassenville	PO Box 6276 Weltevrededepark 1715	Tel. (011-) 475 2839 Fax. (011-) 475 2839
SUNNYSIDE 514 WITKLIPFONTEIN 166	Dr. F.J. Rademan	PO Box 45304 Maifair 2108	Tel. (011-) 888 4551 (H) (011-) 837 8995/6 (W) Cell. 082 337 2184
LIBERTAS 518	A. de Klerk	PO Box 1207 Potchefstroom 2520	Tel. (05692-) 2231
MIZPA 516	C. Pretorius	32 Voortrekker Street Vredefort 9595	Tel. (056-) 931 0419
LESUTOSKRAAL 72	E. du Toit	10 Park Street Vredefort 9595	Tel. (056-) 931 0624
WITKLIPFONTEIN A519	A.E.C. Janse van Vuuren	PO Box 198 Vredefort 9595	Tel. (056-) 931 0052
MORAY 505	L. Stols, A.W. Viljoen and others		Cell. 082 443 2208
BAVIAANSKRANTZ 435			
WELVERDIEND 973			
FONTEINPLAAS 848			

NORTHWEST PROVINCE

[* - members of Bergland Dome Conservancy]

FARM NAME	LANDOWNER	POSTAL ADDRESS	CONTACT NUMBERS
ROCKY RIDGE 23	F. Weideman *	PO Box 615 Parys 9585	Tel. (056-) 818 1644
KOPJESKRAAL	S. Buys *	PO Box 2271 Parys 9585	Tel. (056-) 818 1810 Fax. (056-) 817 7331
KOEDOESFONTEIN	P.L. Röntgen *	PO Box 329 Parys 9585	Tel. (056-) 811 4015
KOEDOESFONTEIN	J. Ferreira *	PO Box 92 Parys 9585	Tel. (056-) 811 3851 Cell. 082 271 8465
KOEDOESLAAGTE	L. van Vuuren *	58 Umgeni Street Drie Riviere 1939	Tel. (016-) 423 3458
KOEDOESLAAGTE	N.J. Croeser *	PO Box 70554 Miederpark 2527	Tel. (018-) 294 4746 (B) (056-) 818 1155 Cell. 082 800 8371
KOEDOESFONTEIN	I.S. Fourie *	PO Box 10551 Johannesburg 2000	Tel. (011-) 498 4000 (B) (011-) 475 2546 (H) Fax. (011-) 836 3763
BUFFELSHOEK	J.H. Nel *	PO Box 1405 Parys 9585	
KOEDOESFONTEIN	J.A. Jordaan *	PO Box 1771 Parys 9585	Tel. (056-) 818 1605
BUFFELSHOEK	W. Olivier *	PO Box 829 Parys 9585	Tel. (056-) 818 1182
KOEDOESFONTEIN SONOP LEEUFONTEIN	Adv. S. le R. De la Harpe *	PO Box 1344 Potchefstroom 2520	Tel. (056-) 818 1750 (H) (018-) 299 1636 (B)
KOEDOESFONTEIN	R. Herbst *	PO Box 2347 Sasolburg 9579	Tel. (056-) 818 1319 (H) (016-) 920 2957 (B) Cell. 082 804 6557
KOEDOESFONTEIN	W.J. Jackson *	PO Box 905 Parys 9585	Tel. (056-) 818 1604
VILJOENSRUS	G. Viljoen *	PO Box 872 Parys 9585	Tel. (056-) 818 1316
KOEDOESFONTEIN	P. Els *	PO Box 630 Parys 9585	Tel. (056-) 811 3856
KOEDOESFONTEIN	P.J. Claassen *	PO Box 715 Parys 9585	Tel. (056-) 811 3856
BUFFELSHOEK	D. Serenyane *	PO Box 651680 Benmore 2010	Tel. (011-) 803 3510 (B) (011-) 802 2863 (H) Cell. 082 372 5566
APACHE BUFFELSHOEK	J. Geldenhuys *	PO Box 2446 Klerksdorp 2570	Tel. (018-) 462 8426 (B) (018-) 468 6673 (H)

FARM NAME	LANDOWNER	POSTAL ADDRESS	CONTACT NUMBERS
KOEDOESFONTEIN	P Malan *	18A Van Der Hof Road Potchefstroom 2520	Tel. ((018-) 297 1352
KOEDOESLAAGTE	J.S.M. Coetzee *	PO Box 72 Parys 9585	
KOEDOESLAAGTE	E. Grämmel *	198 Daffodil Road Lynwood Ridge 0081	Tel. (012-) 476 9265
KOEDOESLAAGTE	J.J. Landman *	PO Box 129 Parys 9585	Tel. (056-) 811 3812
BUFFELSKLOOF	J.H. Naude *	PO Box 420 Kroonstad 9585	Tel. (0562-) 3968
BUFFELSKLOOF	J.S. van der Merwe *	PO Box 1923 Parys 9585	Tel. (056-) 818 1116
BUFFELSKLOOF	R.P. van der Berg *	PO Box 17909 Sunward Park 1470	Tel. (011-) 896 1483
BUFFELSKLOOF	Dr. M.N. Herman *	PO Box 668 Heilbron 9650	Tel. (05889-) 2 1445
ROODERANT	G. Erasmus *	PO Box 1058 Rooihuiskraal Cemturion 0154	Tel. (012-) 661 9343 (H) (012-) 311 2711 (B) Cell. 082 770 8784
ROODERANT	Prof. J.C. Coetzee *	123 Molen Street Potchefstroom 2520	Tel. (018-) 294 6190
ROODERANT	L. Coetzee *	473 Arius Street Waterkloof Ridge Pretoria 0002	Tel. (012-) 462 6612
ROODERANT	F.P. de Beer *	PO Box 5585 Kocks Park Potchefstroom 2523	Tel. (018-) 291 1192
ROODERANT	J. Haggard *	PO Box 252 Viljoenskroon 9520	Tel. (056-) 343 0051
TIERFONTEIN	P.J. Pienaar *	PO Box 1107 Potchefstroom 2520	Tel. (018-) 291 1307
TIERFONTEIN UITVAL	D. van der Merwe *	PO Box 310 Fochville 2515	Tel. (018-) 291 1313
TIERFONTEIN	J. Jordaan *	PO Box 6318 Baillie Park 2526	Tel. (018-) 291 1314
GROOTFONTEIN	P. van Wyk *	PO Box 6599 Baillie Park 2526	
LEEUFONTEIN	Rev. De W. Kruger *	PO Box 35044 Northway 4065	Tel. (013-) 84 1122
LEEUFONTEIN	P. Kirstein *	PO Box 324 Potchefstroom 2520	Tel. (018-) 291 1127

FARM NAME	LANDOWNER	POSTAL ADDRESS	CONTACT NUMBERS
HEADLANDS KOPJESKRAAL	J.C. Olivier *	PO Box 2191 Parys 9585	Tel. (056-) 818 1709
KOEDOESFONTEIN	D. Senekal *	PO Box 5252 Kocks Park 2523	Tel. (056-) 818 1274
	I Smrz *	PO Box 455 Walkerville 1876	
KLIPFONTEIN	B. Erasmus *	Potchefstroom	
KOEDOESFONTEIN	Adv. De W. Nigrini *		
KOEDOESFONTEIN	G. van Rensburg *		
JUMBO	Prof. C.F.C. van der Walt *	PO Box 19972 Noordbrug 2522	Tel. (018-) 290 6532
STEILTES	Mrs. T. du Preez * (Vaalrivier Steiltes)	16 Cilliers Street Klerksdorp	Tel. (018-) 468 2838 (018-) 462 1039
ROODERANT	Rooderant Trust * (C du Plessis)	PO Box 1413 Potchefstroom 2531	Tel. (018-) 294 3254
KOPJESKRAAL	Miss. T. Theron *	PO Box 34 Parys 9585	Tel. (056-) 818 1655
BUFFELSHOEK	E. Beyleveld		Tel. (056-) 818 1179
BUFFELSHOEK	G. Risseeuw		Tel. (056-) 818 1497
ROODERANT	P. Erasmus		
TIERFONTEIN	B. Linde		
TIERFONTEIN	W. Haarhoft		
TIERFONTEIN	A. Scholtz		
TIERFONTEIN	J. Barnard		
KOEDOESFONTEIN	J.S. Ferreira	10 Kort Street Parys 9585	
RIETPOORT	A. Muller		Tel. (018-) 297 3841

FARM NAME	LANDOWNER	POSTAL ADDRESS	CONTACT NUMBERS
TIERFONTEIN	S Theron *	PO Box 200 Potchefstroom 2520	Tel. (018-) 294 3867
LEEUFONEIN	J.P.A. Pienaar *	PO Box 514 Potchefstroom 2520	Tel. (018-) 291 1121
ROODERANT	Dr. Burger *	192 Anderson Drive Norhtcliff 2195	Tel. (011-) 782 4972
SCHOEMANSDRIF	Mrs. K. Janse van Rensburg *	PO Box 34 Vredefort 9595	Tel. (018-) 291 1328
ROODERANT	F. Bekker *	PO Box 5008 Kocks Park Potchefstroom 2523	Tel. (018-) 293 0570 (H) (018-) 297 1014 (B)
BOSHUT	Toyen Polimac *	PO Box 2407 Sasolburg 9579	Tel. (016-) 976 0444
VENTERSKROON	I. van der Walt *	66 Tom street Potchefstroom 2531	Tel. (018-) 294 8745
ROODERANT Div.13	A.C. de Agrela *	PO Box 5155 Kocks Park 2523	Tel. (018-) 291 1191
ROODERANT	P. van Zyl *	147 Nieuwe Street Potchefstroom 2520	Tel. (018-) 294 7630
ROODERANT Div. 75	T.B. Lourens *	158 Milton drive Orkney 2619	Tel. (018-) 473 3132
ROODERANT	Mrs. A. Hilder *		Tel. (018-) 291 1193
ROODERANT Div. 12	O. Stumpke *	PO Box 446 Sundra 2200	Tel. (013-) 661 1880
ROODERANT Div. 23	P.J. Allen *	26 Cecil Drive Melrose Johannesburg 2000	Tel. (011-) 788 5843 (011-) 442 6419
ROODERANT Div. 24	J. Swanepoel *		
ROODERANT Div. 12	G. Vos *	PO Box 720652 Parkview 2193	Tel. (011-) 646 4637 (011-) 646 1808
ROODERANT	T.B. Lourens *	168 Milton Drive Orkney 2619	Tel. (018-) 473 3132
ROODERANT	T. van Niekerk *	PO Box 684 Lydenburg 1120	Tel. (01323-) 5 1409 Cell. 083 305 7868
ROODERANT	B. Arendt *	PO Box 44200 Linden 2104	Tel. (011-) 782 7431 (H) (011-) 888 1079 (B) (018-) 291 1186
BUFFELSKLOOF	DR Church Noordbrug *	PO Box 20499 Noordbrug Potchefstroom	Tel. (056-) 818 1555

FARM NAME	LANDOWNER	POSTAL ADDRESS	CONTACT NUMBERS
GROOTFONTEIN	F.P. Naude	PO Box 242 Kroonstad	Tel. (0562-) 4261 Cell. 083 255 2003
BUFFELSKLOOF	W. van der Merwe	1 Santa Barbara Gerhard Moerdyck Street, Pretoria 0002	Tel. (012-) 44 9873
BUFFELSKLOOF	T. Dale		Tel. (011-) 376 2305 (B) (011-) 646 1263 (H) Cell. 082 569 2860

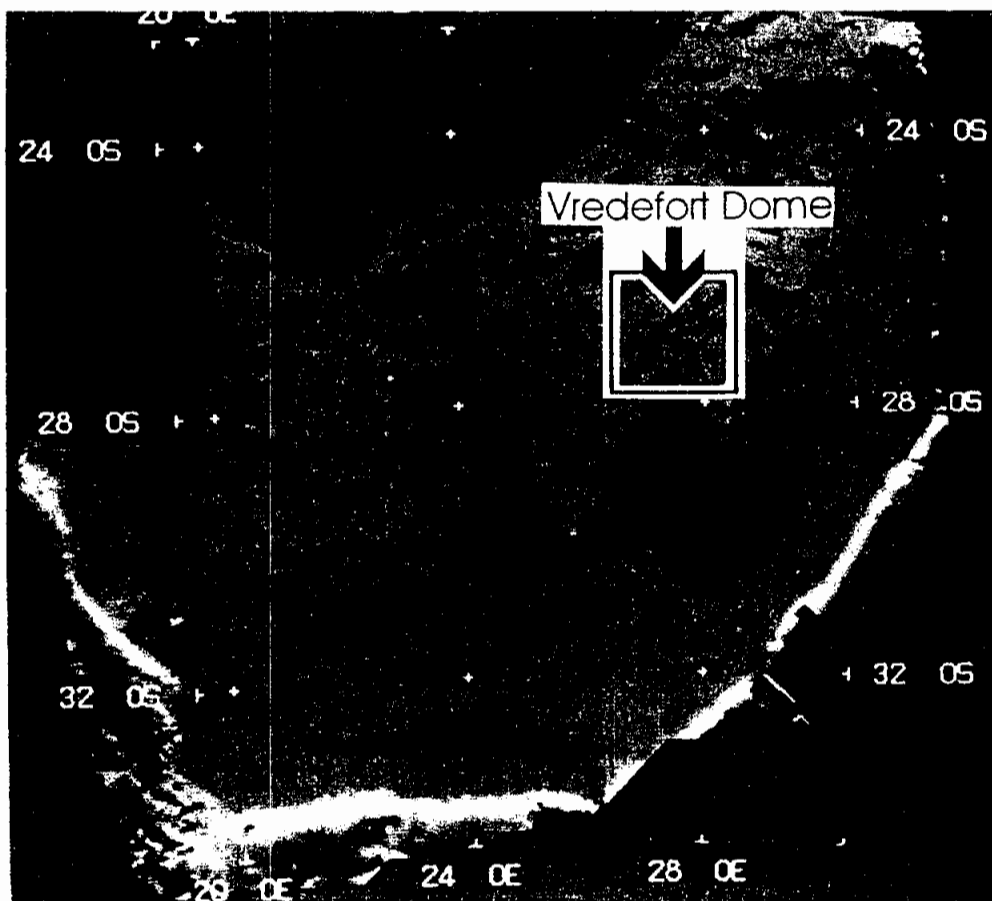
VREDEFORT DOME IN LINE-UP FOR WORLD HERITAGE SITE

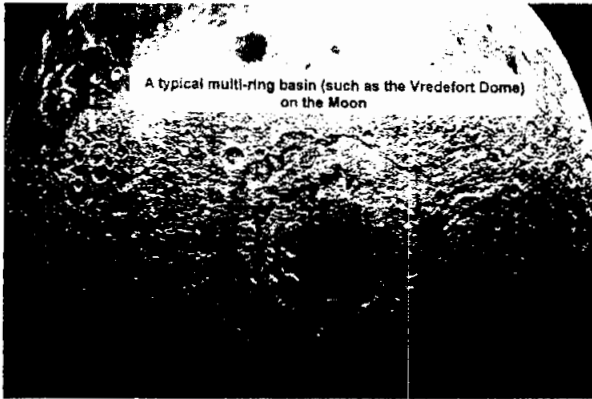
WHY IS THE VREDEFORT DOME PROPOSED AS A WORLD HERITAGE SITE?

A WORLD-FAMOUS METEORITE IMPACT SITE

2000 Million years ago, a giant meteorite of 10 km in diameter hit the earth at the spot where the small town of Vredefort is today. The impact of the meteorite left an enormous crater of approximately 90 km in diameter at its first ring. It has a circular ground plan with at least three rings extending outwards. Although a significant part of the crater rings eroded away with time, a spectacular part of it is still to be seen in the beautiful outcrops near Parys in the Free State and Potchefstroom in the North West Province. Of the original crater, only the root zone remains, affording geologists a unique opportunity for the study of the exposed inner anatomy of an astrobleme. Such a part of an astrobleme is found nowhere else on the earth.

The area became known as the 'Vredefort Dome' because of the dome-like structure that was formed after the impact of the meteorite. Today the site is recognised world-wide as the largest and the oldest meteorite impact site on earth. It is the best preserved impact site of such a large scale on the surface of the earth and draws scientists, geologists and astro-geologists from all over the world. The Dome was the focus of an International Conference on meteorite impact sites at Wits University in July this year. The conference attracted the famous astro-geologist Dr. Shoemaker, discoverer of the Comet Shoemaker-Levy 9.

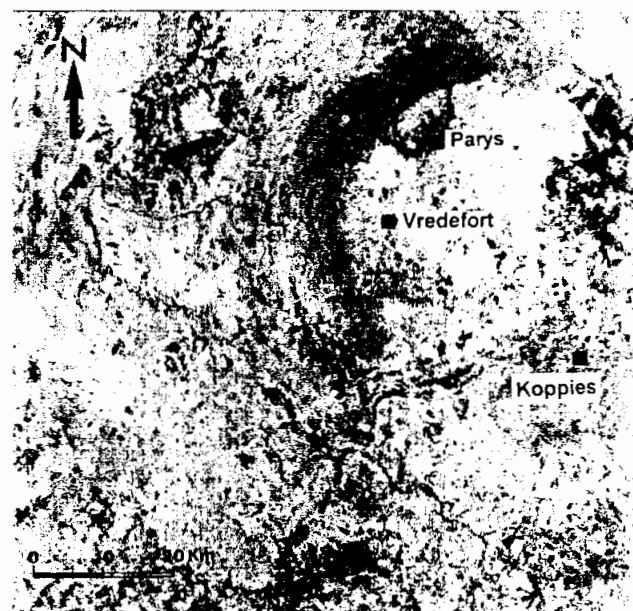




A processed image of pen file aeromagnetic data from the Vredefort dome

Earth scientists view the bombardment of the earth by large extra-terrestrial objects as being undoubtedly a major process during the origin and early development of earth. The Vredefort event is linked to the development of oxygen and multicellular life on earth. The event may have played a key role in determining the route followed by the evolution of life on earth, including that of humanity. (The same type of dolomite caves, which are found at Sterkfontein – where the world-famous skull of ‘Mrs. Ples’ was found – occurs in the first and second ring of the Dome.) The Vredefort Dome can thus be regarded as a site of universal scientific value – one of the main criteria set by UNESCO for World Heritage recognition.

Landsat image of the Vredefort Structure. The course of the Vaal river is clearly visible.



HISTORY AND PRE-HISTORY: ORIGIN OF LIFE ON EARTH

Although the scientific and geological value of the Vredefort Dome is seen as the most important aspect of the application for World Heritage status, the area’s rich anthropological, ecological and archaeological heritage forms a significant part of the motivation.

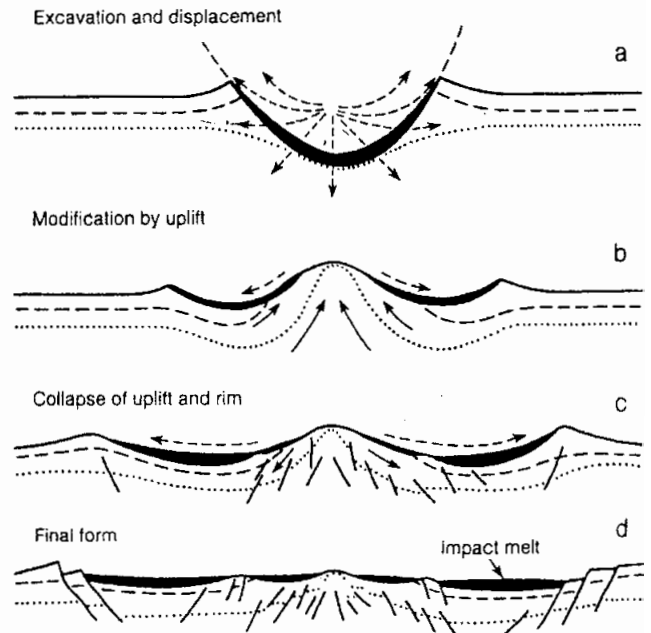
HISTORY AND PREHISTORY: ARCHAEOLOGICAL AND ANTHROPOLOGICAL HERITAGE OF THE VREDEFORT DOME

THE MODIFICATION STAGE IN THE FORMATION OF A COMPLEX CRATER SUCH AS THE VREDEFORT DOME

After excavation (a), rebound of central zone beneath crater thrusts upward, forming a central uplift (b).

The uplift subsequently collapses (c), in conjunction with collapse of the rim.

In final form (d), crater consists of slumped wall material and central peak and/or inner ring; impact melt sheet lines crater floor.



PANORAMA VIEWED FROM THE SITE OF PROPOSED MINING



PROPOSED AREA OF MINING



RAVINES WITH STEEP CLIFF WALLS

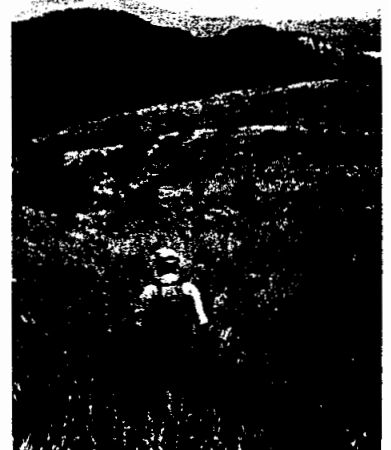


The proposed area of mining is situated mainly on the high hilltops of the Dome. Many ravines with perennial mountain streams, which flow into the Vaalriver are located alongside these hills. Even small disturbances to the hydrology and geo-hydrology in these sensitive eco-systems will have a devastating effect on its unique and age-old plant communities.

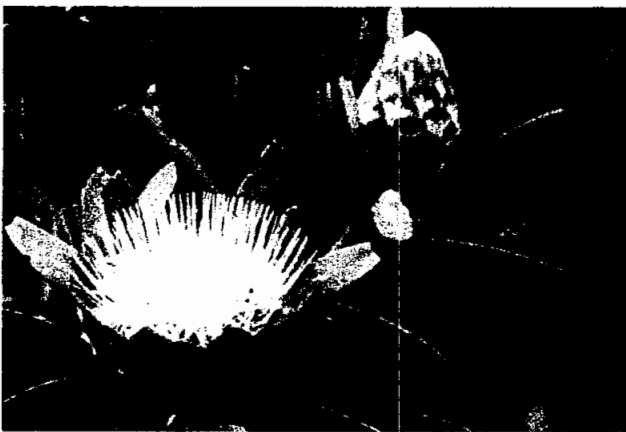


Left: A large chunk of gold ore on the proposed area of mining, overlooking a magnificent view of the Dome

Right: Several hiking routes and lodges are situated on these hilltops



The unique geological structure of the Dome brought about microhabitats and microclimates ensuring plant and tree communities, which are exceptional and unique in South Africa. Certain tree species like the Red Ivory, Cape Chestnut, Bladdernut and Cape Holly only occur hundreds of kilometres away from the area. This is also the case with certain plant species like the treefern (*Cyathea Dregei*), which occur in the many ravines in the area.



Open cast mining is known to be one of the ecologically most unfriendly ways of mining – rehabilitation of mountainous areas with trees as old as 300 years will be impossible. It will take centuries, if ever, for the area to recover.

ECO-TOURISM AND RECREATION IN THE DOME



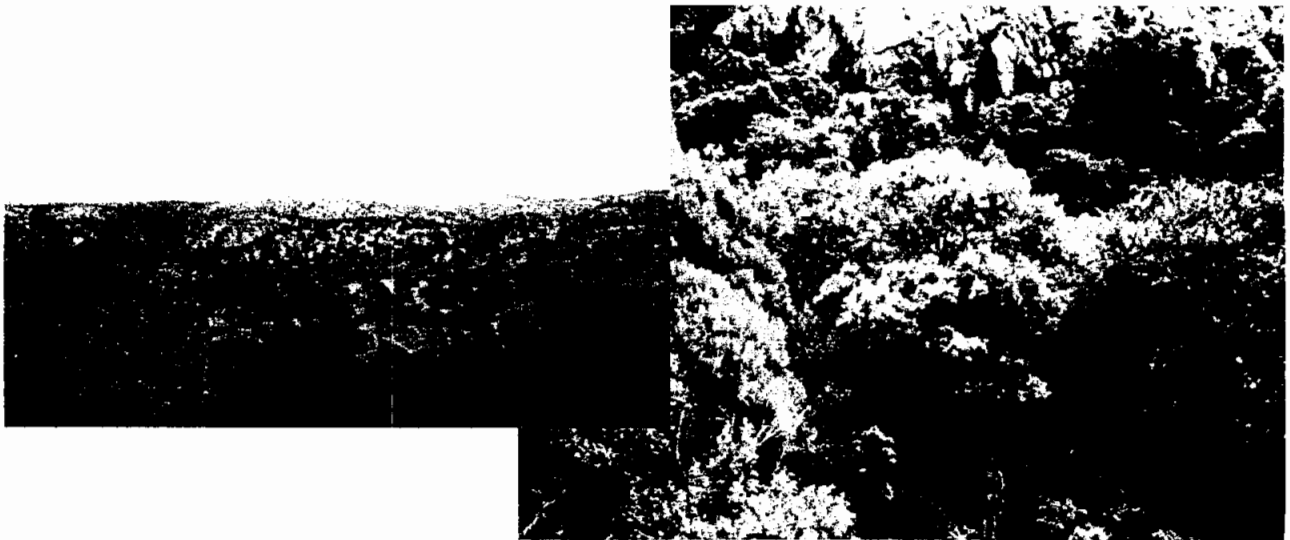
The Vredefort Dome has been identified as a growth node by both the North West and Free State provinces' departments of Tourism and Environmental Conservation. In particular it forms part of the Tourism Master Plan for the North West Province.

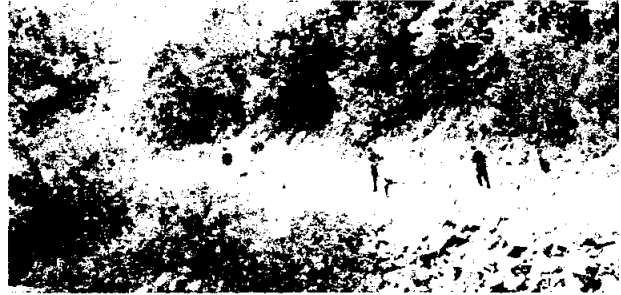
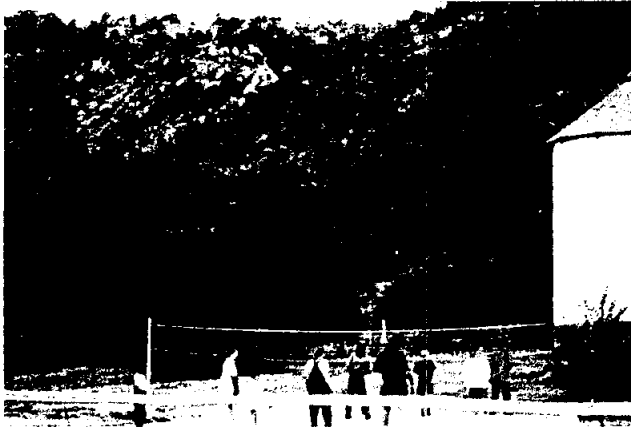
The area's excellent location (only one and a half hours drive from Johannesburg) and its exceptionally unspoilt and scenic beauty draw thousands of tourists throughout the year. Both locally and internationally, the Dome area has the potential to become one of the prime eco-tourism destinations of South Africa – an aspect which will be greatly enhanced if the site is given World Heritage status.



The variety of activities, which are provided, the number of interesting tourist sights and the favourable location of the area makes the Dome unparalleled in a radius of at least 300 kilometres

form Gauteng. Activities include hiking, horse-riding, ab-sailing, canoeing, white water rafting, fishing, birding, game viewing and the viewing of sites of archaeological, historical and geological importance.





The area is increasingly being utilised for conferences, team building, and for educational community projects such as training in craft making and environmental awareness projects. Many schools visit the area for recreational and educational purposes. National mountain bike events as well as ordinary marathons are held on a regular basis in the Dome.

A great diversity in habitats for game exists, including open plains, mountains, bushveld and riverine bush. Historically the 'big five' occurred in the Dome area and several game parks exist in the area. The Dome area is renowned for its bird life. Hosting more than 400 different species, it is labelled as an 'IBA' (Important Birding Area) of South Africa.



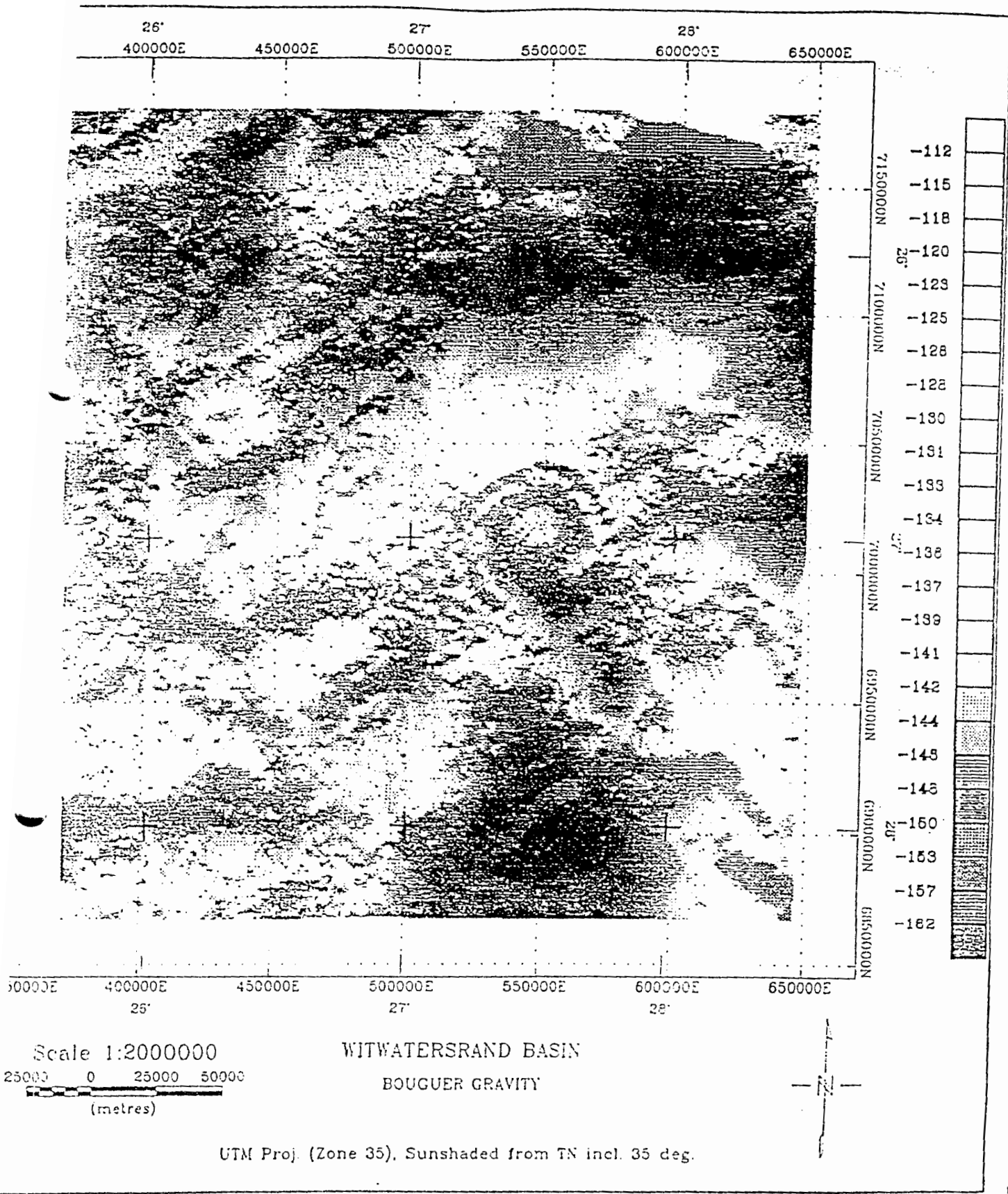


Figure 15: Gravity (Bouguer anomalies) map of the Witwatersrand basin (from Henkel & Reimold, 1998; courtesy of the Geology Division, Gold Fields of South Africa (Pty) Ltd).

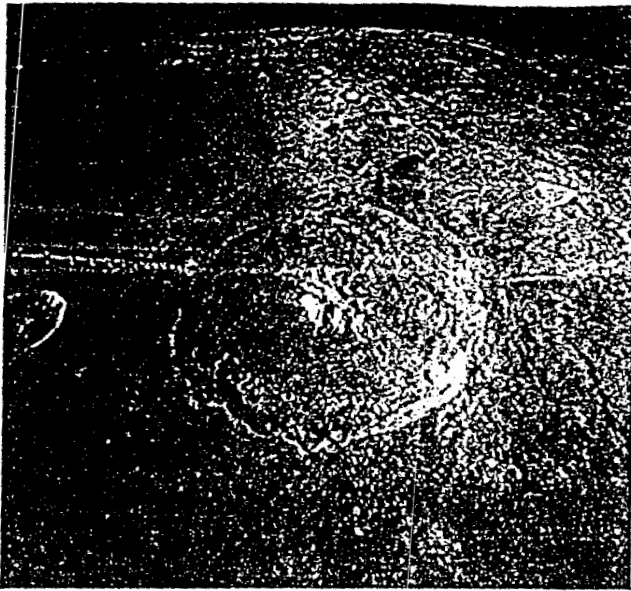


Fig. 3.8. A complex lunar crater. This relatively young crater (Theophilus; $D = 100$ km) displays well-preserved features that are typical of complex impact structures: a central uplift, a scalloped circular outline, ruggedly terraced walls with possible landslide deposits inside the rim, and hummocky ejecta deposits just outside the rim. This view also indicates the continuing nature of lunar cratering; an older impact crater (upper right) has been partly destroyed by Theophilus, while a younger small crater has formed within Theophilus itself (near rim, lower right). The flat dark area in the background (upper left) is made up of lava flows covering part of Mare Nectaris. The spiral-like rod at left center is an instrument boom on the Apollo 16 spacecraft, from which this orbital picture was taken. (Apollo 16 image AS16-M1-0692.)

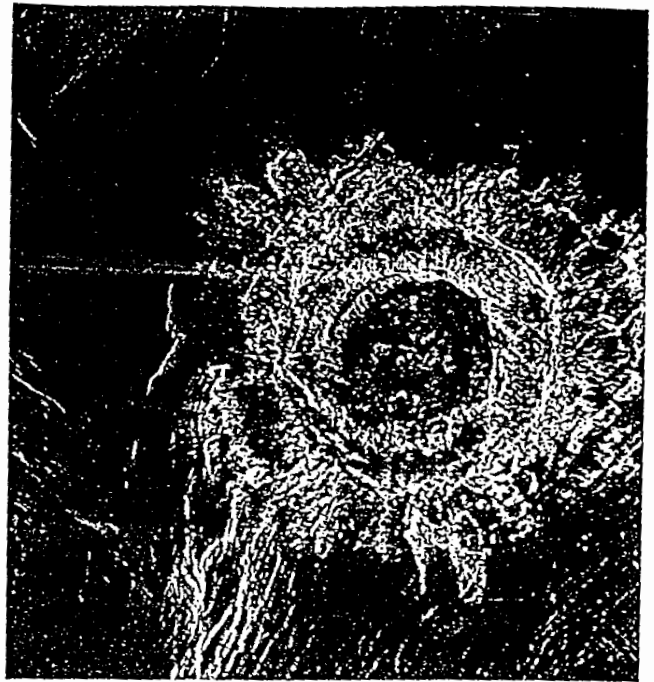


Fig. 3.9. A complex impact basin on Venus. A large, well-preserved multiring impact basin on the surface of Venus (Meitner; $D = 150$ km) is revealed beneath the planet's opaque atmosphere by the imaging radar system of the Magellan spacecraft. Meitner, the third-largest impact structure identified on Venus, shows a flat smooth (dark-colored) interior, two circular rings, and a rough, irregular blanket of lobate ejecta (light-colored). The crater was formed on a surface of smooth plains, possibly underlain by lava flows and cut by abundant parallel fractures (white lines). (Magellan image F-MIDRP .55S319;201.)

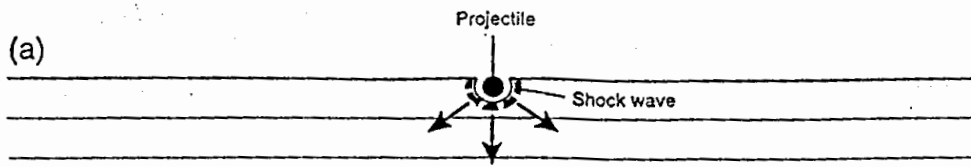
Grieve *et al.*, 1981; Grieve and Pilkington, 1996). Geological studies have also established that the amount of actual stratigraphic uplift (SU) in impact structures is about one-tenth the final diameter (D) of the structure. A detailed statistical relation derived from studies of well-constrained complex impact structures (Grieve *et al.*, 1981, p. 44) is $SU = 0.06 D^{1.1}$ (both SU and D are in kilometers). A subsequent analysis, using more craters (Grieve and Pilkington, 1996, p. 404), gave $SU = 0.086 D^{1.03}$. The two equations are virtually identical, and a value of $SU = 0.1 D$ is a reasonable approximation to either. For large ($D = 100$ – 200 km) impact structures, these relations imply that the crustal rocks beneath the structure are uplifted vertically by 10–20 km during the impact event. An uplift of this magnitude has been estimated for the Vredefort (South Africa) structure on geological grounds (Reimold and Gibson, 1996; Therriault *et al.*, 1997; Turtle and Pierazzo, 1998).

Both theoretical and field studies indicate that central uplifts form in only a few minutes, almost instantaneously by geological standards, even in the largest structures (Melosh, 1989, pp. 129 and 141–142). Theoretical studies also suggest that the central uplifts of structures 200–300 km in

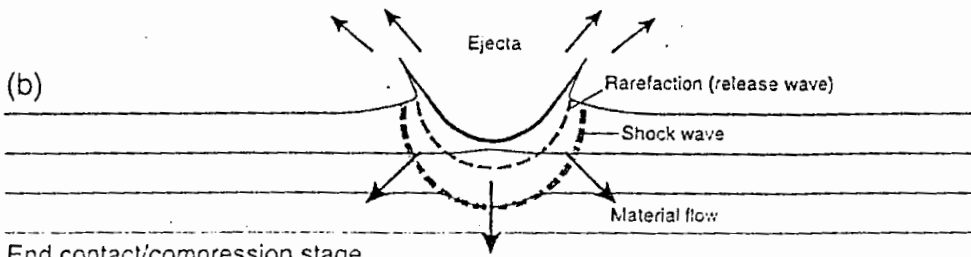
diameter, such as Vredefort (South Africa), formed in less than 15 minutes (Melosh, 1989, pp. 141–142; Turtle and Pierazzo, 1998).

Despite the extensive evidence that central uplifts do form in large impact structures, the details of the process are still the subject of continuing uncertainty and active debate (Dence, 1968; Grieve *et al.*, 1981; Melosh, 1989, Chapter 8; Hörz *et al.*, 1991; Spudis, 1993). Even so fundamental a quantity as the ratio between the diameter of the initial transient crater and the diameter of the final complex impact structure has not been well established; values estimated by various workers, using both theoretical and geological studies, range from about 0.5 to 0.7 (see, e.g., Therriault *et al.*, 1997, Table 2).

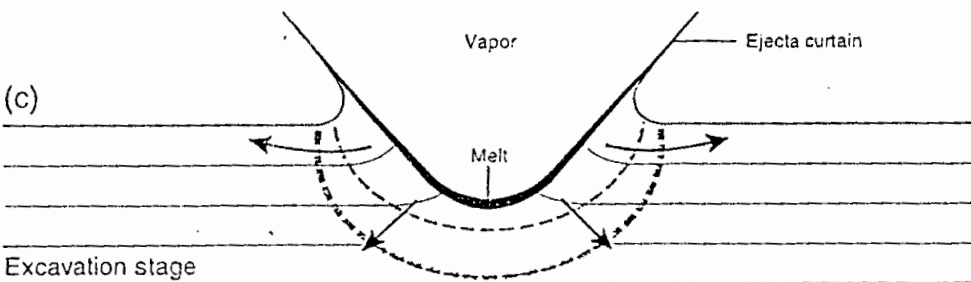
At larger crater diameters, the resulting structures, and especially the centrally uplifted area, become even more complicated. As the crater size increases the character of the central uplift changes, and the single central peak is progressively replaced by a more complex series of concentric rings and basins. At least three types of complex impact structures can be distinguished with increasing crater diameter: central-peak structures, central-peak-basin structures, and peak-



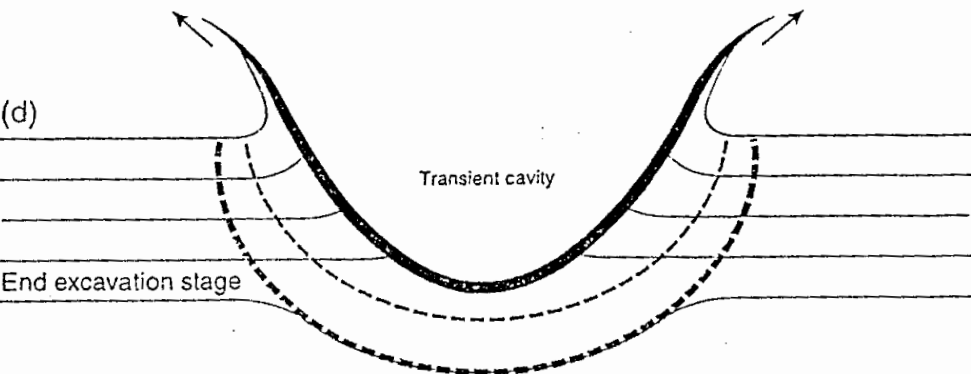
Contact/compression stage



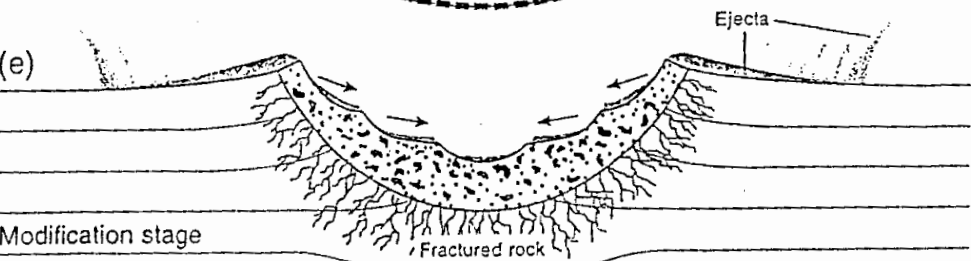
End contact/compression stage



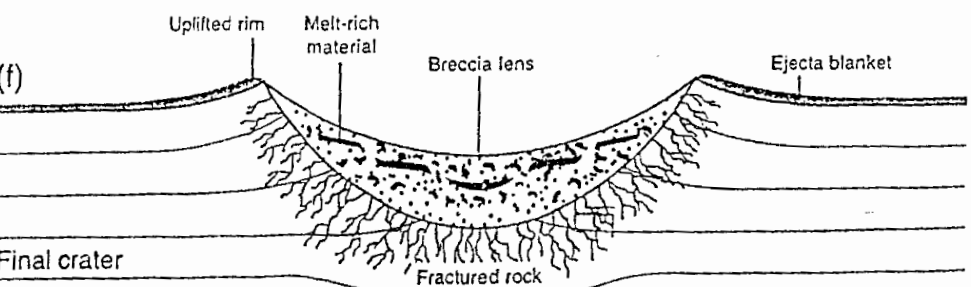
Excavation stage



End excavation stage



Modification stage



Final crater

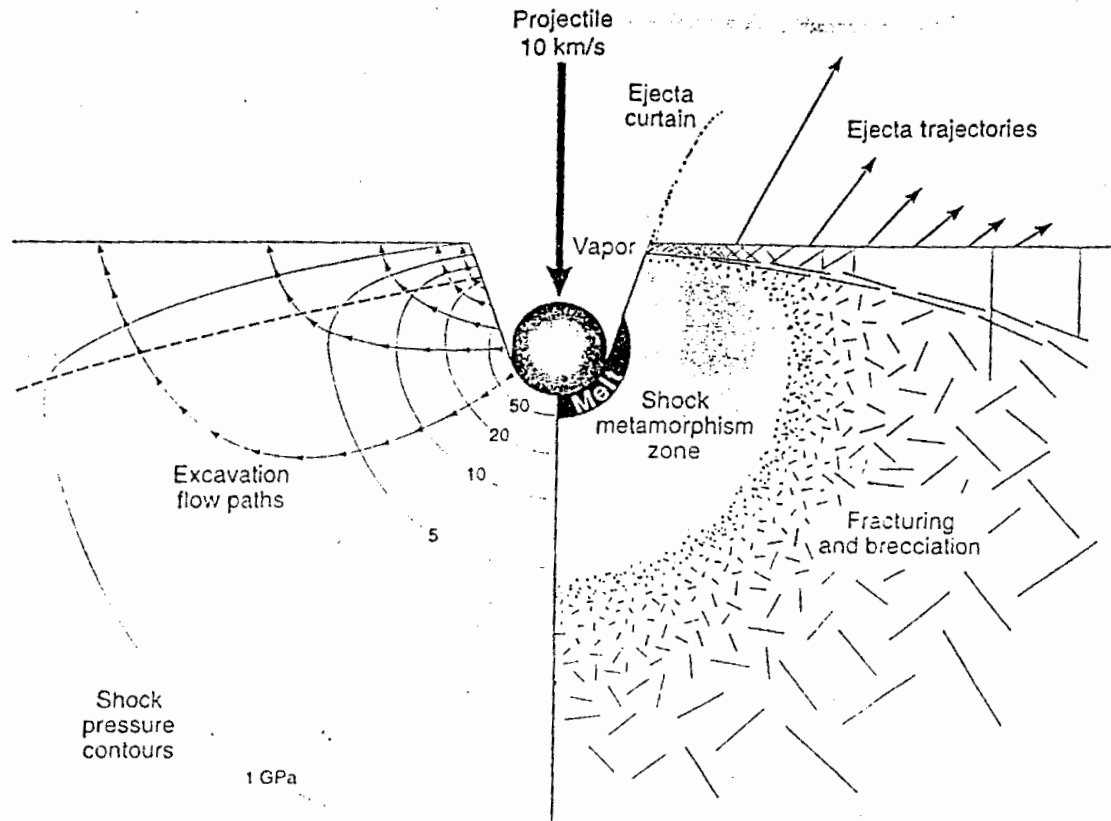


Fig. 3.2. Contact/compression stage: initial shock-wave pressures and excavation flow lines around impact point. Schematic cross-section showing peak shock pressure isobars (pressures in GPa) developed in the target around the impact point near the end of the contact/compression stage. The originally spherical projectile, after penetrating about two diameters into the target, has been almost completely destroyed and converted to melt and vapor. Shock waves radiating from the projectile-target interface decline rapidly outward in peak pressure (isobars in GPa on left side of cavity), creating concentric, approximately hemispherical zones of distinctive shock effects (right side of cavity). From the original interface outward, these zones involve: (1) melting (>50 GPa) and formation of a large melt unit; (2) shock-deformation effects (5–50 GPa); (3) fracturing and brecciation (1–5 GPa). The subsequent excavation stage involves two processes: (1) upward ejection (spalling) of large near-surface fragments and smaller ejecta (ejecta curtain) (upward-pointing arrows above ground surface); (2) subsurface flow of target material to form the transient crater (arrow paths crossing isobars at left side). (Modified from Melosh, 1989, Fig. 5.4, p. 64.)

called a release wave). As the release wave passes through the projectile from back to front, it unloads the projectile from the high shock pressures it had experienced. Because the shock pressures, and the associated temperatures, have been so high, this release results in the virtually complete melting and vaporization of the projectile. At the instant at which the release wave reaches the front end of the projectile, the whole projectile is unloaded, and the release wave continues forward into the target and begins to decompress it as well. This point, at which the release wave reaches the front of the projectile and begins to enter the adjacent compressed target, is taken as the end of the complete contact/compression stage.

The contact/compression stage lasts no more than a few seconds, even for impacts of very large objects. The time required for the shock wave to travel from the projectile/target interface to the rear edge of the projectile is approxi-

mately equal to the time it takes the projectile to travel the distance of one diameter at its original velocity. Even for large projectiles, this time is short: 2 s for a 50-km-diameter projectile traveling at 25 km/s, and less than 0.01 s for a 100-m-diameter object traveling at the same speed. The additional time required for the release wave to travel from the rear to the front edge will be no more than a few times this value, depending on the properties of projectile and target rock (Melosh, 1989, pp. 48 and 58). For most impact events, the entire contact/compression stage is over in less than a second.

After the release wave has reached the front end of the projectile and unloaded it completely, the projectile itself plays no further role in the formation of the impact crater, and the actual excavation of the crater is carried out by the shock waves expanding through the target rocks. The vaporized portion of the projectile may expand out of the crater as part



1.7. Complex impact craters on Venus. Large, well-preserved impact craters on the surface of Venus were revealed by the Magellan spacecraft, which used an imaging radar system to penetrate the planet's opaque atmosphere. In this "crater farm" area, three large, well-preserved impact structures have been produced on a low-relief, slightly fractured surface that may consist of basalt lava flows. The "colors" in this picture actually represent different degrees of surface roughness detected by Magellan's radar system; dark surfaces (the target surface and the crater interiors) are smooth, while lighter areas (crater ejecta blankets and linear fractures in the preimpact surface) are rougher. The three largest craters show features typical of complex impact structures: circular outlines, complex central uplifts, and surrounding deposits of lobate ejecta. Aglaonice, the largest crater (center right), is 63 km in diameter. (Magellan image JPL P-36711.)

tween a Mars-sized object and the larger proto-Earth at about 4.5 Ga (Hartmann *et al.*, 1986). Similar impacts may have stripped off the silicate mantle of the planet Mercury, leaving the present iron-rich object (Benz *et al.*, 1988), may have removed the early primordial atmospheres of the planets (Melosh and Vickery, 1989; Abrens, 1993), and may be responsible for the fact that Uranus' axis of rotation is tilted more than 90° from the axes of all the other planets. In considering the early solar system, large random impact events have become the method of choice for explaining planetary anomalies, a situation that provides local explanations but makes it more difficult to construct uniform theories for planetary development (Taylor, 1992; Chapter 4).

The planetary perspective is a critical part of the study of terrestrial impact structures. The widespread existence of impact craters throughout the solar system demonstrates that they must have been equally abundant on Earth, and the cratered surfaces of other planets make it possible to estimate the intensity and the effects of impact cratering on Earth. More important, impact craters on Earth and other planets complement each other. On other planets, where erosion and tectonics have not been extensive, we can see the preserved upper levels of craters, the sharply circular form, the widespread ejecta deposits, the lava-like bodies of impact melt, and the cliffs and terraces formed during crater development (Figs. 1.5, 1.7, and 1.8).

In most exposed terrestrial impact structures, such surface features have been removed by erosion, and the present surface exposes deeper levels within or even beneath the original crater. Terrestrial structures thus provide a unique third dimension to cratering studies, and their accessibility makes possible a wide range of investigations not possible on other planets. Terrestrial impact structures can be mapped, sampled, drilled, and analyzed in great detail, and they have provided critical "ground truth" for understanding impact phenomena on other planets. Many fundamental concepts of cratering mechanics — crater modification, central uplifts, impact melt formation and emplacement — have been established on terrestrial structures (Shoemaker, 1963; Dence, 1968, 1971; Milton *et al.*, 1972; Dence *et al.*, 1977; Grieve *et al.*, 1977, 1981; Grieve and Cintala, 1981, 1992) and then applied to craters elsewhere in the solar system (e.g., Cintala and Grieve, 1998).

1.3. A PECULIAR PROCESS: WHY IMPACTS ARE DIFFERENT

Large impact events differ in many ways from more familiar geological processes like volcanic explosions, earthquakes, and the slow movements of plate tectonics. Much of

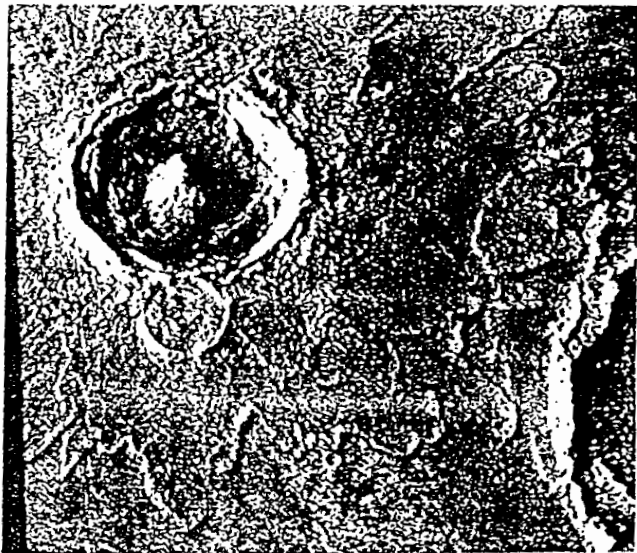


Fig. 1.8. A complex impact crater on Mars. This young complex crater (Yuty; $D = 19$ km) shows typical features: a circular outline, highly terraced interior walls, an unusually pronounced central peak, and a surrounding blanket of highly lobate ejecta. The complex appearance of the ejecta blanket suggests that it may have been partly fluidized by water melted from ice deposits within the target by the impact, and the exaggerated central peak may also reflect the existence of a lower-strength, volatile-bearing target. The thinness of the ejecta deposits is indicated by the fact that the small pre-Yuty crater just tangent to Yuty can still be distinguished through them. The arcuate structure at lower right is part of the wall of an older, larger crater. (Viking Orbiter image 003A07.)

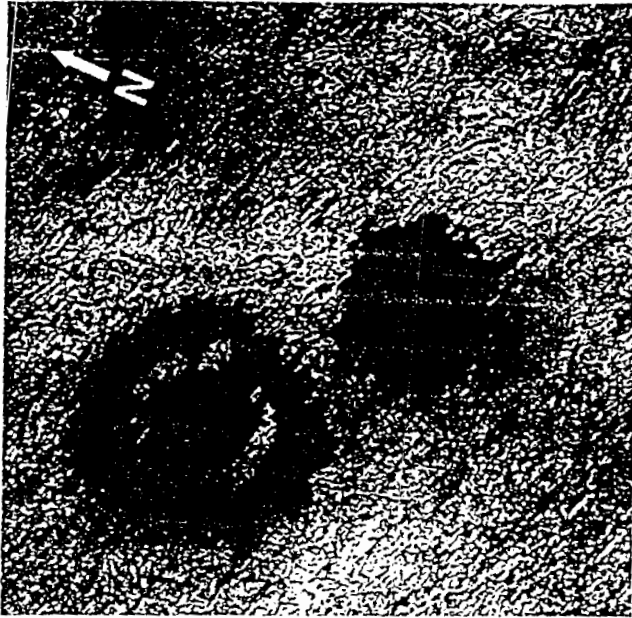


Fig. 1.3. Dual complex impact structures. Clearwater Lakes (Canada), two large, deeply eroded complex impact structures, both with central uplifts, were formed at ~290 Ma by an unusual double impact into the massive crystalline rocks of the Canadian Shield. In the larger structure, Clearwater Lake West (D = 32 km), the central uplift is expressed by a prominent ring of islands about 10 km in diameter; the islands are capped by units of breccias and impact melt. In the smaller Clearwater Lake East (D = 22 km), the central uplift is covered by the waters of the lake. North-east is at the top of the picture. (STS 61A image 61A-35-86.)

new problems: finding the hundreds of undiscovered impact structures still preserved on Earth, discovering the full extent of impact effects on Earth, establishing the mechanisms by which large impacts produce geological and biological effects, understanding the puzzling chemical and mineralogical changes that occur in the extreme physical conditions of the impact environment, and using preserved terrestrial impact structures to better define the complex mechanics by which impact structures form on Earth and other planets.

1.2. THE PLANETARY PERSPECTIVE

The recognition of the importance of meteorite impacts on Earth has come largely from the study of other planets. Explorations of the Moon and the solar system by astronauts and robotic spacecraft in the 1960s and 1970s demonstrated that impact cratering has been, and still is, a major process in the origin and evolution of all the solid bodies of the solar system, from Mercury to the moons of Neptune (for summaries and references, see *Taylor, 1982, Chapter 3; 1992, Chapter 4*). The abundant craters on the surface of our Moon (Figs. 1.5 and 1.6) had been known for centuries since the time of Galileo, and their origin (either by impacts

or volcanic activity) had been debated for just as long (for historical reviews, see *Hoyt, 1987; Mark, 1987; Wilhelms, 1993*). The Apollo program provided better views of the lunar surface, as well as samples returned by astronauts, and this combination gradually but definitely established the impact origin of most lunar craters (*Wilhelms et al., 1987; Hörz et al., 1991; Taylor, 1992, Chapter 4*).

Beyond the Moon, spacecraft revealed impact craters on every solid planetary surface that we could see: the other terrestrial planets Mercury, Venus (Fig. 1.7), and Mars (Figs. 1.8 and 1.9); the satellites of the gas-giant planets in the outer solar system (Figs. 1.10 and 1.11); and even small asteroids (Fig. 1.12).

The general acceptance of lunar and planetary craters as the results of impact events (*Taylor, 1982, Chapter 3; 1992, Chapter 4*) was based on several lines of evidence: their abundance on all solid planetary surfaces, their occurrence on objects of greatly differing composition (rocky, icy) and on surfaces of varying ages, the wide range of crater sizes ob-

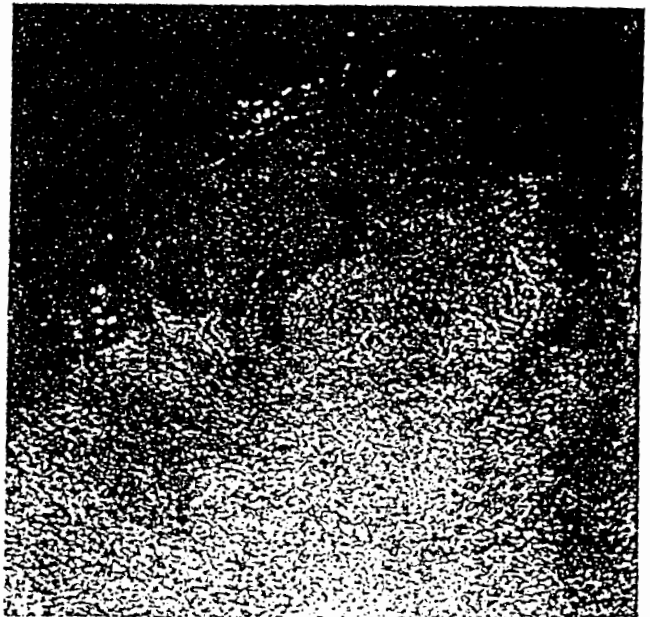


Fig. 1.4. A giant impact structure. One of the largest known terrestrial impact structures, Vredefort (South Africa) is located in the center of the Witwatersrand Basin, about 100 km from Johannesburg. With an age of nearly 2 Ga, the structure has been so deeply eroded that only subcrater rocks are still exposed, and the southern half of the structure has been covered by younger sediments. The structure now appears as a central core of uplifted ancient granitic rocks about 40 km in diameter (circular light-colored area in center), surrounded by a collar of upturned younger sediments and basalt lavas. This raised central core and collar rocks, about 80 km in diameter, is now believed to be only the central part of an impact structure originally 200–300 km in diameter. Despite the great age and deep erosion, the impact origin of Vredefort has been definitely established by a variety of preserved shock-metamorphic effects: shatter cones, planar deformation features in quartz, and the high-pressure minerals coesite and stishovite. North is approximately at the top. (STS 8 image 08-35-1294.)

tectonism changed the original form of the structure. All of the structures now evident in the Vredefort "circles" were not formed during the modification stage (Melosh, 1989) of crater formation. The structure overlies a detachment surface, designated the Vredefort Fault. The Foch- and Ensels Thrust Zones (Fig. 3) are detached over ramps in the plane of the Vredefort Fault to form "circles". In its original form, the outer peripheries of these "circles" may have coincided with the "rings", formed by modification of the transient crater.

In the Potchefstroom Synclinorium, bodies of Magaliesberg quartzite afford an indication of the original thickness of pre-Vredefort Event strata. At the time of impact, the thickness of beds above the basement was in the order of 20 km (measured stratigraphic thicknesses of strata in the Vredefort area: Witwatersrand Supergroup, 9000 m; Ventersdorp Supergroup, 3000 m, Transvaal Supergroup,

8000 m). Much of this has been removed during the impact-related stage of excavation and the rest during 1500 Ma of subsequent erosion, assuming only minimal erosion after the initiation of Karoo sedimentation. What remains are only the structural forms associated with the root zone.

Before the event, the area was subjected to several periods of tectonism, each with a characteristic style and movement direction, as postulated by Winter (1987). These are not relevant to the present paper, but will be referred to, where applicable.

2. Stratigraphy

Granitoid rocks found below the Witwatersrand Supergroup are subdivided into an inner zone designated the Inlandsee Leucogranofels (ILG, Stepto, 1979), ringed by an outer zone consisting of the

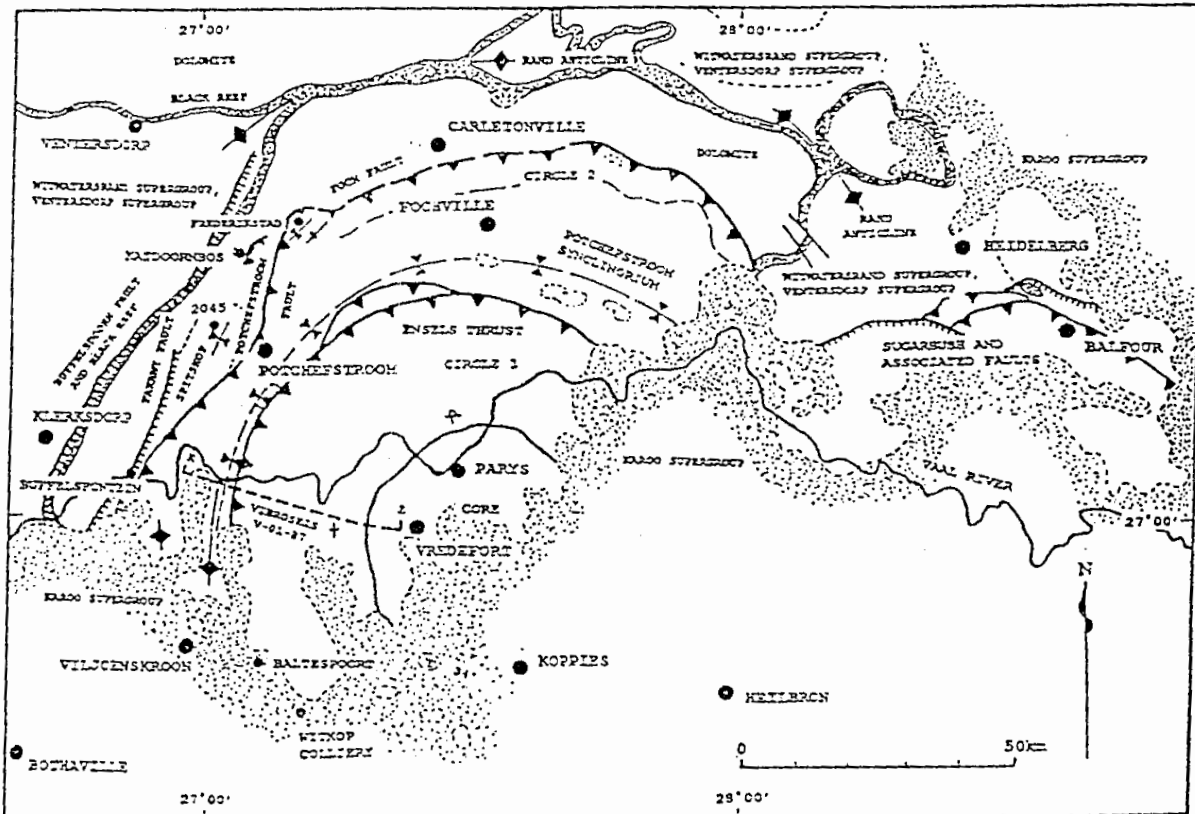


Fig. 2. Salient features of the presently visible remnant of the Vredefort Structure.

and Chuniespoort dolomite constitute remnants of an originally greater circular structure. Except for a very small number of papers, such as that of Simpson (1978), this outer domain has not been previously linked to the Vredefort Structure.

The presently exposed Structure (Fig. 2) is subdivided to comprise the core, circled by tectonised, sometimes overturned strata, designated Circle 1, the Fotechefstroom Synclinorium and a portion of Circle

2 (the term "ring" is avoided in reference to the wide bands of tectonically affected strata). It will be shown that reasons for considering that these structural elements possess a common origin are their concentric arrangement around the granitic core, their situation contiguous to the central portion, their age of formation and the consistently outward tectonic movement, that was primarily responsible for their formation. South and northeast of Vredefort, later

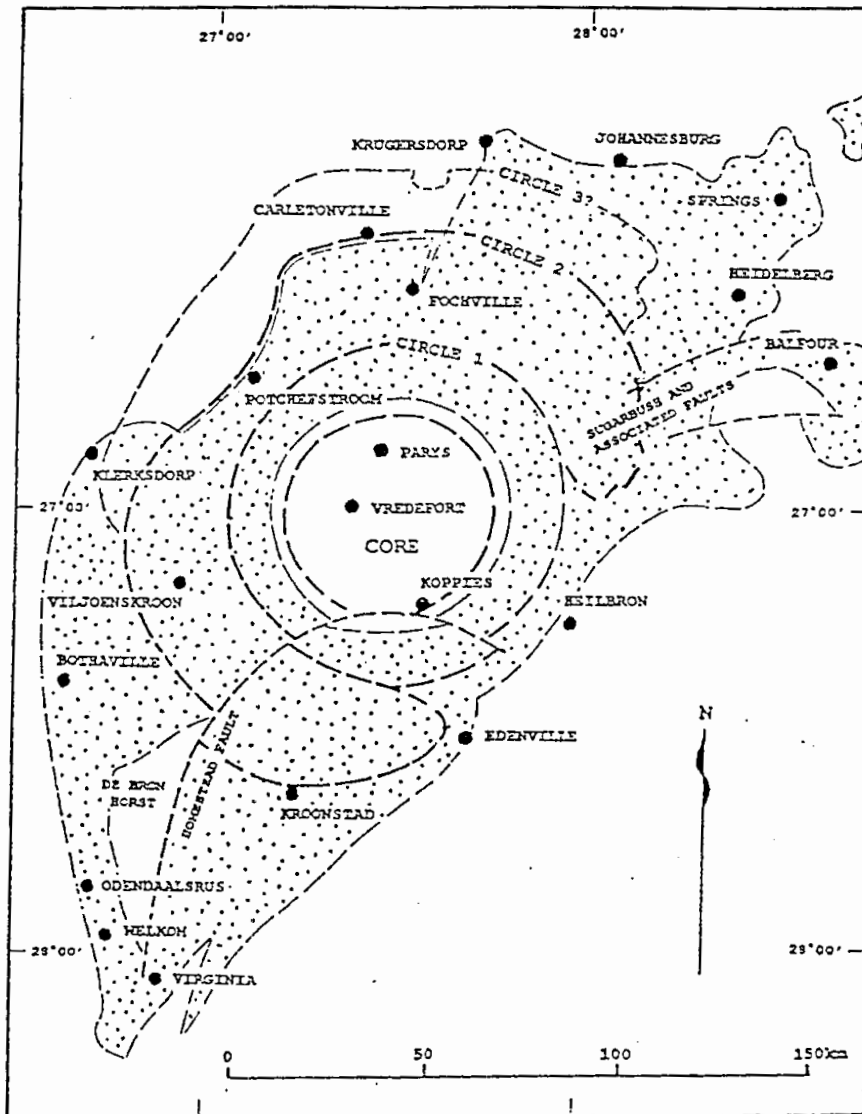


Fig. 1. Position of the Vredefort Structure relative to the Central Rand Group after 2 Ga of erosion. The "Circles" shown as dashed lines refer to the present exposed positions of thrust fault zones and not to the "rings" of a multi-ring basin.

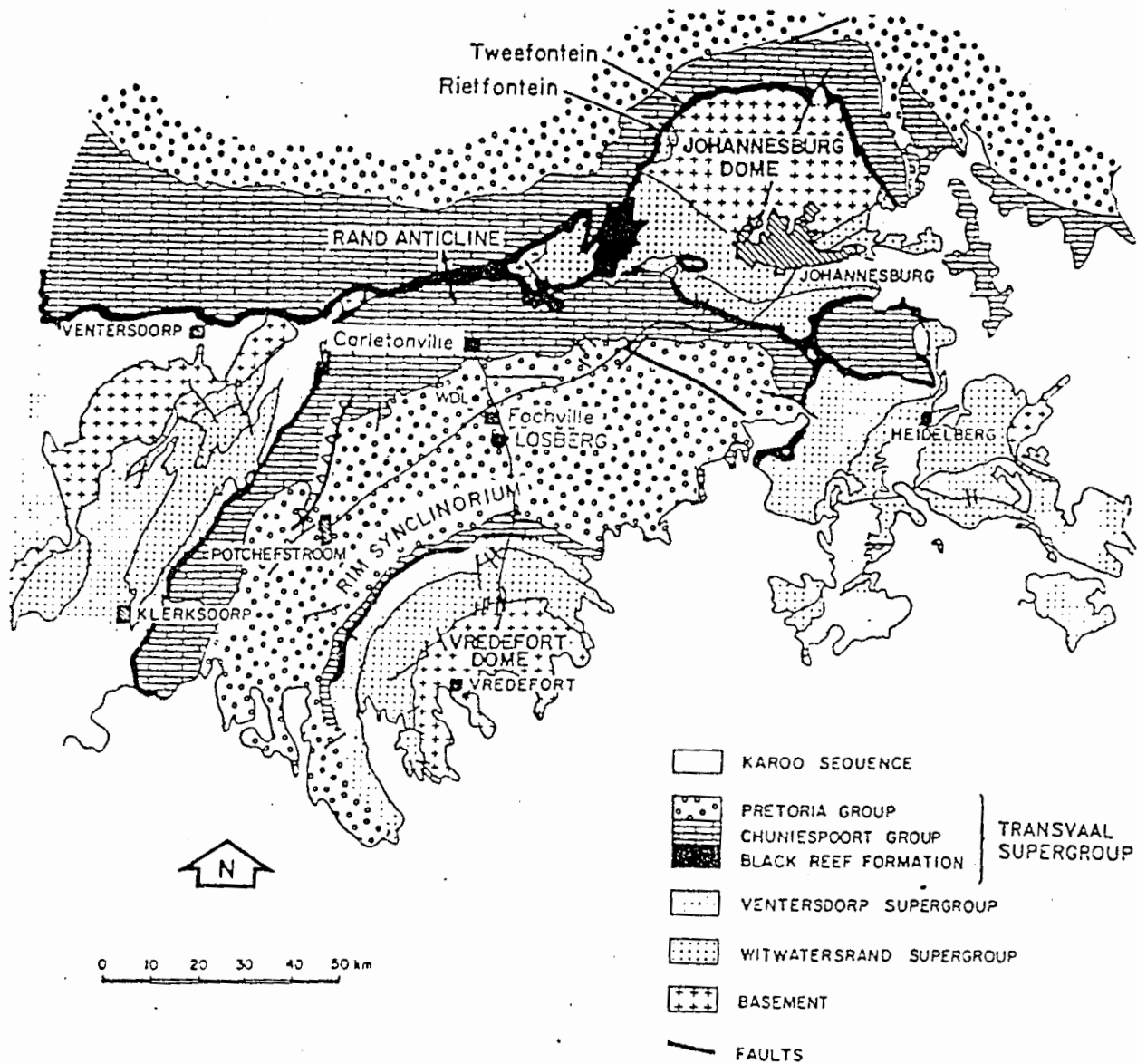


Figure 17: Simplified geological map of the Witwatersrand region showing route from Johannesburg to Western Deep Levels Gold Mine (WDL) and through to the Vredefort dome.

The prominent ridge to the south of the road marks the outcrop position of the Timeball Hill quartzites and shales of the Pretoria Group (upper Transvaal Supergroup), here dipping shallowly to moderately steeply to the south (forming the northern limb of the Potchefstroom Synclinorium; Figs. 2, 5). From high vantage points such as at Wits University, on a clear day, the equivalent strata, dipping shallowly to the north towards the Bushveld Complex, may be seen in the Magaliesberg Range some 50 km to the north. The intervening area marks the northern edge of the main body of Witwatersrand Supergroup rocks and the position of the Rand Anticline (Fig. 5), which appears to have formed a palaeo-high as early as late-

Witwatersrand times (seen in thinning of the Ventersdorp Supergroup) and which may correspond to the exhumed margin of the Vredefort impact structure, or to a ring structure formed by the impact.

The Witwatersrand, Ventersdorp and Transvaal Supergroup rocks along the northern margin of the Witwatersrand basin all show evidence of deformation which is attributed to the formation of the Vredefort dome. Pseudotachylitic breccias associated with bedding-parallel fault zones are common in the reef packages, testifying to high strain rates during deformation (Fig. 19). Most of the fault zones are inferred to have involved out-of-basin thrusting away from the dome, however, some show basin-

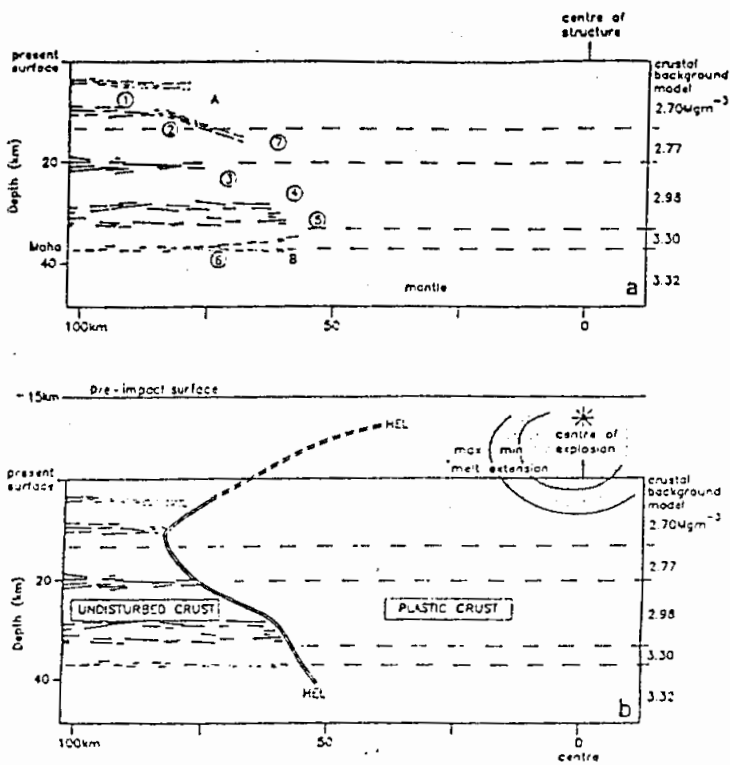


Figure 14. (a) Results from a NW-SE trending reflection seismic profile through the Witwatersrand basin and Vredefort dome (from Henkel & Reimold, 1998; original section modified from Durrheim et al., 1991 to give equal vertical and horizontal scales). The reflectors terminate towards the Vredefort dome. (b) Interpretation by Henkel & Reimold (1998) of termination of horizontal reflectors as the boundary inside of which rocks experienced shock compression which brought them above their Hugoniot Elastic Limit (HEL) during the Vredefort impact event.



Figure 16: Aeromagnetic map of the Witwatersrand basin and surrounding region (after Comer et al., 1990). Note the outline of the basin, delineated by magnetic West Rand Group shales, and the double-ring anomalies in the Vredefort dome (see text for discussion).

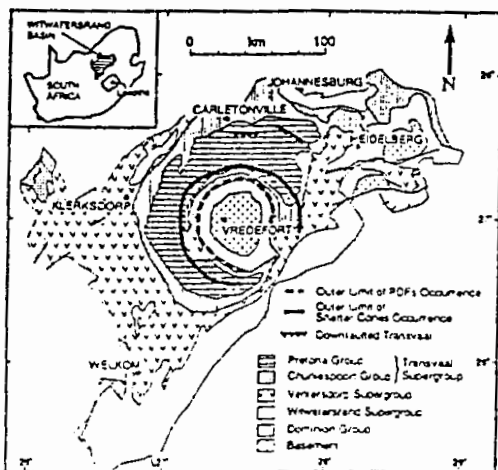


Figure 13. Distribution of planar deformation features in quartz, and shatter cones in the Vredefort dome (from Theriault et al., 1997). Abundant pseudotachylitic breccia occurs as far as the goldfields around Carletonville.

diameter of the central uplift at the surface of the original crater is, however, a matter of debate, as it is not totally clear whether, in fact, the central uplift necessarily displays a gross conical geometry, widening with depth (see discussion in Henkel & Reimold, 1988). This makes it difficult to calculate an original crater diameter, except that Melosh's (1989) equations applied to a 70 km wide dome/uplift suggest a crater diameter somewhere between 100 and 200 km (see also empirical modelling results of Turtle & Pierazzo, 1998). In many examples of complex craters, however, the crater also includes a region of downwarping around the central uplift. In the present case, the Vredefort dome is surrounded by the Potchefstroom Synclinorium, the outer limit of which corresponds roughly with the limits of the Witwatersrand basin. Unfortunately, the basin is elliptical rather than circular, a feature attributed to younger, ca. 1.0-1.2 Ga, NW-directed thrusting on the craton (Friese et al., 1995; Henkel & Reimold, 1998). Similar tectonic modification of the Sudbury structure has been proposed to explain its elliptical geometry (e.g., Dressler, 1984). In the case of the Vredefort structure, this implies a minimum diameter of ~180 km, based on the NW-SE profile, and a maximum of ~240-300 km, assuming that subsequent deformation did not involve major extension of the structure in NE-SW direction.

Geophysics

The Witwatersrand basin and, by extension, the Vredefort dome, is one of the most intensively studied regions of the Earth's crust from a geophysical perspective, although much of the data remains the property of gold mining companies. Several geophysical interpretations of the Vredefort dome and surrounding region have been carried out (Antoine et al., 1990; Green and Chetty, 1990; Comer et al., 1990; Durrheim et al., 1991; Henkel & Reimold, 1998; Ellis & Reimold, 1999).

Geophysical data for the Kaapvaal craton have been used extensively by proponents of a non-impact origin for the Vredefort dome (e.g., Coward et al., 1995; Nicolaysen, 1998). Coward et al. (1995) used seismic profiles across the Witwatersrand basin to suggest that the Vredefort dome formed as a consequence of complex folding related to a thrust fault bend. Friese et al. (1995) have used similar profiles to suggest that the asymmetric structure of the dome, with overturned collar strata in the NW and normal way-up strata in the SE, is a consequence of post-doming, ca. 1.0-1.2 Ga, NW-directed thrusting related to a Grenvillian-Kibaran age plate convergence event along the southern margin of the Kaapvaal craton. More recently, Brink et al. (1999) and Ellis & Reimold (1999) have identified impact-related faults in the supracrustal succession from vibroseis data from the dome and Potchefstroom synclinorium. Brink et al. (1997) suggested that reflections dipping inward towards the dome represent a series of outward-verging thrusts which break the surface to form three major concentric rings. Ellis & Reimold (1999), however, have suggested that these reflectors are associated with structures that are more consistent with slumping of blocks in towards the dome. Simpson (1978) also noted inward-dipping normal faults in the Potchefstroom Synclinorium from surface mapping.

Deep crustal reflection seismic profiles across the Witwatersrand basin (Durrheim et al., 1991) show only a few subhorizontal reflectors (possibly subhorizontal intrusions, breccia zones, or fault zones) beneath the Vredefort dome (Fig. 14). This has been interpreted variously as either evidence of predominantly vertical dips in the core of the central uplift, or a consequence of masking by thick, subhorizontal, near-surface gabbroic sheet intrusions extending over much of the core of the dome (Pybus, 1995), or as evidence of destruction of layering in the target crust by impact shock which led to these rocks exceeding their Hugoniot Elastic Limit (Henkel & Reimold, 1998).

Henkel & Reimold (1998) have used gravity and seismic data across the dome and Witwatersrand basin to delineate the extent of shock deformation and model the size of the Vredefort impact structure. These data are presented in Table 2.

The dome is well-exposed in its northern and northwestern sectors, but is largely hidden beneath shales and dolerite sills of the Phanerozoic (~250-180 Ma) Karoo Supergroup in the south and southeast (Fig. 3). The dome comprises a 40 km wide core of Archaean basement gneisses that is surrounded by a 15-20 km wide, "collar" of generally subvertical to overturned Late Archaean to Palaeoproterozoic supracrustal strata (Fig. 3). Beyond the collar, the dip of these strata shallows, defining a broad, ~ 90 km wide rim synclinorium (Potchefstroom synclinorium). The limits of this synclinal structure broadly define the boundary of the Witwatersrand basin (Fig. 2), suggesting that the formation of the Vredefort dome played a significant role in the preservation of the Witwatersrand gold deposits (McCarthy et al., 1990).

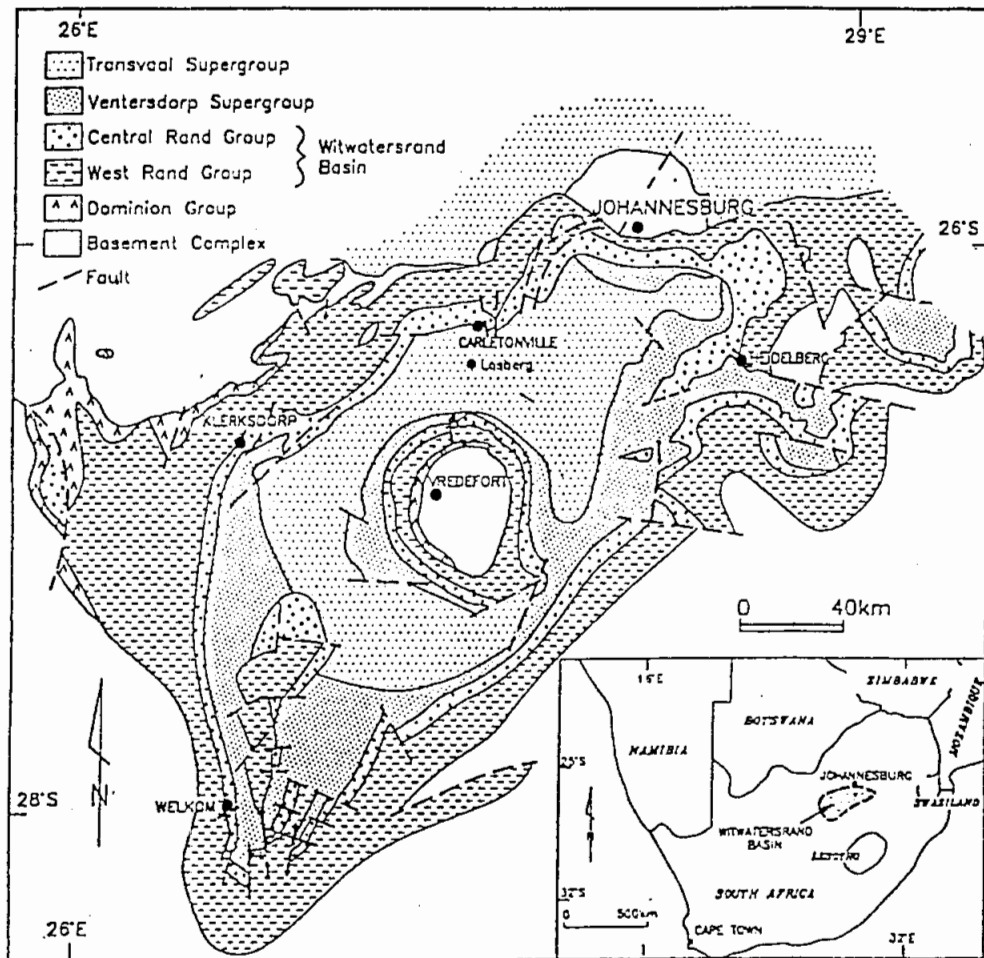


Figure 2: Simplified map showing the distribution of Archaean and Palaeoproterozoic rocks in the Witwatersrand basin. The southern part of the basin is covered by younger sediments and has been constrained by geophysical methods.

The core of the Vredefort dome consists of a sequence of amphibolite and granulite facies Archaean granite-gneisses with subsidiary mafic, ultramafic, pelitic and ironstone xenoliths, possibly as old as 3.5 Ga (Hart et al., 1981). These gneisses have been divided into an inner zone, the Inlandsee Terrane; and an outer annulus, the Outer Granite Gneiss (Stephens, 1990; Fig. 3). Structural and geochronological studies in the core rocks suggest that the rocks experienced at least two deformation events which accompanied the upper amphibolite to granulite facies metamorphism prior to the deposition of the supracrustal rocks at ~3.1 Ga. The rocks resemble the typical Archaean granite-greenstone sequences observed elsewhere on the Kaapvaal craton (Fig. 1), with the exception of the unusually high grades of metamorphism.

The collar of the dome comprises a series of unconformity-bounded sedimentary and volcanic rocks deposited between 3.07 Ga and 2.25 Ga in a succession of basins on the Kaapvaal craton (Clendennin et al., 1988) (Fig. 4). These now form a concentrically-arranged up- or overturned sequence which youngs away from the core of the dome (Fig. 3). The oldest rocks are the 3.074 ± 0.027 Ga Dominion Group (Armstrong et al., 1991), a bimodal sequence of basaltic andesite and felsic lavas and subsidiary rift-related clastic sediments, which attain a maximum thickness of ca. 400 m in

FREE STATE PROVINCE



DEPARTMENT OF TOURISM, ENVIRONMENTAL AND ECONOMIC AFFAIRS

DIRECTORATE: ENVIRONMENTAL AFFAIRS
Fountain Towers Bld, Cnr. Markgraaff & Zaaron Street
Private Bag / Privaatsak X 20801, BLOEMFONTEIN 9300

☎ (051) 400 4781

Fax./ Faks. (051) 400 4811

Enq. Coenie Erasmus

Date. 15th September 2003

To: Minister V. Moosa

Department of Environmental Affairs and Tourism

Private Bag X447

Pretoria

0001, South Africa

Re: Nomination of Vredefort Dome as a World Heritage Site

This letter serves to confirm our full support for the declaration of the Vredefort Dome as a World Heritage Site

.....

Date:.....

S Belot

MEC: Department of Tourism, Environmental and Economic Affairs – Free State

TENTATIVE LIST SUBMISSION

STATE PARTY: South Africa **DATE OF SUBMISSION:**

Submission Prepared by:

Name: Coenie Erasmus

Address: Private Bag X20801

Bloemfontein, 9300

South Africa

E-mail: erasmusc@dteea.fs.gov.za

Tel: +27(0)51 4004781

Fax: +27(0)51 4004811

INSTITUTION: Department of Tourism, Environmental and Economic Affairs –
Free State

NAME OF PROPERTY: Vredefort Dome

State, Province or Region: Free State and Northwest provinces

DESCRIPTION:

Impact cratering has been a fundamental, if not the most important process in the Solar System. The effects of large comet, asteroid, and meteorite impacts on planetary surfaces since formation of the planets are obvious on every solid body in the Solar System.

Only Earth seems to have a limited impact crater record. However, impact of interterrestrial matter did leave its mark on Earth, and not only on solid matter. Evolution of life has been, at least once but probably repeatedly over the last 500 million years, been disrupted by catastrophic impact events.

What we see at present of the Vredefort Structure, are the eroded "roots" of this structure at a level approximately 17 km below the point of the original impact. The greater part of the structure had been removed by erosion taking place over 1 600 Ma, whereas a portion is buried under later sedimentary rocks of the Karoo Supergroup. The impact scar we see today measures approximately 140 km across and magnificently displays a variety of shock-induced features, which were recorded in the upturned collar strata, and the granitic gneiss core of the structure. Two surrounding concentric rings with diameter of approximately 160 km can also be observed. Nothing of the meteorite remained and the only information is the projection of the size of the original crater, which is estimated at approximately 90 km in diameter and more than 20 km in depth. Following American speculations, one might conceive a subject with a diameter of 4 to 5, or even up to 10 km in diameter striking the earth with a velocity of 30 km per second (108 000 km/hour).

On impact, a transitional crater is formed, which almost immediately is filled up by material falling from the steep sides. By this process, the diameter of the crater becomes enlarged. The thinner (and consequently lighter) crust of the earth at this

point, becomes uplifted over a long period, floating higher on the heavier mantle material underneath the original crater. In the process when the crater is formed, immediately after impact, concentric rings are formed around the crater.

The event took place before the continents, as we know it today, moved apart. Life on earth at that stage probably was confined to the most primitive forms, being stromatolite-building bacteria, and no great extinction was recorded. Stromatolites survived this catastrophe, as well as other "great extinctions" and can still be found today. This most probably was because they were widespread, living under a protective layer of water. Free oxygen only appeared probably during the following 600 Ma, to which the primitive organisms had to adapt. Multi-cellular life appeared only about 600 to 700 Ma ago. It can be speculated that the appearance of eukaryotic life forms after this impact, might be analogous to the emergence of mammals after the Chixculub impact some 60 Ma ago.

It has been argued that the anthropological history of South Africa could be indirectly linked to the catastrophic event. Recognisable crustal fractures formed weak zones in the dolomitic limestones of the Transvaal Supergroup, leading to the formation of caves (Brink et al., 2000), such as those found in the already proclaimed Sterkfontein World Heritage Site (Cradle of Human Mankind). These are the locations of important finds of hominid fossils.

The Vredefort structure has a cross-section of 400 km, rendering it impossible to impose protection and management measures to include the entire structure. The reason for this being that a significant portion of three provinces would be included, as would some of the most densely populated and most industrialised areas in the country. Furthermore, the parts of the structure covered by sedimentary material are not visible and do not justify any measures being taken for conservation and management.

Considering the practicalities involved, it is proposed that the so-called Vredefort Dome, which represents a significantly representative portion of the Vredefort structure, being taken as the point of departure. This represents the most conspicuous aboveground and visible part of the structure, including a portion of the central granite core and the north western portion of the first concentric ring around the core, known as the Vredefort Hills. The Vaal River, forming the boundary between the Free State Province and the Northwest Province, bisects the Vredefort Hills.

The designated area proposed for inscription as World Heritage Site, is situated within the central part of the Vredefort Structure, covering a part of the central granite core and a considerable portion of the north-western part of the surrounding, concentric ring or 'collar' of overturned strata. The area was decided upon since it can easily be designated, by means of secondary provincial roads bordering the proposed site

The Dome is also unique in South Africa regarding its bird-, insect-, plant and animal life, made possible by the diversity of very sensitive ecosystems and microhabitats in the area

The unique geological structure of the Dome brought about a diversity of microhabitats and microclimates ensuring plant communities, which are exceptional and unique in South Africa. At least 99 plant species have been recorded from this area, but a complete floral checklist of the Dome does not exist

Approximately 50 species of small mammals, including eight "Red Data Species" of which one is endemic, can be found in the area. Studies by entomologists have also indicated that unique and rare species occur in this area, but further research is still

needed. It is known that more butterfly species occur in the Vredefort Hills than in the whole of the British Isles.

The Dome is also renowned in academic circles as an area, which is rich in anthropological and archaeological heritage.

The designated area predominantly is utilised for agricultural purposes. In the Vredefort Hills, extensive grazing practices dominate, with scattered cultivated lands in the valleys and along the Vaal River. This however being a marginal farming area, cultivation is decreasing rapidly and the emphasis is rapidly moving towards tourism-orientated activities based on the scenic beauty of the area. The land situated on the granite core of the Vredefort structure, has a rolling topography, consisting of scattered, low granite "koppies" between intensively cultivated lands on deep sandy soils where maize predominantly is produced.

JUSTIFICATION OF UNIVERSAL VALUE

Criteria under which inscription is proposed

With reference to the UNESCO Document (WHC-97/2) entitled "Operational Guidelines for the Implementation of the World Heritage Convention," as issued by the National Department of Environmental Affairs and Tourism (February 1997), the following criteria are mentioned in paragraphs 43 and 44:

Paragraph 43 states: "natural features consisting of physical and biological formations or groups of such formations, which are of outstanding universal value from the aesthetic or scientific point of view;

geological and physiographical formations and precisely delineated area, which constitute the habitat of threatened species of animals and plants of outstanding universal value from the point of view of science or conservation;

natural sites or precisely delineated natural areas of outstanding universal value from the point of view of science, conservation or natural beauty".

(i) The Vredefort Structure – a natural geologic feature

A multi-ring structure centered around Vredefort, South Africa, is recognizable on maps compiled by the Council for Geosciences and on geophysical surveys (magnetic, gravity, vibroseis), described by authors such as Corner et al. (1986), Antoine et al. (1990) and Durrheim et al. (1991). The structure is also recognized to be the largest of these structures so far found on the surface of the earth. Impact structures are classified according to magnitude and complexity. The larger and most complex of these structures found on the inner planets and on the lunar surface are characterized by concentric ring systems that surround a central crater. Due to its age and exposure to more than 1 600 Ma of erosion, only the root remnant of the original Vredefort Structure is presently visible. Early discussions in literature referred only to the set of forms comprising the granitic core and the surrounding inner circle of hills, characterized by overturned strata, known as the Vredefort "Dome." However, it has subsequently been shown that the inner core and circle only constitute remnants of a still mapable, much larger, concentrically ringed structure. Complex, multi-ring astroblemes are formed by the impacts of large bodies, such as asteroids or the cores of comets.

In the outer rings of large astroblemes, such as Vredefort, thrust faults are created when material is accelerated away from the point of impact

Folds, distinguished from those of a "normal" compressional tectonic system by their concentric arrangement around the impact point, accompany the faults. As crustal material is driven away from the point of impact, thrust fault systems detach to move over the ramps provided by the impact ward-facing limbs of the anticlinal folds.

During the impact and the penetration of the earth's surface by the impactor, a first stage, transient crater is formed. The walls of this first, temporary crater are unstable, and they immediately collapse inward. In the zone below the point of impact the strata are disrupted by the processes of spalling and the formation of impact breccias and melt breccias, shock structures such as shatter cones, megascopic shock planes and high pressure silica polymorphs (coesite and stishovite) are formed where the rocks are quartzitic. All of these features were recorded in the overturned collar strata of the inner ring and the granitoid core of the Vredefort Structure. The collapse of the transient crater leads to the formation of a much wider, final crater, the shape of which may be modified by further isostatic uplift and erosion.

At Vredefort, nothing remains of the transient crater and the existence of the final crater is indicated only by centripetally-moving faults, such as the Potchefstroom Fault that were formed in its floor. However, even the remnant affords a unique opportunity for study of the exposed inner anatomy of an astrobleme, such as is not found anywhere else on earth. In the up- and overturned strata forming the inner ring, faults of pre-Vredefort Event age are exposed in section, thereby affording a key to the understanding of the evolution of these systems, which is extremely important in understanding the structural geology involved in the exploration for gold. In scientific publications, theories have been proposed that link the distribution of gold in the Witwatersrand Supergroup to the Vredefort Event (Reimold and Gibson, 1996). It is therefore important that the system must remain preserved and available for research.

The relationship between Vredefort-related thrust faulting and dolomitic cave formation, mentioned by Brink et al. (2000b) is interesting. Many of the caves of palaeo-anthropological importance are distributed in a zone around Sterkfontein and Kromdraai (already listed as a World heritage Site) west of Johannesburg, South Africa. Southward, the relationship is also seen in the dolomitic rocks overlying thrust faults in the Gatsrand between Potchefstroom and Carletonville, around Lindequesdrif north of Parys, and also along the Vaal River, in the area immediately west of the Dome. All of these are found in the dolomite, stratigraphically known as the Malmani Subgroup of the Transvaal Supergroup. Caves and other Karst characteristics developed in the nappes overlying the broken ramp zones of the thrust faults formed during the Vredefort Event. The connection between cave formation and nappes is too obvious to be fortuitous. The Vredefort Event may thus have been ultimately responsible for the formation of the caves in which our ancestors found their dwellings.

Of further interest is that the age of the impact event (about 2 000 Ma ago) coincides with that of the transition between prokaryotic and eukaryotic life forms (Reimold et al., 2000), indicating an evolutionary change similar to Vredefort and other large impact events. In causing the extinction of the dinosaurs, the impact event associated with Chicxulub in the Yucatan Peninsula heralded the change from predominantly Saurian to Mamalian forms of life (Reimold et al., 2000).

(ii) **The Vredefort Event – an outstanding moment in the earth's history**

The Vredefort Impact Event happened near the end of the great accretionary period of the planets of the solar system (Reimold et al., 2000) when planets were built from the accretion of dust and rubble and ice revolving around the sun. Obviously, the coming

together of this material entailed impacting, leaving the multitude of craters still visible on the surfaces of the planets situated closer to the sun, that are not covered by water or frozen gases. The earth can be classified as being situated near the middle of this system, and its surface is partly covered by water. Most of the craters formed on its surface were therefore obliterated by erosion, or are now covered by subsequently deposited sediments. The processes of accretionary bombardment and the existence of ancient astroblemes, such as Vredefort, have only lately been recognised. According to estimates, more than 200 impact basins of greater than 200 km in diameter must have formed during the early stages of the world's creation. Having left the largest of the preserved astroblemes, the Vredefort impact must be regarded as representing probably the largest recorded episode of explosive energy release on the earth's surface. Obviously, all of the effects are not known yet, and the structure remains alone of the greatest sources of future research and, hopefully, knowledge.

(iii) The Vredefort Structure – outstanding worth from a scientific point of view

Since the beginning of the 1900's, numerous international and local earth scientists have studied various aspects of the Vredefort Structure. In 1925, two geologists, Hall and Molengraaff stated: "To anyone occupying a suitable point within the central Vredefort granite, the grand simplicity of design at once suggests a correspondingly broad simplicity in the major cause." Noting the similar ring-like features displayed by the craters on the moon, Boon and Albritton (1937) suggested that the Vredefort Structure was the scar of an ancient meteorite impact. Since it was scientifically described for the first time, the literature on the structure has become voluminous.

The structure of Vredefort is fortuitously situated within the boundaries of the Central Rand Group of the Witwatersrand Supergroup, which is the greatest single gold deposit in the world. Since the discovery of the Witwatersrand around 1886, the greater Vredefort structure and the Dome area has been subjected to the search for new mineable areas on an intensive scale. This also entailed the drilling of hundreds of boreholes into the structure, as well as the obtaining of numerous geophysical profiles. It can be claimed that the Vredefort Structure is the best known and explored of all of the large astroblemes on earth. As their economic importance to various mining companies wanes, the results of all of this activity are only now becoming available to earth scientists doing research on the Vredefort Structure.

The structure has long been the focus of geological congresses, of which two of the more important ones may be mentioned. In 1987, an international workshop was held in Parys, South Africa, attended by earth scientists from over the world. The subject of the workshop was the so-called crypto-explosion structures that were then in the process of being found on the earth's surface in increasing numbers, with a special focus on the Vredefort Structure. During July 1999, the 62nd Annual Meteoritical Society Congress was held in Johannesburg, South Africa. A substantial part of this congress was devoted to the Vredefort Structure, with several excursions to the Dome, and numerous papers read on aspects of its formation and place in the realm of known impact sites. It is becoming obvious that, because of the superlative exposure of structural aspects, the Vredefort Structure must be considered as of outstanding universal scientific value.

Assurance of authenticity / integrity

Scientific and popular literature on the different aspects of the Vredefort Dome is voluminous (please refer to the bibliography). According to a Ph.D. dissertation analyzing the scientific literature on the Vredefort structure, some 750 scientific documents were produced. The area still remains the theme of research by various institutions, universities, mine-houses and individual scientists with topics ranging from mineral mining to anthropology, hydrology, the origins of the structure, aspects of biodiversity, etc.

Possible comparative analysis of similar sites

About 160 impact structures have been identified on the earth's surface (Deutsch et al., 2000). The three largest of these are Sudbury [200 Km] in Canada, Chicxulub [200 Km] in Mexico and Vredefort [approximately 400 Km] (Brink et al., 2000).

The remnant structure of Sudbury contains the original crater melt pool, now composed of various igneous rock types. Possibly the most important of these is quartz diorite, with an exploitable nickel, copper, platinum and other metal content. Because of its economic importance, the deposit was mined extensively, and many of its important characteristics were destroyed. The originally circular morphology of the structure was altered to a broken oval shape by subsequent tectonic movement of the earth's crust, thereby causing an endless controversy among geologists as to even whether the structure originally was an astrobleme.

Chicxulub lies buried under sediments and does not possess any recognisable surface expression at all.

To date, only one other large impact structure has been proclaimed a World Heritage Site, i.e. the Popigai Structure (35 Ma) in a remote part of northeastern Siberia (Deutsch et al., 2000). Possessing a diameter of 100 Km, Popigai is considerably smaller than Vredefort. Popigai was not subjected to the same erosional intensity as Vredefort. It is relatively young, and is probably the best preserved of the larger structures. Because it possesses a phenomenal quantity of diamonds, formed by the extreme pressures associated with impact, it was explored extensively by drilling and geophysical surveys. It is now regarded to be the type locality for impact-formed diamonds, but due to economic reasons, it cannot be exploited. Exploration has ceased more than a decade ago, due to the remote and inhospitable location, making new field studies virtually impossible. The area can presently only be accessed by helicopter.

Contrary to Popigai, Vredefort it is easily accessible and the natural heritage resources of the Vredefort Dome possesses great resources from the educational, scientific, recreational and tourism points of view. Although still largely pristine, it is located in the immediate vicinity of South Africa's economic heartland and this area is the home of some 16 million people.

AUTHORIZATION

1. I, MARTINUS CORNELIUS BRINE P.O. BOX 6308 BAILLE PARK 2526
the undersigned, hereby grant free of charge to Unesco the non-exclusive right for the legal term of copyright to reproduce and use in accordance with the terms of paragraph 2 of the present authorization throughout the world the photograph(s) and/or slide(s) described in paragraph 4.
2. I understand that the photograph(s) and/or slide(s) described in paragraph 4 of the present authorization will be used by Unesco to disseminate information on the sites protected under the World Heritage Convention in the following ways:
 - a) Unesco publications;
 - b) co-editions with private publishing houses for World Heritage publications: a percentage of the profits will be given to the World Heritage Fund;
 - c) postcards - to be sold at the sites protected under the World Heritage Convention through national parks services or antiquities (profits, if any, will be divided between the services in question and the World Heritage Fund);
 - d) slide series - to be sold to schools, libraries, other institutions and eventually at the sites (profits, if any, will go to the World Heritage Fund);
 - e) exhibitions, etc.
3. I also understand that I shall be free to grant the same rights to any other eventual user but without any prejudice to the rights granted to Unesco.
4. The list of photograph(s) and/or slide(s) for which the authorization is given is attached. (Please describe in the attachment the photographs and give for each a complete caption and the year of production or, if published, of first publication.)
5. All photographs and/or slides will be duly credited. The photographer's moral rights will be respected. Please indicate the exact wording to be used for the photographic credit.
6. I hereby declare and certify that I am duly authorized to grant the rights mentioned in paragraph 1 of the present authorization.
7. I hereby undertake to indemnify Unesco, and to hold it harmless of any responsibility, for any damages resulting from any violation of the certification mentioned under paragraph 6 of the present authorization.
8. Any differences or disputes which may arise from the exercise of the rights granted to Unesco will be settled in a friendly way. Reference to courts or arbitration is excluded.

POTCHERFSSA-CORA

Place

20 JANUARY
2003

date

M.C. Brine

Signature, title or function of the person duly authorized

Summary

WORLD HERITAGE CONVENTION ACT NO. 49 OF 1999

Purpose:

The purpose of the act is provide for the incorporation of the World Heritage Convention into South African law; the enforcement and implementation of the World Heritage Convention in South Africa; the recognition and establishment of World Heritage Sites; the establishment of Authorities and the granting of additional powers to existing organs of state; the powers and duties of such Authorities, especially those safeguarding the integrity of World Heritage Sites; where appropriate, the establishment of Boards and Executive Staff Components of the Authorities; integrated management plans over World Heritage Sites; land matters in relation to World Heritage Sites; financial, auditing and reporting controls over the Authorities; and to provide for incidental matters.

Objectives of Act.

The objectives of this Act are to provide for—

- (i) the cultural and environmental protection and sustainable development of, and related activities within, World Heritage Sites; and
- (ii) giving effect to the values of the Convention;
- (b) make the Convention part of South African domestic law and to create a framework to ensure that the Convention and the Operational Guidelines are effectively implemented in the Republic, subject to the Constitution and the provisions of this Act;
- (c) promote, manage, oversee, market and facilitate tourism and related development in connection with World Heritage Sites in accordance with applicable law, the Convention and the Operational Guidelines in such a way that the cultural and ecological integrity is maintained;
- (d) ensure that everything done in terms of this Act conforms with the obligations of the Republic in terms of the Convention and the Operational Guidelines;
- (e) ensure the identification and transmission to future generations of the cultural and natural heritage of the Republic;
- (f) ensure that effective and active measures are taken for the protection, conservation and presentation of the cultural and natural heritage of the Republic;
- (g) encourage investment and innovation in connection with World Heritage Sites;
- (h) encourage job creation in connection with World Heritage Sites;
- (i) promote the development of culturally, environmentally and, if applicable, economically sustainable projects in connection with World Heritage Sites; and
- (j) promote empowerment and advancement of historically disadvantaged persons in projects related to World Heritage Sites.

Fundamental principles.

The fundamental principles recognised by the act are

- (a) cultural and natural heritage management must be sensitive to the people and their needs and must equitably serve their physical, psychological, developmental, cultural and social interests;
- (b) development must be socially, culturally, environmentally and economically sustainable;
- (c) equitable access to World Heritage Sites must be pursued and special measures must be taken to ensure access thereto by historically disadvantaged persons;
- (d) the participation of all interested and affected parties in the governance of cultural and natural heritage must be promoted;
- (e) all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation;
- (f) participation by vulnerable and historically disadvantaged persons must be ensured;
- (g) decisions must take into account the interests, needs and values of all interested and affected parties;
- (h) community well-being and empowerment must be promoted through cultural and natural heritage education, the raising of cultural and natural heritage awareness, the sharing of knowledge and experience and other appropriate means;
- (i) the social, economic, cultural and natural heritage consequences of activities, including disadvantages and benefits, must be considered;
- (j) decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with applicable law;
- (k) there must be intergovernmental co-ordination and harmonisation of policies, legislation and actions relating to the cultural and natural heritage;
- (l) actual or potential conflicts of interest between—
 - (i) organs of state;
 - (ii) an organ of state and an Authority; or
 - (iii) Authorities,should be resolved through appropriate conflict resolution procedures and the principles of co-operative government in accordance with the Constitution;
- (m) policy, administrative practice and legislation and the interpretation of existing legislation relating to the cultural and natural heritage must promote the integration of these resources in provincial, urban and rural planning and social and economic development;
- (n) global and international responsibilities relating to the cultural and natural heritage must be discharged in the national interest;
- (o) the cultural and natural heritage is held in public trust for the people, the beneficial use of cultural and environmental resources must serve the public interest and the cultural and natural heritage must be protected as the common heritage of the people; and
- (p) sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, dolomitic land and ridges, estuaries, wetlands, and similar systems

require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

Sustainable development of World Heritage Sites includes that—

- (a) the unnatural disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be avoided, are mitigated;
- (b) pollution and degradation of the environment are avoided, or, where they cannot be avoided, are mitigated;
- (c) the unnatural disturbance of landscapes and sites that constitute the cultural and natural heritage of the Republic is avoided, or, where it cannot be avoided, is mitigated, and that the cultural and natural heritage of the Republic must be enhanced;
- (d) waste is avoided, or, where it cannot be avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner;
- (e) the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource;
- (f) the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised;
- (g) a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions;
- (h) negative impacts on the environment and on the environmental rights of the people must be anticipated and prevented, and where they cannot be prevented, must be mitigated;
- (i) cultural and natural heritage may promote reconciliation, understanding and respect, and contribute to the development of a unifying South African identity; and
- (j) cultural and natural heritage management must guard against the use of this heritage for purposes of threatening a culture based on equality and freedom or for party-political gain.

Authority

The Minister of Environmental Affairs may in terms of sec 8 and 9, where an existing organ of state is already lawfully managing or involved in a World Heritage Site,

- (a) declare that such organ of state is an Authority under this Act which is a juristic person with the capacity to sue and be sued in its own name;
- (b) give or impose such additional powers or duties referred to in section 13 to that organ of state in relation to that World Heritage Site.

or

establish a new Authority which is a juristic person with the capacity to sue and be sued in its own name, with so much of the powers and duties set out in this Act, as the Minister may determine.

Any new Authority may exercise its powers and duties through a Board or an Executive Staff Component or both, as the Minister may determine .

Powers and duties of Authorities

Where an Authority controls one or more World Heritage Sites, the Minister may, by notice in the Gazette, give some or all of the following powers to an Authority over one or more specified World Heritage Sites, namely to—

- (a) implement the Convention, including to ensure—
 - (i) the identification, protection, conservation, presentation and transmission of the cultural and natural heritage to future generations; and
 - (ii) that effective and active measures are taken for the effective protection, conservation and presentation of the cultural and natural heritage;
- (b) exercise all the powers reasonably necessary to fulfil the duties of an Authority spelled out in subsection (2);
- (c) liaise with relevant cultural, nature conservation and similar authorities on a local, provincial, national and, with the consent of the Department, international level;
- (d) conserve, manage, promote, facilitate and monitor cultural and natural heritage;
- (e) manage cultural and natural heritage in accordance with all applicable national and provincial legislation, policies and management plans;
- (f) negotiate land claims over—
 - (i) State land with claimants, in consultation with the Department of Land Affairs, in terms of the Restitution of Land Rights Act, 1994 (Act No. 22 of 1994), and settle any such claims, with the approval of the Minister for Agriculture and Land Affairs or his or her delegate; or
 - (ii) private land forming part of or affecting World Heritage Sites or land affecting World Heritage Sites, with the owner, and settle any such claims;
- (g) enter into agreements, subject to section 217 of the Constitution, with any person for the provision of goods and services, including the performance of powers and duties of the Authority, but the Minister may prescribe the procedure to be adopted in procuring and negotiating such agreements, or in any particular matter determine that an agreement requires his or her prior written approval;
- (h) acquire land or rights in land by contract, donation or otherwise;
- (i) charge fees, rent or other consideration for—
 - (i) any function it fulfils; or
 - (ii) any right it grants;
- (j) use for gain or reward any movable and immovable asset under its control, subject to all applicable law, where such asset is not required by the Authority for the fulfilment of its functions, but such movable and immovable property, as listed in the nomination file for the World Heritage Site, may not be alienated, leased or encumbered without the prior written approval of the Minister;
- (k) undertake, or cause to be undertaken, research or investigations relevant to a World Heritage Site;
 - (l) co-ordinate with—
 - (i) the relevant tribunals under the Development Facilitation Act, 1995 (Act No. 67 of 1995), if applicable; or
 - (ii) similar bodies or relevant planning authorities, on a national, provincial and local level,

in order to expedite sustainable development in World Heritage Sites and to ensure that development takes place in accordance with all applicable laws and procedures;

(m) initiate, assist, comment on or facilitate any application under the Development Facilitation Act, 1995, or other applicable development, planning or management law relating to or affecting a World Heritage Site;

(n) with the consent of the Minister, perform any function, on contractually agreed terms that are fair in relation to the obligations imposed on an Authority, at the request of—

(i) a national government department;

(ii) an institution or statutory body;

(iii) another country;

(iv) a province;

(v) a regional council;

(vi) a local government; or

(vii) any other entity or person approved by the Minister;

(o) employ persons or entities on a permanent or temporary basis;

(p) make rules in connection with the World Heritage Site under its jurisdiction regarding such matters as the Minister may determine;

(q) establish committees and subcommittees and otherwise arrange its internal affairs in a manner it deems necessary;

(r) enter into contracts in an open and transparent manner regarding cultural development or nature conservation with a competent national, provincial or local government or private nature conservation entity, with the necessary administrative capacity and resources; and

(s) do all things incidental or reasonably necessary for the proper fulfilment of paragraphs (a) to (r).

The Authority has the following duties in connection with a World Heritage Site under its control, namely to—

(a) develop measures for the cultural and environmental protection and sustainable development of, and related activities within, World Heritage Sites and to ensure that the values of the Convention are given effect to;

(b) promote, manage, oversee, market and facilitate tourism and related development in connection with World Heritage Sites in accordance with applicable law, the Convention and the Operational Guidelines in such a way that the cultural and ecological integrity are maintained;

(c) identify cultural and natural heritage that must be transmitted to future generations;

(d) take effective and active measures for the protection, conservation and presentation of the cultural and natural heritage;

(e) facilitate steps that encourage investment and innovation;

(f) facilitate programmes that encourage job creation;

(g) take measures that ensure that the values of the Convention are promoted;

(h) establish and implement the Integrated Management Plan;

(i) initiate steps regarding research, education, training, awareness raising and capacity building; and

(j) liaise with, and be sensitive to, the needs of communities living in or near World Heritage Sites.

Preparation and implementation of integrated management plans.

In terms of chapter IV of the Act every Authority must prepare and implement an integrated management plan for the World Heritage Site under its control to fulfil Articles 4 and 5 of the Convention.

An Authority must conduct its affairs in accordance with an integrated management plan.

In preparing an integrated management plan, an Authority must have due regard for, and seek to integrate and harmonise that integrated management plan with the requirements of the Convention and the Operational Guidelines, and with applicable—

- (a) plans in terms of the National Environmental Management Act, 1998, the National Heritage Resources Act, 1999, the Cultural Institutions Act, 1998 (Act No. 119 of 1998), the Development Facilitation Act, 1995, and the National Parks Act, 1976 (Act No. 57 of 1976);
- (b) provincial government planning and development plans;
- (c) regional planning and development plans;
- (d) local government planning and development plans; and
- (e) existing planning and development plans of an existing organ of state

In addition to the requirements of the Convention, the Operational Guidelines and the directives of the Minister for a plan of this nature, every integrated management plan must contain, at least—

- (a) a co-ordinated policy framework;
- (b) such planning measures, controls and performance criteria as may be prescribed;
- (c) a programme for the implementation of the plan;
- (d) procedures for public participation;
- (e) procedures for participation by nature conservation, tourism and other relevant experts;
- (f) cultural or nature conservation components required by—
 - (i) applicable law; and
 - (ii) the directives of the Minister;
- (g) provisions regarding the—
 - (i) activities allowed within a particular geographical area;
 - (ii) terms and conditions for conducting activities;
 - (iii) prohibition of activities prescribed by the Minister;
 - (iv) control over the frequency, size, impact or manner of conducting activities in a particular geographical area, including without limitation, the use of, or access to, structures;
- (v) a description of the World Heritage Site concerned, an assessment of its significance and an evaluation of material threats to its significance; and
- (vi) alienation, lease or encumbrance of movable and immovable property if applicable.

An Authority must submit its first integrated management plan to the Minister for approval within six months of the establishment of that Authority or such later date set by the Minister.

The World Heritage Site must be managed as prescribed pending the approval by the Minister of the integrated management plan.

An integrated management plan becomes effective once approved by the Minister.

Funding.

Subject to applicable law, an Authority may receive and raise monies from any legal source, as the Minister may prescribe with the concurrence of the Minister of Finance, including—

- (a) contract for goods and services;
- (b) loan;
- (c) donor funding from inside or outside the Republic;
- (d) interest;
- (e) joint venture income;
- (f) fees, including, without limitation, fees related to—
 - (i) turnover;
 - (ii) rights granted by an Authority; or
 - (iii) services provided by an Authority;
- (g) sale income;
- (h) income from the development or leasing of its assets;
- (i) subsidies from any organ of state; or
- (j) appropriation by Parliament or a provincial legislature.

The monies received or raised by an Authority must be used in accordance with the business and financial plan of the Authority as approved by the Minister.

An Authority must submit to the Minister its annual financial plan for approval for the following financial year not later than 30 days before the end of each financial year.

It must set out and explain proposed operations, projects, activities and other objectives of an Authority for the following financial year, including—

- (a) the cost of those operations, projects, activities and other objectives;
- (b) the manner in which it is proposed to finance them;
- (c) the performance indicators applicable to them;
- (d) a statement of estimated income and expenditure for that financial

year;

- (e) any other information and particulars that may be prescribed; and
- (f) any additional relevant information that may be requested by the

Minister in writing from time to time.

An Authority must submit a five year strategic plan to the Minister for approval, not later than 30 days before the end of its first financial year. Thereafter, a revised strategic plan must be submitted to the Minister for approval every financial year. A five-year strategic plan must be annexed to the annual financial plan of an Authority.

An Authority must keep proper books and records of account, subject to applicable law, for each financial year in accordance with generally accepted accounting practice, with regard to its income, expenditure and transactions during the financial year and the state of its assets and liabilities during, and as at the end of, the financial year.

Annually, within six months of the end of the financial year, an Authority must have the following financial statements:

- (a) A statement of income and expenditure;
- (b) a cash-flow statement; and
- (c) a balance sheet,

prepared for that year, which must accurately reflect transactions and financial sources as well as the position and state of affairs of an Authority

The books and records of account and financial statements of an Authority must be audited annually by the Auditor-General.

Regulations.

The Minister may,

(1) Subject to the objectives and fundamental principles of this Act, make regulations that are consistent with the Act with regard to—

- (a) anything which in terms of this Act must be prescribed;
- (b) generally, all matters which are reasonably necessary to be prescribed in order to achieve the objectives of this Act.

(2) Subject to the applicable law, the Minister may make regulations regarding—

- (a) the conditions of service, employment, transfer, promotion and, where an Authority is already in existence, the continued employment of its employees;
- (b) the transfer of employees from an organ of state to an Authority;
- (c) the management and administration of an Authority;
- (d) the determination of criteria for the making of appointments to a Board, including criteria for the determination of the rights of interested parties;
- (e) the financial and accounting activities of an Authority;
- (f) the identification, investigation and nomination of a future World Heritage Site;
- (g) the management and control of a World Heritage Site;
- (h) the administration, management and control of movable and immovable assets of an Authority; and
- (i) the time, manner and form of complying with any administrative, technical or reporting requirements of the Convention.

(3) The Minister may—

- (a) prescribe norms and standards for cultural or natural heritage that are consistent with the provisions of this Act; and
- (b) prescribe national policy relating to the management of cultural or natural heritage in addition to, but not inconsistent with, the objectives and principles set out in this Act.

(4) The Minister may, by regulation, incorporate as many of, or all of, the Operational Guidelines as may be necessary, with the necessary changes, where appropriate, for their effective implementation in the Republic.

WORLD HERITAGE CONVENTION ACT

NO. 49 OF 1999

[View Regulation]

[ASSENTED TO 3 DECEMBER, 1999]

[DATE OF COMMENCEMENT: 4 AUGUST, 2000]

(English text signed by the State President)

ACT

To provide for the incorporation of the World Heritage Convention into South African law; the enforcement and implementation of the World Heritage Convention in South Africa; the recognition and establishment of World Heritage Sites; the establishment of Authorities and the granting of additional powers to existing organs of state; the powers and duties of such Authorities, especially those safeguarding the integrity of World Heritage Sites; where appropriate, the establishment of Boards and Executive Staff Components of the Authorities; integrated management plans over World Heritage Sites; land matters in relation to World Heritage Sites; financial, auditing and reporting controls over the Authorities; and to provide for incidental matters.

Preamble.—RECOGNISING that the cultural heritage and the natural heritage are among the priceless and irreplaceable possessions, not only of the Republic, but of humankind as a whole;

ACKNOWLEDGING that the loss, through deterioration, disappearance or damage through inappropriate development of any of these most prized possessions, constitutes an impoverishment of the heritage of all the peoples of the world and, in particular, the people of South Africa.

ARRANGEMENT OF SECTIONS

CHAPTER I

DEFINITIONS, OBJECTIVES, PRINCIPLES AND IMPLEMENTATION

1. Definitions
2. Enactment of Convention as part of South African law
3. Objectives of Act
4. Fundamental principles
5. Enforcement and implementation of Convention
6. Identification and nomination of World Heritage Sites

CHAPTER II

AUTHORITIES

7. Consultation prior to declaration or establishment of Authority
8. Existing organ of state declared as Authority
9. Establishment of new Authorities
10. Organs of new Authorities
11. Name of Authority
12. Disestablishment of Authority and revocation of powers
13. Powers and duties of Authorities

CHAPTER III

BOARD AND EXECUTIVE STAFF COMPONENT

14. Establishment of Board for new Authority

15. Powers and duties of Board of new Authority
16. Terms of employment of Board of new Authority
17. Appointment of Executive Staff Component of new Authority
18. Transfer of staff members where existing organ of state is declared as Authority
19. Powers of Executive Staff Component of new Authority
20. Terms of employment of Executive Staff Component of new Authority

CHAPTER IV INTEGRATED MANAGEMENT PLANS

21. Preparation and implementation of integrated management plans
22. Harmonisation of integrated management plans
23. Objects of integrated management plans
24. Contents of integrated management plans
25. Approval of integrated management plans
26. Duration of integrated management plan
27. Amendment or termination of integrated management plan by Minister
28. Model integrated management plan

CHAPTER V LAND

29. Purchase of land for World Heritage Site purposes
30. Expropriation of land for World Heritage Site purposes
31. Transfer and alienation of movable or immovable property, and consolidation of land

CHAPTER VI FINANCES AND REPORTS

32. Application of chapter
33. Funding
34. Security
35. Expenditure of monies
36. Annual financial plan
37. Strategic plan
38. Financial regulations
39. Accounting
40. Audit
41. Report by Auditor-General
42. Annual report

CHAPTER VII GENERAL

43. Delegation
44. Regulations
45. Short title and commencement

Schedule Convention concerning the protection of the world cultural and natural heritage

CHAPTER I

DEFINITIONS, OBJECTIVES, PRINCIPLES AND IMPLEMENTATION

1. Definitions.—In this Act, unless inconsistent with the context—
- “Authority” means an existing Authority which is declared as an Authority in terms of section 8 or an Authority which is established in terms of section 9;
- “Board” means the Board referred to in section 14;
- “Convention”, as well as “World Heritage Convention”, means the Convention Concerning the Protection of the World Cultural and Natural Heritage, adopted by the General Conference of United Nations Education, Scientific and Cultural Organization (Unesco) on 16 November 1972 and ratified by the Republic on 10 July 1997, a copy of which is set out in the Schedule;
- “cultural heritage” has the meaning given to it in Article 1 of the Convention;
- “Department” means the Department of Environmental Affairs and Tourism;
- “ecosystem” has the meaning given to it in section 1 of the National Environmental Management Act, 1998 (Act No. 107 of 1998);
- “environment” has the meaning given to it in section 1 of the National Environmental Management Act, 1998;
- “establishment date” means the date determined by the Minister in terms of section 8 or 9;
- “Executive Staff Component” has the meaning given to it in Chapter III;
- “historically disadvantaged persons” means persons or categories of persons that were unfairly discriminated against on the basis of past legislation, policies, prejudice and stereotypes;
- “integrated management plans” has the meaning given to it in Chapter IV;
- “MEC” means the Member of the Executive Council responsible for environmental, cultural or heritage affairs, as the case may be, in the province concerned;
- “Minister” means the Minister of Environmental Affairs and Tourism;
- “natural heritage” has the meaning given to it in Article 2 of the Convention;
- “Operational Guidelines” means the operational guidelines for the implementation of the Convention prepared by the World Heritage Committee;
- “pollution” has the meaning given to it in section 1 of the National Environmental Management Act, 1998;
- “prescribe” means prescribed by regulation in terms of this Act;
- “regulation” means a regulation made in terms of this Act;
- “sustainable development” has the meaning given to it in section 4 (2) of this Act;
- “this Act” includes the Convention, regulations and any notice issued under this Act;
- “World Heritage Committee” means the World Heritage Committee established in terms of Article 8 of the Convention;
- “World Heritage Fund” means the World Heritage Fund established in terms of Article 15 (1) of the Convention;
- “World Heritage List” means the World Heritage List established in terms of Article 11 (2) of the Convention;
- “World Heritage Site” means any place in the Republic which—
- (a) has been included on—
 - (i) the World Heritage List; or

(ii) the tentative list of the Republic referred to in Article 121 (a) (i) of the Operational Guidelines, and is proclaimed by the Minister by notice in the Gazette to be a World Heritage Site; or

(b) has been proclaimed by the Minister by notice in the Gazette to be a special heritage site for management in accordance with this Act as if that site qualified under paragraph (a)—

(i) after consultation with the Minister affected by such a proclamation;

(ii) if applicable, after consultation with the relevant MEC; and

(iii) subject to a resolution of Parliament, but such a special heritage site cannot be referred to as a World Heritage Site.

2. Enactment of Convention as part of South African law.—The Convention is enacted into law in the Republic.

3. Objectives of Act.—The objectives of this Act are to—

(a) provide for—

(i) the cultural and environmental protection and sustainable development of, and related activities within, World Heritage Sites; and

(ii) giving effect to the values of the Convention;

(b) make the Convention part of South African domestic law and to create a framework to ensure that the Convention and the Operational Guidelines are effectively implemented in the Republic, subject to the Constitution and the provisions of this Act;

(c) promote, manage, oversee, market and facilitate tourism and related development in connection with World Heritage Sites in accordance with applicable law, the Convention and the Operational Guidelines in such a way that the cultural and ecological integrity is maintained;

(d) ensure that everything done in terms of this Act conforms with the obligations of the Republic in terms of the Convention and the Operational Guidelines;

(e) ensure the identification and transmission to future generations of the cultural and natural heritage of the Republic;

(f) ensure that effective and active measures are taken for the protection, conservation and presentation of the cultural and natural heritage of the Republic;

(g) encourage investment and innovation in connection with World Heritage Sites;

(h) encourage job creation in connection with World Heritage Sites;

(i) promote the development of culturally, environmentally and, if applicable, economically sustainable projects in connection with World Heritage Sites; and

(j) promote empowerment and advancement of historically disadvantaged persons in projects related to World Heritage Sites.

4. Fundamental principles.—(1) For purposes of this Act, the fundamental principles listed in the following paragraphs are recognised by the State and apply throughout the Republic to the actions of all organs of State and Authorities in relation to World Heritage Sites, subject to applicable law, including, without limitation, the National Environmental Management Act, 1998, and the National Heritage Resources Act, 1999 (Act No. 29 of 1999), but in the event of any conflict between the principles of this Act and the said Acts, the provisions of the said Acts prevail:

- (a) cultural and natural heritage management must be sensitive to the people and their needs and must equitably serve their physical, psychological, developmental, cultural and social interests;
 - (b) development must be socially, culturally, environmentally and economically sustainable;
 - (c) equitable access to World Heritage Sites must be pursued and special measures must be taken to ensure access thereto by historically disadvantaged persons;
 - (d) the participation of all interested and affected parties in the governance of cultural and natural heritage must be promoted;
 - (e) all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation;
 - (f) participation by vulnerable and historically disadvantaged persons must be ensured;
 - (g) decisions must take into account the interests, needs and values of all interested and affected parties;
 - (h) community well-being and empowerment must be promoted through cultural and natural heritage education, the raising of cultural and natural heritage awareness, the sharing of knowledge and experience and other appropriate means;
 - (i) the social, economic, cultural and natural heritage consequences of activities, including disadvantages and benefits, must be considered;
 - (j) decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with applicable law;
 - (k) there must be intergovernmental co-ordination and harmonisation of policies, legislation and actions relating to the cultural and natural heritage;
 - (l) actual or potential conflicts of interest between—
 - (i) organs of state;
 - (ii) an organ of state and an Authority; or
 - (iii) Authorities,should be resolved through appropriate conflict resolution procedures and the principles of co-operative government in accordance with the Constitution;
 - (m) policy, administrative practice and legislation and the interpretation of existing legislation relating to the cultural and natural heritage must promote the integration of these resources in provincial, urban and rural planning and social and economic development;
 - (n) global and international responsibilities relating to the cultural and natural heritage must be discharged in the national interest;
 - (o) the cultural and natural heritage is held in public trust for the people, the beneficial use of cultural and environmental resources must serve the public interest and the cultural and natural heritage must be protected as the common heritage of the people; and
 - (p) sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, dolomitic land and ridges, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.
- (2) For the purposes of this Act, sustainable development of World Heritage Sites includes that—
- (a) the unnatural disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be avoided, are mitigated;

(b) pollution and degradation of the environment are avoided, or, where they cannot be avoided, are mitigated;

(c) the unnatural disturbance of landscapes and sites that constitute the cultural and natural heritage of the Republic is avoided, or, where it cannot be avoided, is mitigated, and that the cultural and natural heritage of the Republic must be enhanced;

(d) waste is avoided, or, where it cannot be avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner;

(e) the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource;

(f) the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised;

(g) a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions;

(h) negative impacts on the environment and on the environmental rights of the people must be anticipated and prevented, and where they cannot be prevented, must be mitigated;

(i) cultural and natural heritage may promote reconciliation, understanding and respect, and contribute to the development of a unifying South African identity; and

(j) cultural and natural heritage management must guard against the use of this heritage for purposes of threatening a culture based on equality and freedom or for party-political gain.

5. Enforcement and implementation of Convention.—The Minister is responsible for enforcing and implementing this Act and the Convention in the Republic, including—

(a) after consultation with the relevant provinces and other organs of state concerned, submitting an inventory as described in Article 11 of the Convention;

(b) publishing such particulars as may be prescribed of any new World Heritage Site in the Gazette within a reasonable period of time;

(c) applying to the World Heritage Committee for international assistance in terms of Article 13 and Part V of the Convention;

(d) entering into agreements in terms of Article 13 of the Convention;

(e) making applications to the World Heritage Fund and overseeing the proper use of any financing obtained in terms of the Convention;

(f) preparing reports as required by Article 29 of the Convention after due consultation with the provinces and organs of state concerned;

(g) disseminating information related to the Convention and reports from Convention meetings;

(h) initiating steps regarding research, education, training, awareness raising and capacity building; and

(i) ensuring public participation.

6. Identification and nomination of World Heritage Sites.—(1) The Minister is responsible for the procedure relating to the nomination of World Heritage Sites in accordance with this Act, the Convention and the Operating Guidelines.

(2) The Department or a body determined by the Minister must identify places of potential cultural or natural heritage and investigate the desirability of nominating such places for inclusion on the World Heritage List.

(3) Any person may submit a proposal in writing to the Department or, if it is in existence, the body referred to in subsection (2), for a place in the Republic to be nominated for inclusion on the World Heritage List.

(4) The Minister may determine the format and procedures for—

- (a) the proposal referred to in subsection (3);
- (b) an investigation into such proposal; and
- (c) the nomination of any place in the Republic for inclusion on the World

Heritage List.

(5) A written motivation for the declaration of a place as a World Heritage Site must be prepared and kept by the Department in accordance with the requirements of the Convention and the Operating Guidelines.

CHAPTER II

AUTHORITIES

7. Consultation prior to declaration or establishment of Authority.—(1) The Minister must consult with the Minister of Arts, Culture, Science and Technology and with interested parties before acting in terms of section 8 or 9, which consultation, in the case of interested parties, may be in the form of public hearings and must include consultation with representatives from the relevant affected—

- (a) provinces;
- (b) local governments;
- (c) cultural authorities;
- (d) nature conservation authorities;
- (e) heritage authorities; and
- (f) other organs of state.

(2) The consultation with interested parties referred to in subsection (1) must be in a manner that the Minister considers to be appropriate, including—

- (a) calling on interested parties to participate in the public hearings referred to in subsection (1); and
- (b) specifying particulars of the consultation process by notice in the Gazette, in at least two nationally distributed newspapers, appropriate local newspapers and radio stations.

(3) The Minister must, after consultation in terms of subsection (1), but before acting in terms of section 8 or 9, if applicable, notify—

- (a) the owner of the area affected by the proposed action;
- (b) the mortgage holder, the occupier and any other person with a registered interest in the area affected by the proposed action; and
- (c) cultural, nature conservation, heritage and similar public interest bodies with an interest in the area affected by the proposed action.

(4) The notification referred to in subsection (2) must be effected by notice in the Gazette, in at least two nationally distributed newspapers, appropriate local newspapers and radio stations.

8. Existing organ of state declared as Authority.—Where an existing organ of state is already lawfully managing or involved in a World Heritage Site, the Minister may, after consultation with the relevant affected MEC or Minister, if applicable, by notice in the Gazette—

- (a) declare that such organ of state is an Authority under this Act which is a juristic person with the capacity to sue and be sued in its own name;

(b) give or impose such additional powers or duties referred to in section 13 to that organ of state in relation to that World Heritage Site.

9. Establishment of new Authorities.—The Minister may, by notice in the Gazette, establish an Authority which is a juristic person with the capacity to sue and be sued in its own name, with so much of the powers and duties set out in this Act, as the Minister may determine.

10. Organs of new Authorities.—An Authority established in terms of section 9 may exercise its powers and duties through a Board or an Executive Staff Component or both, as the Minister may determine by notice in the Gazette.

11. Name of Authority.—The Minister may, by notice in the Gazette, determine a name for an Authority.

12. Disestablishment of Authority and revocation of powers.—(1) An Authority referred to in section 9 must only be disestablished in terms of a resolution by Parliament.

(2) The Minister may, at any time, investigate the performance by an Authority of its powers and duties in terms of this Act, the Convention or the Operational Guidelines.

(3) As part of any such investigation, the Minister must afford the Authority the opportunity of refuting any allegations against it.

(4) If that investigation reveals that an Authority is not performing its functions properly, the Minister must submit a report to Parliament for consideration by the National Assembly and the National Council of Provinces.

(5) If the National Assembly and the National Council of Provinces pass a resolution amending, suspending, revoking or terminating the powers of such an Authority or disestablishing it, the Minister must give effect to such a resolution by notifying that Authority accordingly.

(6) Where an Authority is disestablished in terms of this section, the Minister must ensure that—

(a) the assets of the Authority are protected; and

(b) the resolutions of the National Assembly and the National Council of Provinces are published in the Gazette for public information.

13. Powers and duties of Authorities.—(1) In the case where an Authority controls one or more World Heritage Sites, the Minister may, by notice in the Gazette, give some or all of the following powers to an Authority over one or more specified World Heritage Sites, namely to—

(a) implement the Convention, including to ensure—

(i) the identification, protection, conservation, presentation and transmission of the cultural and natural heritage to future generations; and

(ii) that effective and active measures are taken for the effective protection, conservation and presentation of the cultural and natural heritage;

(b) exercise all the powers reasonably necessary to fulfil the duties of an Authority spelled out in subsection (2);

(c) liaise with relevant cultural, nature conservation and similar authorities on a local, provincial, national and, with the consent of the Department, international level;

(d) conserve, manage, promote, facilitate and monitor cultural and natural heritage;

(e) manage cultural and natural heritage in accordance with all applicable national and provincial legislation, policies and management plans;

(f) negotiate land claims over—

- (i) State land with claimants, in consultation with the Department of Land Affairs, in terms of the Restitution of Land Rights Act, 1994 (Act No. 22 of 1994), and settle any such claims, with the approval of the Minister for Agriculture and Land Affairs or his or her delegate; or
- (ii) private land forming part of or affecting World Heritage Sites or land affecting World Heritage Sites, with the owner, and settle any such claims;
- (g) enter into agreements, subject to section 217 of the Constitution, with any person for the provision of goods and services, including the performance of powers and duties of the Authority, but the Minister may prescribe the procedure to be adopted in procuring and negotiating such agreements, or in any particular matter determine that an agreement requires his or her prior written approval;
- (h) acquire land or rights in land by contract, donation or otherwise;
- (i) charge fees, rent or other consideration for—
 - (i) any function it fulfils; or
 - (ii) any right it grants;
- (j) use for gain or reward any movable and immovable asset under its control, subject to all applicable law, where such asset is not required by the Authority for the fulfilment of its functions, but such movable and immovable property, as listed in the nomination file for the World Heritage Site, may not be alienated, leased or encumbered without the prior written approval of the Minister;
- (k) undertake, or cause to be undertaken, research or investigations relevant to a World Heritage Site;
- (l) co-ordinate with—
 - (i) the relevant tribunals under the Development Facilitation Act, 1995 (Act No. 67 of 1995), if applicable; or
 - (ii) similar bodies or relevant planning authorities, on a national, provincial and local level,
 - in order to expedite sustainable development in World Heritage Sites and to ensure that development takes place in accordance with all applicable laws and procedures;
- (m) initiate, assist, comment on or facilitate any application under the Development Facilitation Act, 1995, or other applicable development, planning or management law relating to or affecting a World Heritage Site;
- (n) with the consent of the Minister, perform any function, on contractually agreed terms that are fair in relation to the obligations imposed on an Authority, at the request of—
 - (i) a national government department;
 - (ii) an institution or statutory body;
 - (iii) another country;
 - (iv) a province;
 - (v) a regional council;
 - (vi) a local government; or
 - (vii) any other entity or person approved by the Minister;
- (o) employ persons or entities on a permanent or temporary basis;
- (p) make rules in connection with the World Heritage Site under its jurisdiction regarding such matters as the Minister may determine;
- (q) establish committees and subcommittees and otherwise arrange its internal affairs in a manner it deems necessary;
- (r) enter into contracts in an open and transparent manner regarding cultural development or nature conservation with a competent national, provincial or

local government or private nature conservation entity, with the necessary administrative capacity and resources; and

(s) do all things incidental or reasonably necessary for the proper fulfilment of paragraphs (a) to (r).

(2) An Authority has, unless the Minister prescribes otherwise, the following duties in connection with a World Heritage Site under its control, namely to—

(a) develop measures for the cultural and environmental protection and sustainable development of, and related activities within, World Heritage Sites and to ensure that the values of the Convention are given effect to;

(b) promote, manage, oversee, market and facilitate tourism and related development in connection with World Heritage Sites in accordance with applicable law, the Convention and the Operational Guidelines in such a way that the cultural and ecological integrity are maintained;

(c) identify cultural and natural heritage that must be transmitted to future generations;

(d) take effective and active measures for the protection, conservation and presentation of the cultural and natural heritage;

(e) facilitate steps that encourage investment and innovation;

(f) facilitate programmes that encourage job creation;

(g) take measures that ensure that the values of the Convention are promoted;

(h) establish and implement the Integrated Management Plan;

(i) initiate steps regarding research, education, training, awareness raising and capacity building; and

(j) liaise with, and be sensitive to, the needs of communities living in or near World Heritage Sites.

(3) In giving the powers referred to in subsection (1) to an Authority established in terms of section 9, the Minister must specify the powers which must be exercised by either the Board or the Executive Staff Component, or both, as the case may be.

(4) The Minister may, by notice in the Gazette, publish model rules to be used as a guideline by Authorities.

CHAPTER III

BOARD AND EXECUTIVE STAFF COMPONENT

14. Establishment of Board for new Authority.—(1) The Minister may, by notice in the Gazette, establish a Board for an Authority established in terms of section 9, subject to subsection (2).

(2) Before the Minister establishes a Board in terms of subsection (1), the Minister must—

(a) invite nominations by notice in the Gazette and in at least two nationally distributed newspapers; and

(b) stipulate in such invitation the procedures to be adopted regarding such nominations.

(3) A Board may not have less than five and not more than nine members.

(4) The Minister must ensure that the Board is broadly representative and multidisciplinary, with members who may make a contribution towards the proper functioning of the Authority, and may include, without limitation, representatives from—

(a) national Government;

(b) provincial government departments and cultural or nature conservation authorities;

- (c) directly affected adjacent communities;
- (d) heritage bodies;
- (e) organised business;
- (f) affected adjacent tribal authorities;
- (g) nature conservation bodies;
- (h) cultural organisations;
- (i) non-governmental organisations;
- (j) scientific or academic expert bodies;
- (k) local authorities;
- (l) private landowners; and
- (m) international cultural or nature conservation bodies.

15. Powers and duties of Board of new Authority.—(1) With regard to the Authority for which a Board is established, the Board has the powers reasonably necessary to—

- (a) be responsible for the policy of, and general oversight over, that Authority;
- (b) provide directions to the Executive Staff Component of that Authority;
- (c) monitor the activities of the Executive Staff Component of that Authority to ensure compliance with this Act; and
- (d) co-ordinate with Boards of other Authorities.

(2) The Minister may give to a Board any of the powers referred to in section 13, in addition to the powers referred to in subsection (1).

(3) The Minister may review decisions, actions and policies of the Board.

16. Terms of employment of Board of new Authority.—(1) The Minister may prescribe matters relating to the terms of employment of the Board, including—

- (a) term of office, service conditions and remuneration of Board members;
- (b) filling of vacancies on the Board and resignation or removal from office of Board members; and
- (c) the size of the Board and the number of Board members required to constitute a quorum at a meeting.

(2) The Board may, subject to the approval of the Minister, delegate and assign its powers and duties, excluding the power with regard to policy.

17. Appointment of Executive Staff Component of new Authority.—(1) The Board must appoint an Executive Staff Component for an Authority established in terms of section 9.

(2) The Executive Staff Component of an Authority established in terms of section 9 must be under the control and supervision of a Chief Executive Officer, who is nominated by the Board and appointed by the Minister.

(3) The Board must ensure that the Executive Staff Component is broadly representative and multidisciplinary, with members qualified to make a substantial contribution towards the effective day-to-day and long-term functioning of the Authority, and may include members who are skilled in matters relating to—

- (a) finances;
- (b) business acumen;
- (c) cultural heritage;
- (d) natural heritage;
- (e) tourism;
- (f) project management;
- (g) marketing;
- (h) community involvement; and
- (i) legal matters.

(4) The Minister may prescribe whether or not the Executive Staff Component and other employees of an Authority established in terms of section 9 are subject to the provisions of, and the directives, rules and policies made under, the Public Service Act, 1994 (Proclamation 103 of 1994).

(5) Where the Minister prescribes that the provisions, directives, rules and policies referred to in subsection (4) do not apply to an Authority, the Minister must, with the concurrence of the Minister of Finance, prescribe the conditions of employment applicable to the Executive Staff Component or other employees of an Authority established in terms of section 9, including, without limitation, regulations regarding vacation of office, resignation, removal from office and remuneration.

18. Transfer of staff members where existing organ of state is declared as Authority.—Subject to applicable law, a staff member of an organ of state referred to in section 8 may, without interrupting his or her service or any change to accrued employment rights, benefits and obligations, be transferred to be a staff member in a similar position in an Authority established in terms of section 8.

19. Powers of Executive Staff Component of new Authority.—(1) An Executive Staff Component has all the necessary powers to be responsible for the effective day-to-day management and functioning of an Authority.

(2) The Minister may, in addition to the powers referred to in subsection (1), give any power referred to in section 13 to an Executive Staff Component.

20. Terms of employment of Executive Staff Component of new Authority.—

(1) The Minister may prescribe matters relating to the functioning of the Executive Staff Component, subject to section 17 (4).

(2) The Executive Staff Component may delegate and assign any of its functions.

CHAPTER IV

INTEGRATED MANAGEMENT PLANS

21. Preparation and implementation of integrated management plans.—(1) Every Authority must prepare and implement an integrated management plan for the World Heritage Site under its control to fulfil Articles 4 and 5 of the Convention.

(2) An Authority must conduct its affairs in accordance with an integrated management plan.

22. Harmonisation of integrated management plans.—In preparing an integrated management plan, an Authority must have due regard for, and seek to integrate and harmonise that integrated management plan with the requirements of the Convention and the Operational Guidelines, and with applicable—

(a) plans in terms of the National Environmental Management Act, 1998, the National Heritage Resources Act, 1999, the Cultural Institutions Act, 1998 (Act No. 119 of 1998), the Development Facilitation Act, 1995, and the National Parks Act, 1976 (Act No. 57 of 1976);

(b) provincial government planning and development plans;

(c) regional planning and development plans;

(d) local government planning and development plans; and

(e) existing planning and development plans of an existing organ of state referred to in section 8.

23. Objects of integrated management plans.—The object of every integrated management plan is to ensure the protection and management of the World Heritage Site concerned in a manner that is consistent with the objectives and principles of this Act.

24. Contents of integrated management plans.—In addition to the requirements of the Convention, the Operational Guidelines and the directives of the Minister for a plan of this nature, every integrated management plan must contain, at least—

- (a) a co-ordinated policy framework;
- (b) such planning measures, controls and performance criteria as may be prescribed;
- (c) a programme for the implementation of the plan;
- (d) procedures for public participation;
- (e) procedures for participation by nature conservation, tourism and other relevant experts;
- (f) cultural or nature conservation components required by—
 - (i) applicable law; and
 - (ii) the directives of the Minister;
- (g) provisions regarding the—
 - (i) activities allowed within a particular geographical area;
 - (ii) terms and conditions for conducting activities;
 - (iii) prohibition of activities prescribed by the Minister;
 - (iv) control over the frequency, size, impact or manner of conducting activities in a particular geographical area, including without limitation, the use of, or access to, structures;
- (v) a description of the World Heritage Site concerned, an assessment of its significance and an evaluation of material threats to its significance; and
- (vi) alienation, lease or encumbrance of movable and immovable property referred to in section 13 (1) (j) in accordance with this Act, if applicable.

25. Approval of integrated management plans.—(1) An Authority must submit its first integrated management plan to the Minister for approval within six months of the establishment of that Authority or such later date set by the Minister.

(2) The World Heritage Site must be managed as prescribed pending the approval by the Minister of the integrated management plan.

(3) An integrated management plan must be submitted to the Minister in terms of subsection (1) after the Authority has consulted with—

- (a) surrounding communities on, or immediately adjacent to, the World Heritage Site;
- (b) owners of private land in, or immediately adjacent to, the World Heritage Site; and
- (c) claimants in terms of the Restitution of Land Rights Act, 1994, with claims over World Heritage Sites or land affecting World Heritage Sites.

(4) The Minister must, upon receipt of an integrated management plan and after consultation with the Minister of Arts, Culture, Science and Technology, the relevant MEC and planning authority, and if applicable, the Council established in terms of section 14 of the National Heritage Resources Act, 1999—

- (a) approve that plan with or without conditions; or
- (b) reject that plan but a rejected plan may be re-submitted if it has been amended to the satisfaction of the Minister.

(5) An integrated management plan becomes effective once approved by the Minister.

(6) Upon approval in terms of subsection (4), the Authority must make such plan available at its main place of business for public inspection during regular office hours.

(7) The Minister may, after consultation in terms of subsection (4), approve the existing planning and development plans of an existing organ of state referred to in section 8, as the integrated management plan for purposes of this chapter, if the Minister is satisfied that such plans comply materially with this chapter.

26. Duration of integrated management plan.—(1) Every integrated management plan must cover a period of at least five years or such longer period as the Minister may determine but where new opportunities or threats arise, or in the case of changed circumstances, an integrated management plan may be reviewed and amended as and when necessary by an Authority, and submitted to the Minister for approval in accordance with section 25 (4).

(2) An Authority must submit subsequent integrated management plans to the Minister to be dealt with in accordance with section 25 (4) before the end of the second last year of the operation of a current integrated management plan.

27. Amendment or termination of integrated management plan by Minister.—

(1) The Minister may amend or terminate an integrated management plan if in the opinion of the Minister—

(a) that integrated management plan is inefficient; or

(b) that integrated management plan does not comply with the Convention, the Operational Guidelines or applicable law.

(2) The Minister may not amend or terminate an integrated management plan if the effect of such amendment or termination is likely to have an adverse effect on the contractual rights between the Authority and a rights-holder under a contract, licence, grant or similar instrument.

28. Model integrated management plan.—(1) The Minister may prepare model integrated management plans or sections thereof after consultation with the Minister of Arts, Culture, Science and Technology.

(2) The Minister may prescribe norms and standards in connection with the preparation and contents of integrated management plans after consultation with the Minister of Arts, Culture, Science and Technology.

CHAPTER V

LAND

29. Purchase of land for World Heritage Site purposes.—The Minister may, with the concurrence of the Minister of Public Works, purchase any property and reserve it for purposes contemplated in this Act in relation to World Heritage Sites, if that purpose is in the public interest.

30. Expropriation of land for World Heritage Site purposes.—The Expropriation Act, 1975 (Act No. 63 of 1975), applies to all expropriations under this Act and any reference to the Minister of Public Works in that Act must be read as a reference to the Minister for purposes of such expropriations.

31. Transfer and alienation of movable or immovable property, and consolidation of land.—(1) (a) The Minister may, with the concurrence of the Minister of Finance, transfer any movable property belonging to the State to an Authority to enable it to perform its powers and duties or to achieve any of its objectives.

(b) The Minister may, with the consent of the Minister responsible for the administration of that land in terms of the State Land Disposal Act, 1961 (Act No. 48 of 1961), and with the concurrence of the Minister of Finance, transfer any immovable property belonging to the State to an Authority to enable it to perform its powers and duties or to achieve any of its objectives.

(2) Immovable property transferred to an Authority in terms of subsection (1), may not, without the prior written approval of the Minister, granted with the concurrence of the Minister of Finance, be alienated, leased or encumbered.

(3) The Minister may—

(a) subject to section 40 of the Deeds Registries Act, 1937 (Act No. 47 of 1937), consolidate land of which the State is the owner and forming part or potentially forming part of a World Heritage Site;

(b) subject to section 65 of the Deeds Registries Act, 1937, register by notarial deed, entered into between the State and an owner or owners, a condition over land forming part or potentially forming part of a World Heritage Site to the effect that such land may not be separately alienated, leased or encumbered without the prior written consent of the Minister, and the said notarial deed may be accompanied by a sketch plan of such land.

(4) The Minister must before giving written consent in terms of subsection (3), consult with all relevant parties, including the relevant—

(a) land owners;

(b) mortgage holders; and

(c) cultural, nature conservation, heritage and similar public interest bodies with an interest in the area affected by the proposed action.

(5) (a) A registrar defined in section 102 of the Deeds Registries Act, 1937, must upon submission of a certificate by the Minister that land has been transferred to an Authority in terms of this section, make entries and endorsements in, or on, any relevant register or other document in his or her office to register such land in the name of the Authority.

(b) Stamp duty, office fee or other fee is not payable in respect of such registration.

(6) (a) If an Authority is disestablished in terms of section 12, a registrar must, upon submission of a certificate by the Minister that land transferred to an Authority in terms of subsection (5) has been transferred back from such Authority to the State, make such entries and endorsements in, or on, any relevant register or other document in his or her office to register such land in the name of the State.

(b) Stamp duty, office fee or other fee is not payable in respect of such registration.

CHAPTER VI

FINANCES AND REPORTS

32. Application of chapter.—The Minister may, by notice in the Gazette, declare some or all of the sections in this chapter to apply to an Authority.

33. Funding.—Subject to applicable law, an Authority may receive and raise monies from any legal source, as the Minister may prescribe with the concurrence of the Minister of Finance, including—

(a) contract for goods and services;

(b) loan;

(c) donor funding from inside or outside the Republic;

(d) interest;

(e) joint venture income;

(f) fees, including, without limitation, fees related to—

(i) turnover;

(ii) rights granted by an Authority; or

(iii) services provided by an Authority;

(g) sale income;

(h) income from the development or leasing of its assets;

(i) subsidies from any organ of state; or

(j) appropriation by Parliament or a provincial legislature.

34. Security.—Without derogating from the objectives of this Act, an Authority may use any of its unencumbered assets as security for debt or other obligations, with the consent of the Cabinet and, if applicable, the relevant MEC.

35. Expenditure of monies.—(1) The monies received or raised by an Authority in terms of section 33 must be used in accordance with the business and financial plan of the Authority as approved by the Minister.

(2) An Authority may, with the approval of the Minister, granted with the concurrence of the Minister of Finance and the relevant MEC, authorise the chief executive officer to invest any unspent portion of the funds of the Authority, but any surplus at the end of a financial year must be carried over to the next financial year and be utilised to defray expenses incurred by the Authority during that financial year.

36. Annual financial plan.—(1) (a) An Authority must submit to the Minister its annual financial plan for approval for the following financial year not later than 30 days before the end of each financial year.

(b) The annual financial plan for the first financial year of an Authority must be submitted to the Minister for approval within 90 days after the establishment date.

(2) The annual financial plan must set out and explain proposed operations, projects, activities and other objectives of an Authority for the following financial year, including—

- (a) the cost of those operations, projects, activities and other objectives;
- (b) the manner in which it is proposed to finance them;
- (c) the performance indicators applicable to them;
- (d) a statement of estimated income and expenditure for that financial

year;

(e) any other information and particulars that may be prescribed; and

(f) any additional relevant information that may be requested by the

Minister in writing from time to time.

37. Strategic plan.—(1) (a) (i) An Authority must submit a five year strategic plan to the Minister for approval, not later than 30 days before the end of its first financial year.

(ii) Thereafter, a revised strategic plan must be submitted to the Minister for approval every financial year.

(b) A five-year strategic plan must be annexed to the annual financial plan of an Authority.

(2) This chapter does not prevent the Authority from undertaking any planning for a longer term.

38. Financial regulations.—The following matters may be prescribed:

(a) the contents, format and structure of the annual financial plan and, if considered necessary, those of the strategic plan;

(b) the extent to, and manner in, which an Authority must consult with interested persons or members of the public in connection with any annual financial plan or any strategic plan; and

(c) the procedure regarding the opening and keeping of a bank account by an Authority.

39. Accounting.—(1) An Authority must keep proper books and records of account, subject to applicable law, for each financial year in accordance with generally accepted accounting practice, with regard to its income, expenditure and transactions during the financial year and the state of its assets and liabilities during, and as at the end of, the financial year.

(2) Annually, within six months of the end of the financial year, an Authority must have the following financial statements:

- (a) A statement of income and expenditure;
- (b) a cash-flow statement; and
- (c) a balance sheet,

prepared for that year, which must accurately reflect transactions and financial sources as well as the position and state of affairs of an Authority so as to comply with the requirements of the Companies Act, 1973 (Act No. 61 of 1973).

40. Audit.—(1) The Minister must as soon as is practicable inform the Auditor-General in writing of the establishment of an Authority.

(2) The books and records of account and financial statements of an Authority must be audited annually by the Auditor-General.

(3) The Chief Executive Officer must annually submit, within six months after the end of the financial year, financial statements of an Authority approved by the Executive Staff Component and the Board and certified to that effect by the chairperson of the Board, to the Auditor-General for auditing.

(4) Upon completion of the audit, the Auditor-General must furnish a report to the Minister through the chairperson of the Board.

41. Report by Auditor-General.—(1) The Auditor-General must express an opinion in the report referred to in section 40 (4), amongst other things, as to whether—

(a) the information contained in the financial statements of an Authority has been presented on a basis consistent with that of the previous financial year, where applicable, and is a fair representation of the financial position and results of operations and cash-flows for the period; and

(b) the transactions and activities of an Authority which came to the attention of the Auditor-General had been authorised in terms of this Act.

(2) The report of the Auditor-General must draw attention to inadequate management measures identified during the course of the audit and to any other matter arising from the audit which, in the opinion of the Auditor-General, must be brought to the notice of the Minister and Parliament.

42. Annual report.—An Authority must submit to the Minister, within six months after the end of each financial year, an annual report that includes—

(a) in connection with the integrated management plan—

(i) compliance with the integrated management plan, including compliance with applicable performance indicators;

(ii) the efficiency of the integrated management plan;

(iii) possible improvements to the integrated management plan; and

(iv) other matters in connection with the integrated management plan which the Authority wants to draw to the attention of the Minister;

(b) the extent to which the Authority succeeded or failed to meet its obligations in terms of the Convention, the Operational Guidelines and this Act, including—

(i) fulfilment of performance indicators;

(ii) the result of a five-year independent review of the overall performance; and

(iii) such other matters in connection with the duties and obligations of an Authority as the Minister may determine; and

(c) details of agreements entered into by the Authority in terms of section 13 (1) (g) and (h).

CHAPTER VII

GENERAL

43. Delegation.—(1) The Minister may, by notice in the Gazette, delegate or assign any power, duty or function conferred upon him or her by or in terms of this Act, excluding the power to make regulations, to—

- (a) the Director-General of the Department;

[General Note: Certain powers delegated in Government Notice No. 723 in Government Gazette 23445 of 24 May, 2002.]

- (b) an Authority;
- (c) a provincial government;
- (d) a local government; or
- (e) an organ of state.

(2) The Minister may exercise any power or perform any duty or function despite subsection (1).

(3) The Director-General may delegate or assign any of his or her powers, duties or functions—

- (a) to an Authority;
- (b) with the concurrence of the MEC, to a provincial authority; or
- (c) to a statutory body that is primarily involved in cultural matters or nature conservation,

but such delegation may not affect the obligations of the Department under the Convention.

44. Regulations.—(1) The Minister may, subject to the objectives and fundamental principles of this Act, make regulations that are consistent with the Act with regard to—

- (a) anything which in terms of this Act must be prescribed;
- (b) generally, all matters which are reasonably necessary to be prescribed in order to achieve the objectives of this Act.

(2) Subject to the applicable law, the Minister may make regulations regarding—

- (a) the conditions of service, employment, transfer, promotion and, where an Authority is already in existence, the continued employment of its employees;
- (b) the transfer of employees from an organ of state to an Authority;
- (c) the management and administration of an Authority;
- (d) the determination of criteria for the making of appointments to a Board, including criteria for the determination of the rights of interested parties;
- (e) the financial and accounting activities of an Authority;
- (f) the identification, investigation and nomination of a future World Heritage Site;
- (g) the management and control of a World Heritage Site;
- (h) the administration, management and control of movable and immovable assets of an Authority; and
- (i) the time, manner and form of complying with any administrative, technical or reporting requirements of the Convention.

(3) The Minister may—

- (a) prescribe norms and standards for cultural or natural heritage that are consistent with the provisions of this Act; and
- (b) prescribe national policy relating to the management of cultural or natural heritage in addition to, but not inconsistent with, the objectives and principles set out in this Act.

(4) The Minister may, by regulation, incorporate as many of, or all of, the Operational Guidelines as may be necessary, with the necessary changes, where appropriate, for their effective implementation in the Republic.

45. Short title and commencement.—This Act is called the World Heritage Convention Act, 1999, and comes into operation on a date to be fixed by the President by proclamation in the Gazette.

Schedule

CONVENTION CONCERNING THE PROTECTION OF THE WORLD CULTURAL AND NATURAL HERITAGE

The General Conference of the United Nations Education, Scientific and Cultural Organization meeting in Paris from 17 October to 21 November 1972, at its seventeenth session,

Noting that the cultural heritage and the natural heritage are increasingly threatened with destruction not only by the traditional causes of decay, but also by changing social and economic conditions which aggravate the situation with even more formidable phenomena of damage or destruction,

Considering that deterioration or disappearance of any item of the cultural or natural heritage constitutes a harmful impoverishment of the heritage of all the nations of the world,

Considering that protection of this heritage at the national level often remains incomplete because of the scale of the resources which it requires and of the insufficient economic, scientific, and technological resources of the country where the property to be protected is situated,

Recalling that the Constitution of the Organization provides that it will maintain, increase, and diffuse knowledge by assuring the conservation and protection of the world's heritage, and recommending to the nations concerned the necessary international conventions,

Considering that the existing international conventions, recommendations and resolutions concerning cultural and natural property demonstrate the importance, for all the peoples of the world, of safeguarding this unique and irreplaceable property, to whatever people it may belong,

Considering that parts of the cultural or natural heritage are of outstanding interest and therefore need to be preserved as part of the world heritage of mankind as a whole,

Considering that in view of the magnitude and gravity of the new dangers threatening them, it is incumbent on the international community as a whole to participate in the protection of the cultural and natural heritage of outstanding universal value, by the granting of collective assistance which, although not taking the place of action by the State concerned, will serve as an efficient complement thereto,

Considering that it is essential for this purpose to adopt new provisions in the form of a convention establishing an effective system of collective protection of the cultural and natural heritage of outstanding universal value, organized on a permanent basis and in accordance with modern scientific methods,

Having decided, at its sixteenth session, that this question should be made the subject of an international convention,

Adopts this sixteenth day of November 1972 this Convention.

I. DEFINITION OF THE CULTURAL AND NATURAL HERITAGE

Article 1

For the purpose of this Convention, the following shall be considered as "cultural heritage": monuments, architectural works, works of monumental sculpture and

painting, elements or structures of an archaeological nature, inscriptions, cave dwellings and combinations of features, which are of outstanding universal value from the point of view of history, art or science, groups of buildings, groups of separate or connected buildings which, because of their architecture, their homogeneity or their place in the landscape, are of outstanding universal value from the point of view of history, art or science, sites, works of man or the combined works of nature and man, and areas including archaeological sites which are of outstanding universal value from the historical, aesthetic, ethnological or anthropological point of view.

Article 2

For the purposes of this Convention, the following shall be considered as “natural heritage”: natural features consisting of physical and biological formations or groups of such formations, which are of outstanding universal value from the aesthetic or scientific point of view, geological and physiographical formations and precisely delineated areas which constitute the habitat of threatened species of animals and plants of outstanding universal value from the point of view of science or conservation, natural sites or precisely delineated natural areas of outstanding universal value from the point of view of science, conservation or natural beauty.

Article 3

It is for each State Party to this Convention to identify and delineate the different properties situated on its territory mentioned in Articles 1 and 2 above.

II. NATIONAL PROTECTION AND INTERNATIONAL PROTECTION OF THE CULTURAL AND NATURAL HERITAGE

Article 4

Each State Party to this Convention recognizes that the duty of ensuring the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage referred to in Articles 1 and 2 and situated on its territory, belongs primarily to that State. It will do all it can to this end, to the utmost of its own resources and, where appropriate, with any international assistance and co-operation, in particular, financial, artistic, scientific and technical, which it may be able to obtain.

Article 5

To ensure that effective and active measures are taken for the protection, conservation and presentation of the cultural and natural heritage situated on its territory, each State Party to this Convention shall endeavour, in so far as possible, and as appropriate for each country—

(a) to adopt a general policy which aims to give the cultural and natural heritage a function in the life of the community and to integrate the protection of that heritage into comprehensive planning programmes;

(b) to set up within its territories, where such services do not exist, one or more services for the protection, conservation and presentation of the cultural and natural heritage with an appropriate staff and possessing the means to discharge their functions;

(c) to develop scientific and technical studies and research and to work out such operating methods as will make the State capable of counteracting the dangers that threaten its cultural or natural heritage;

(d) to take the appropriate legal, scientific, technical, administrative and financial measures necessary for the identification, protection, conservation, presentation and rehabilitation of this heritage; and

(e) to foster the establishment or development of national or regional centres for training in the protection, conservation and presentation of the cultural and natural heritage and to encourage scientific research in this field.

Article 6

1. Whilst fully respecting the sovereignty of the States on whose territory the cultural and natural heritage mentioned in Articles 1 and 2 is situated, and without prejudice to property right provided by national legislation, the States Parties to this Convention recognize that such heritage constitutes a world heritage for whose protection it is the duty of the international community as a whole to co-operate.
2. The States Parties undertake, in accordance with the provisions of this Convention, to give their help in the identification, protection, conservation and presentation of the cultural and natural heritage referred to in paragraphs 2 and 4 of Article 11 if the States on whose territory it is situated so request.
3. Each State Party to this Convention undertakes not to take any deliberate measures which might damage directly or indirectly the cultural and natural heritage referred to in Articles 1 and 2 situated on the territory of other States Parties to this Convention.

Article 7

For the purpose of this Convention, international protection of the world cultural and natural heritage shall be understood to mean the establishment of a system of international co-operation and assistance designed to support States Parties to the Convention in their efforts to conserve and identify that heritage.

III. INTERGOVERNMENTAL COMMITTEE FOR THE PROTECTION OF THE WORLD CULTURAL AND NATURAL HERITAGE

Article 8

1. An Intergovernmental Committee for the Protection of the Cultural and Natural Heritage of Outstanding Universal Value, called “the World Heritage Committee”, is hereby established within the United Nations Education, Scientific and Cultural Organization. It shall be composed of 15 States Parties to the Convention, elected by States Parties to the Convention meeting in general assembly during the ordinary session of the General Conference of the United Nations Educational, Scientific and Cultural Organization. The number of States members of the Committee shall be increased to 21 as from the date of the ordinary session of the General Conference following the entry into force of this Convention for at least 40 States.
2. Election of members of the Committee shall ensure an equitable representation of the different regions and cultures of the world.
3. A representative of the International Centre for the Study of the Preservation and Restoration of Cultural Property (Rome Centre), a representative of the International Council of Monuments and Sites (ICOMOS) and a representative of the International Union for Conservation of Nature and Natural Resources (IUCN), to whom may be added, at the request of States Parties to the Convention meeting in general assembly during the ordinary sessions of the General Conference of the United Nations Educational, Scientific and Cultural Organization, representatives of other intergovernmental or non-governmental organizations, with similar objectives, may attend the meetings of the Committee in an advisory capacity.

Article 9

1. The term of office of States members of the World Heritage Committee shall extend from the end of the ordinary session of the General Conference during which they are elected until the end of its third subsequent ordinary session.

2. The term of office of one-third of the members designated at the time of the first election shall, however, cease at the end of the first ordinary session of the General Conference following that at which they were elected; and the term of office of a further third of the members designated at the same time shall cease at the end of the second ordinary session of the General Conference following that at which they were elected. The names of these members shall be chosen by lot by the President of the General Conference of the United Nations Education, Scientific and Cultural Organization after the first election.

3. States members of the Committee shall choose as their representatives persons qualified in the field of the cultural or natural heritage.

Article 10

1. The World Heritage Committee shall adopt its Rules of Procedure.

2. The Committee may at any time invite public or private organizations or individuals to participate in its meetings for consultation on particular problems.

3. The Committee may create such consultative bodies as it deems necessary for the performance of its functions.

Article 11

1. Every State Party to this Convention shall, in so far as possible, submit to the World Heritage Committee an inventory of property forming part of the cultural and natural heritage, situated in its territory and suitable for inclusion in the list provided for in paragraph 2 of this Article. This inventory, which shall not be considered exhaustive, shall include documentation about the location of the property in question and its significance.

2. On the basis of the inventories submitted by States in accordance with paragraph 1, the Committee shall establish, keep up to date and publish, under the title of "World Heritage List," a list of properties forming part of the cultural heritage and natural heritage, as defined in Articles 1 and 2 of this Convention, which it considers as having outstanding universal value in terms of such criteria as it shall have established. An updated list shall be distributed at least every two years.

3. The inclusion of a property in the World Heritage List requires the consent of the State concerned. The inclusion of a property situated in a territory, sovereignty or jurisdiction over which is claimed by more than one State shall in no way prejudice the rights of the parties to the dispute.

4. The Committee shall establish, keep up to date and publish, whenever circumstances shall so require, under the title of "list of World Heritage in Danger", a list of the property appearing in the World Heritage List for the conservation of which major operations are necessary and for which assistance has been requested under this Convention. This list shall contain an estimate of the cost of such operations. The list may include only such property forming part of the cultural and natural heritage as is threatened by serious and specific dangers, such as the threat of disappearance caused by accelerated deterioration, large-scale public or private projects or rapid urban or tourist development projects; destruction caused by changes in the use or ownership of the land; major alterations due to unknown causes; abandonment for any reason whatsoever; the outbreak or the threat of an armed conflict; calamities and cataclysms; serious fires, earthquakes, landslides; volcanic eruptions; changes in water level, floods and tidal waves. The Committee may at any time, in case of urgent need, make a new entry in the List of World Heritage in Danger and publicize such entry immediately.

5. The Committee shall define the criteria on the basis of which a property belonging to the cultural or natural heritage may be included in either of the lists mentioned in paragraphs 2 and 4 of this article.

6. Before refusing a request for inclusion in one of the two lists mentioned in paragraphs 2 and 4 of this article, the Committee shall consult the State Party in whose territory the cultural or natural property in question is situated.

7. The Committee shall, with the agreement of the States concerned, co-ordinate and encourage the studies and research needed for the drawing up of the lists referred to in paragraphs 2 and 4 of this article.

Article 12

The fact that a property belonging to the cultural or natural heritage has not been included in either of the two lists mentioned in paragraphs 2 and 4 of Article 11 shall in no way be construed to mean that it does not have an outstanding universal value for purposes other than those resulting from inclusion in these lists.

Article 13

1. The World Heritage Committee shall receive and study requests for international assistance formulated by States Parties to this Convention with respect to property forming part of the cultural or natural heritage, situated in their territories, and included or potentially suitable for inclusion in the lists mentioned referred to in paragraphs 2 and 4 of Article 11. The purpose of such requests may be to secure the protection, conservation, presentation or rehabilitation of such property.

2. Requests for international assistance under paragraph 1 of this article may also be concerned with identification of cultural or natural property defined in Articles 1 and 2, when preliminary investigations have shown that further inquiries would be justified.

3. The Committee shall decide on the action to be taken with regard to these requests, determine where appropriate, the nature and extent of its assistance, and authorize the conclusion, on its behalf, of the necessary arrangements with the government concerned.

4. The Committee shall determine an order of priorities for its operations. It shall in so doing bear in mind the respective importance for the world cultural and natural heritage of the property requiring protection, the need to give international assistance to the property most representative of a natural environment or of the genius and the history of the peoples of the world, the urgency of the work to be done, the resources available to the States on whose territory the threatened property is situated and in particular the extent to which they are able to safeguard such property by their own means.

5. The Committee shall draw up, keep up to date and publicize a list of property for which International assistance has been granted.

6. The Committee shall decide on the use of the resources of the Fund established under Article 15 of this Convention. It shall seek ways of increasing these resources and shall take all useful steps to this end.

7. The Committee shall co-operate with international and national governmental and non-governmental organizations having objectives similar to those of this Convention. For the implementation of its programmes and projects, the Committee may call on such organizations, particularly the International Centre for the Study of the Preservation and Restoration of Cultural Property (the Rome Centre), the International Council of Monuments and Sites (ICOMOS) and the International Union for Conservation of Nature and Natural Resources (IUCN), as well as on public and private bodies and individuals.

8. Decisions of the Committee shall be taken by a majority of two-thirds of its members present and voting. A majority of the members of the Committee shall constitute a quorum.

Article 14

1. The World Heritage Committee shall be assisted by a Secretariat appointed by the Director-General of the United Nations Educational, Scientific and Cultural Organization.

2. The Director-General of the United Nations Educational, Scientific and Cultural Organization, utilizing to the fullest extent possible the services of the International Centre for the Study of the Preservation and the Restoration of Cultural Property (the Rome Centre), the International Council of Monuments and Sites (ICOMOS) and the International Union for Conservation of Nature and Natural Resources (IUCN) in their respective areas of competence and capability, shall prepare the Committee's documentation and the agenda of its meetings and shall have the responsibility for the implementation of its decisions.

IV. FUND FOR THE PROTECTION OF THE WORLD CULTURAL AND NATURAL HERITAGE

Article 15

1. A Fund for the Protection of the World Cultural and Natural Heritage of Outstanding Universal Value, called "the World Heritage Fund", is hereby established.

2. The Fund shall constitute a trust fund, in conformity with the provisions of the Financial Regulations of the United Nations Educational, Scientific and Cultural Organization.

3. The resources of the Fund shall consist of—

(a) compulsory and voluntary contributions made by States Parties to this Convention,

(b) Contributions, gifts or bequests which may be made by—

(i) other States;

(ii) the United Nations Educational, Scientific and Cultural Organization, other organizations of the United Nations system, particularly the United Nations Development Programme or other intergovernmental organizations;

(iii) public or private bodies or individuals;

(c) any interest due on the resources of the Fund;

(d) funds raised by collections and receipts from events organized for the benefit of the fund; and

(e) all other resources authorized by the Fund's regulations, as drawn up by the World Heritage Committee.

4. Contributions to the Fund and other forms of assistance made available to the Committee may be used only for such purposes as the Committee shall define. The Committee may accept contributions to be used only for a certain programme or project, provided that the Committee shall have decided on the implementation of such programme or project. No political conditions may be attached to contributions made to the Fund.

Article 16

1. Without prejudice to any supplementary voluntary contribution, the States Parties to this Convention undertake to pay regularly, every two years, to the World Heritage Fund, contributions, the amount of which, in the form of a uniform percentage applicable to all States, shall be determined by the General Assembly of States Parties to the Convention, meeting during the sessions of the General Conference of the

United Nations Educational, Scientific and Cultural Organization. This decision of the General Assembly requires the majority of the States Parties present and voting, which have not made the declaration referred to in paragraph 2 of this Article. In no case shall the compulsory contribution of States Parties to the Convention exceed 1% of the contribution to the regular budget of the United Nations Educational, Scientific and Cultural Organization.

2. However, each State referred to in Article 31 or in Article 32 of this Convention may declare, at the time of the deposit of its instrument of ratification, acceptance or accession, that it shall not be bound by the provisions of paragraph 1 of this Article.

3. A State Party to the Convention which has made the declaration referred to in paragraph 2 of this Article may at any time withdraw the said declaration by notifying the Director-General of the United Nations Educational, Scientific and Cultural Organization. However, the withdrawal of the declaration shall not take effect in regard to the compulsory contribution due by the State until the date of the subsequent General Assembly of States parties to the Convention.

4. In order that the Committee may be able to plan its operations effectively, the contributions of States Parties to this Convention which have made the declaration referred to in paragraph 2 of this Article, shall be paid on a regular basis, at least every two years, and should not be less than the contributions which they should have paid if they had been bound by the provisions of paragraph 1 of this Article.

5. Any State Party to the Convention which is in arrears with the payment of its compulsory or voluntary contribution for the current year and the calendar year immediately preceding it shall not be eligible as a Member of the World Heritage Committee, although this provision shall not apply to the first election. The terms of office of any such State which is already a member of the Committee shall terminate at the time of the elections provided for in Article 8, paragraph 1 of this Convention.

Article 17
The States Parties to this Convention shall consider or encourage the establishment of national public and private foundations or associations whose purpose is to invite donations for the protection of the cultural and natural heritage as defined in Articles 1 and 2 of this Convention.

Article 18

The States Parties to this Convention shall give their assistance to international fund-raising campaigns organized for the World Heritage Fund under the auspices of the United Nations Educational, Scientific and Cultural Organization. They shall facilitate collections made by the bodies mentioned in paragraph 3 of Article 15 for this purpose.

V. CONDITIONS AND ARRANGEMENTS FOR INTERNATIONAL ASSISTANCE

Article 19

Any State Party to this Convention may request international assistance for property forming part of the cultural or natural heritage of outstanding universal value situated within its territory. It shall submit with its request such information and documentation provided for in Article 21 as it has in its possession and as will enable the Committee to come to a decision.

Article 20

Subject to the provisions of paragraph 2 of Article 13, sub-paragraph (c) of Article 22 and Article 23, international assistance provided for by this Convention may be granted only to property forming part of the cultural and natural heritage which the

World Heritage Committee has decided, or may decide, to enter in one of the lists mentioned in paragraphs 2 and 4 of Article 11.

Article 21

1. The World Heritage Committee shall define the procedure by which requests to it for international assistance shall be considered and shall specify the content of the request, which should define the operation contemplated, the work that is necessary, the expected cost thereof, the degree of urgency and the reasons why the resources of the State requesting assistance do not allow it to meet all the expenses. Such requests shall be supported by experts' reports whenever possible.

2. Requests based upon disasters or natural calamities should, by reasons of the urgent work which they may involve, be given immediate, priority consideration by the Committee, which should have a reserve fund at its disposal against such contingencies.

3. Before coming to a decision, the Committee shall carry out such studies and consultations as it deems necessary.

Article 22

Assistance granted by the World Heritage Fund may take the following forms—

(a) studies concerning the artistic, scientific and technical problems raised by the protection, conservation, presentation and rehabilitation of the cultural and natural heritage, as defined in paragraphs 2 and 4 of Article 11 of this Convention;

(b) provisions of experts, technicians and skilled labour to ensure that the approved work is correctly carried out;

(c) training of staff and specialists at all levels in the field of identification, protection, conservation, presentation and rehabilitation of the cultural and natural heritage;

(d) supply of equipment which the State concerned does not possess or is not in a position to acquire;

(e) low-interest or interest-free loans which might be repayable on a long-term basis;

(f) the granting, in exceptional cases and for special reasons, of non-repayable subsidies.

Article 23

The World Heritage Committee may also provide international assistance to national or regional centres for the training of staff and specialists at all levels in the field of identification, protection, conservation, presentation and rehabilitation of the cultural and natural heritage.

Article 24

International assistance on a large scale shall be preceded by detailed scientific, economic and technical studies. These studies shall draw upon the most advanced techniques for the protection, conservation, presentation and rehabilitation of the natural and cultural heritage and shall be consistent with the objectives of this Convention. The studies shall also seek means of making rational use of the resources available in the State concerned.

Article 25

As a general rule, only part of the cost of work necessary shall be borne by the international community. The contribution of the State benefiting from international assistance shall constitute a substantial share of the resources devoted to each programme or project, unless its resources do not permit this.

Article 26

The World Heritage Committee and the recipient State shall define in the agreement they conclude the conditions in which a programme or project for which international assistance under the terms of this Convention is provided, shall be carried out. It shall be the responsibility of the State receiving such international assistance to continue to protect, conserve and present the property so safeguarded, in observance of the conditions laid down by the agreement.

VI. EDUCATIONAL PROGRAMMES

Article 27

1. The States Parties to this Convention shall endeavour by all appropriate means, and in particular by educational and information programmes, to strengthen appreciation and respect by their peoples of the cultural and natural heritage defined in Articles 1 and 2 of the Convention.

2. They shall undertake to keep the public broadly informed of the dangers threatening this heritage and of the activities carried on in pursuance of this Convention.

Article 28

States Parties to this Convention which receive international assistance under the Convention shall take appropriate measures to make known the importance of the property for which assistance has been received and the role played by such assistance.

VII. REPORTS

Article 29

1. The States Parties to this Convention shall, in the reports which they submit to the General Conference of the United Nations Educational, Scientific and Cultural Organization on dates and in a manner to be determined by it, give information on the legislative and administrative provisions which they have adopted and other action which they have taken for the application of this Convention, together with details of the experience acquired in this field.

2. These reports shall be brought to the attention of the World Heritage Committee.

3. The Committee shall submit a report on its activities at each of the ordinary sessions of the General Conference of the United Nations Educational, Scientific and Cultural Organization.

VIII. FINAL CLAUSES

Article 30

This Convention is drawn up in Arabic, English, French, Russian and Spanish, the five texts being equally authoritative.

Article 31

1. This Convention shall be subject to ratification or acceptance by States members of the United Nations Educational, Scientific and Cultural Organization in accordance with their respective constitutional procedures.

2. The instruments of ratification or acceptance shall be deposited with the Director-General of the United Nations Educational, Scientific and Cultural Organization.

Article 32

1. This Convention shall be open to accession by all States not members of the United Nations Educational, Scientific and Cultural Organization which are invited by the General Conference of the Organization to accede to it.

2. Accession shall be effected by the deposit of an instrument of accession with the Director-General of the United Nations Educational, Scientific and Cultural Organization.

Article 33

This Convention shall enter into force three months after the date of the deposit of the twentieth instrument of ratification, acceptance or accession, but only with respect to those States which have deposited their respective instruments of ratification, acceptance or accession on or before that date. It shall enter into force with respect to any other State three months after the deposit of its instrument of ratification, acceptance or accession.

Article 34

The following provisions shall apply to those States Parties to this Convention which have a federal or non-unitary constitutional system—

(a) with regard to the provisions of this Convention, the implementation of which comes under the legal jurisdiction of the federal or central legislative power, the obligations of the federal or central government shall be the same as for those States parties which are not federal States;

(b) with regard to the provisions of this Convention, the implementation of which comes under the legal jurisdiction of individual constituent States, countries, provinces or cantons that are not obliged by the constitutional system of the federation to take legislative measures, the federal government shall inform the competent authorities of such States, countries, provinces or cantons of the said provisions, with its recommendation for their adoption.

Article 35

1. Each State Party to this Convention may denounce the Convention.
2. The denunciation shall be notified by an instrument in writing, deposited with the Director-General of the United Nations Educational, Scientific and Cultural Organization.
3. The denunciation shall take effect twelve months after the receipt of the instrument of denunciation. It shall not affect the financial obligations of the denouncing State until the date on which the withdrawal takes effect.

Article 36

The Director-General of the United Nations Educational, Scientific and Cultural Organization shall inform the States members of the Organization, the States not members of the Organization which are referred to in Article 32, as well as the United Nations, of the deposit of all the instruments of ratification, acceptance, or accession provided for in Articles 31 and 32, and of the denunciations provided for in Article 35.

Article 37

1. This Convention may be revised by the General Conference of the United Nations Educational, Scientific and Cultural Organization. Any such revision shall, however, bind only the States which shall become Parties to the revising convention.
2. If the General Conference should adopt a new convention revising this Convention in whole or in part, then, unless the new convention otherwise provides, this Convention shall cease to be open to ratification, acceptance or accession, as from the date on which the new revising convention enters into force.

Article 38

In conformity with Article 102 of the Charter of the United Nations, this Convention shall be registered with the Secretariat of the United Nations at the request of the Director-General of the United Nations Educational, Scientific and Cultural Organization.

Done in Paris, this twenty-third day of November 1972, in two authentic copies bearing the signature of the President of the seventeenth session of the General Conference and of the Director-General of the United Nations Educational, Scientific

and Cultural Organization, which shall be deposited in the archives of the United Nations Educational, Scientific and Cultural Organization, and certified true copies of which shall be delivered to all the States referred to in Articles 31 and 32 as well as to the United Nations.

Summary

NATIONAL HERITAGE RESOURCES ACT NO. 25 OF 1999

Purpose

The purpose of the act is to introduce an integrated and interactive system for the management of the national heritage resources; to promote good government at all levels, and empower civil society to nurture and conserve their heritage resources so that they may be bequeathed to future generations; to lay down general principles for governing heritage resources management throughout the Republic; to introduce an integrated system for the identification, assessment and management of the heritage resources of South Africa; to establish the South African Heritage Resources Agency together with its Council to co-ordinate and promote the management of heritage resources at national level; to set norms and maintain essential national standards for the management of heritage resources in the Republic and to protect heritage resources of national significance.

General Principles

Those heritage resources of South Africa which are of cultural significance or other special value for the present community and for future generations must be considered part of the national estate and fall within the sphere of operations of heritage resources authorities.

The national estate may include **geological sites of scientific or cultural importance**.

All authorities, bodies and persons performing functions and exercising powers in terms of this Act for the management of heritage resources must recognise the following principles:

- (a) Heritage resources have lasting value in their own right and provide evidence of the origins of South African society and as they are valuable, finite, non-renewable and irreplaceable they must be carefully managed to ensure their survival;
- (b) every generation has a moral responsibility to act as trustee of the national heritage for succeeding generations and the State has an obligation to manage heritage resources in the interests of all South Africans;
- (c) heritage resources have the capacity to promote reconciliation, understanding and respect, and contribute to the development of a unifying South African identity; and
- (d) heritage resources management must guard against the use of heritage for sectarian purposes or political gain.

To ensure that heritage resources are effectively managed—

- (a) the skills and capacities of persons and communities involved in heritage resources management must be developed; and
 - (b) provision must be made for the ongoing education and training of existing and new heritage resources management workers.
- (3) Laws, procedures and administrative practices must—
- (a) be clear and generally available to those affected thereby;
 - (b) in addition to serving as regulatory measures, also provide guidance and information to those affected thereby.

Heritage resources contribute significantly to research, education and tourism and they must be developed and presented for these purposes in a way that ensures dignity and respect for cultural values.

Policy, administrative practice and legislation must promote the integration of heritage resources conservation in urban and rural planning and social and economic development.

The principles for management of heritage resources can be prescribed by SAHRA, by notice in the Government Gazette

There is a three-tier system for heritage resources management, in which national level functions are the responsibility of SAHRA, provincial level functions are the responsibility of provincial heritage resources authorities and local level functions are the responsibility of local authorities. Heritage resources authorities and local authorities are accountable for their actions and decisions and the performance of functions under this system.

All branches of the State and supported bodies must give heritage resources authorities such assistance in the performance of their functions as is reasonably practicable and must -

- (a) maintain and conserve the heritage resources under its control in accordance with standards and procedures set out in regulations by SAHRA.
- (b) submit annually to SAHRA a report on the maintenance and development of such resources;
- (c) not take any action that adversely affects such a resource unless the authority concerned is satisfied that there is no feasible and prudent alternative to the taking of that action and that all measures that can reasonably be taken to minimise the adverse effect will be taken;
- (d) at the initiation of the planning process of the project, or at least 90 days before taking any action that could adversely affect such heritage resource, whichever is the greater, inform SAHRA of the proposed action and give them a reasonable opportunity to consider and comment on it.

Constitution, function, powers and duties of heritage resources authorities

An organisation to be known as the South African Heritage Resources Agency (SAHRA) which shall be a body corporate capable of suing and being sued in its corporate name and which shall be governed by a Council established in terms of

section 14 is established with the object to co-ordinate the identification and management of the national estate.

The general functions of SAHRA are to—

- (a) establish national principles, standards and policy for the identification, recording and management of the national estate in terms of which heritage resources authorities and other relevant bodies must function with respect to South African heritage resources;
- (b) co-ordinate the management of the national estate by all agencies of the State and other bodies and monitor their activities to ensure that they comply with national principles, standards and policy for heritage resources management;
- (c) identify, record and manage nationally significant heritage resources and keep permanent records of such work;
- (d) advise, assist and provide professional expertise to any authority responsible for the management of the national estate at provincial or local level, and assist any other body concerned with heritage resources management;
- (e) promote and encourage public understanding and enjoyment of the national estate and public interest and involvement in the identification, assessment, recording and management of heritage resources;
- (f) promote education and training in fields related to the management of the national estate; and
- (g) perform any other functions assigned to it by this Act or as directed by the Minister.

Finances and property

The funds of SAHRA consists of—

- (a) moneys appropriated by Parliament to enable it to perform its functions and exercise its powers;
- (b) fees and fines received under the regulations;
- (c) fees received in payment of services;
- (d) funds raised by and donations and contributions to it;
- (e) trust funds vested in it;
- (f) interest derived from investments; and
- (g) moneys received from any other source.

SAHRA must—

- (a) keep full and correct accounts and records of all its financial transactions and affairs, including all its transactions in its capacity of trustee of any trust fund, and all properties under its control, and must ensure that all payments out of its funds are correctly made and properly authorised and that adequate control is maintained over its assets, or those in its custody, and the incurring of liabilities; and
- (b) as soon as possible after the end of the financial year, draw up annual financial statements which must show money received and expenditure incurred and its assets and liabilities at the end of the financial year concerned.

General powers and duties of heritage resources authorities.

A heritage resources authority must—

- (a) furnish information, advice and assistance to enhance public sensitivity towards and awareness of the need for management of the national estate;
- (b) maintain a list of conservation bodies which have, in accordance with regulations by the heritage resources authority concerned, registered their interest in—
 - (i) a geographical area; or
 - (ii) a category of heritage resources;
- (c) regularly inspect heritage resources which are formally protected by the heritage resources authority concerned in terms of any provision of Part 1 of Chapter II;
- (d) endeavour to assist any community or body of persons with an established interest in any heritage resource to obtain reasonable access to such heritage resource, should they request it, and may for this purpose—
 - (i) enter into negotiations with the owner of such resource;
 - (ii) facilitate the making of arrangements as may be required for the achievement of such access,
- (e) make arrangements to ensure the protection and management of all heritage resources and property owned or controlled by it or vested in it.

PROTECTION AND MANAGEMENT OF HERITAGE RESOURCES

SAHRA must identify those places with qualities so exceptional that they are of special national significance in terms of the heritage assessment criteria set out in section 3 (2) and prescribed under section 6 (1) and (2), and must investigate the desirability of their declaration as national heritage sites.

SAHRA may, by notice in the Gazette, declare any place referred to above to be a national heritage site.

SAHRA is responsible for the protection of national heritage sites in accordance with the provisions of the act.

No person may destroy, damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of any heritage site without a permit issued by the heritage resources authority responsible for the protection of such site.

The responsible heritage resources authority may make regulations pertaining to heritage sites under its control, or to any other heritage site with the consent of the owner of that site—

- (a) safeguarding heritage sites from destruction, damage, disfigurement, excavation or alteration;
- (b) regulating the conditions of use of any heritage site or the conditions for any development thereof;

(c) regulating the admission of members of the public to a heritage site, and the fees payable for such admission.

SAHRA, or a provincial heritage resources authority, may by notice in the Gazette or the Provincial Gazette, as the case may be—

- (a) provisionally protect for a maximum period of two years any—
 - (i) protected area;
 - (ii) heritage resource, the conservation of which it considers to be threatened and which threat it believes can be alleviated by negotiation and consultation; or
 - (iii) heritage resource, the protection of which SAHRA or the provincial heritage resources authority wishes to investigate in terms of this Act.

No person may damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of a provisionally protected place or object without a permit issued by a heritage resources authority or local authority responsible for the provisional protection.

Management

SAHRA, or a provincial heritage resources authority may negotiate and agree with a provincial authority, local authority, conservation body, person, or community for the execution of a heritage agreement to provide for the conservation, improvement or presentation of a clearly defined heritage resource: Provided that the consent of the owner of such resource must be given.

Such a heritage agreement must be in the form of a binding contract.

A heritage agreement may include such terms and conditions as the parties think fit, including provision for public access, and provision for financial or other assistance from the heritage authority concerned.

Nothing in this Act requires a heritage resources authority to negotiate or agree with any person or authority to enter into or execute any heritage agreement.

The heritage agreement referred to in subsection (7) or (8) may provide for—

- (a) the maintenance and management of the place;
- (b) the custody of the place and the duties of any person who may be employed in connection therewith;
- (c) the occupation or use of the place by the owner or otherwise;
- (d) the restriction of the right of the owner or occupier to do certain acts or things on or near the place;
- (e) the facilities of access to be permitted to the public and to persons deputed by the guardian to inspect or maintain the place;
- (f) the presentation of the place;
- (g) the notice to be given to the guardian in case the owner intends to offer the land on which the place is situated for sale, lease or other disposal, and the right to be reserved to the guardian to have first refusal of such sale, lease or other disposal;
- (h) the payment of any expenses incurred by the owner or by the guardian in connection with the maintenance of the place;
- (i) any other matter connected with the protection or management of the place which is agreed to by the owner and the guardian;

- (j) the duration of the agreement, with provision for the earlier termination thereof by any party thereto; and
- (k) the procedure for the resolution of any dispute arising out of the agreement.

Presentation of protected resources

Heritage resources authorities and local authorities must, wherever appropriate, co-ordinate and promote the presentation and use of places of cultural significance and heritage resources which form part of the national estate and for which they are responsible in terms of section 5 for public enjoyment, education, research and tourism, including—

- (a) the erection of explanatory plaques and interpretive facilities, including interpretive centres and visitor facilities;
- (b) the training and provision of guides;
- (c) the mounting of exhibitions;
- (d) the erection of memorials; and
- (e) any other means necessary for the effective presentation of the national estate.

Each heritage resources authority must adopt for any place which is protected in terms of this Act and is owned or controlled by it or vested in it, a plan for the management of such place in accordance with the best environmental, heritage conservation, scientific and educational principles that can reasonably be applied taking into account the location, size and nature of the place and the resources of the authority concerned, and may from time to time review any such plan.

A conservation management plan may at the discretion of the heritage resources authority concerned and for a period not exceeding 10 years, be operated either solely by the heritage resources authority or in conjunction with an environmental or tourism authority or under contractual arrangements, on such terms and conditions as the heritage resources authority may determine.

Regulations by the heritage resources authority concerned must provide for a process whereby, prior to the adoption or amendment of any statement of general policy or any conservation management plan, the public and interested organisations are notified of the availability of a draft statement or plan for inspection, and comment is invited and considered by the heritage resources authority concerned.

NATIONAL HERITAGE RESOURCES ACT

NO. 25 OF 1999

[View Regulation]

[ASSENTED TO 14 APRIL, 1999]

[DATE OF COMMENCEMENT: 1 APRIL, 2000]

(English text signed by the President)

ACT

To introduce an integrated and interactive system for the management of the national heritage resources; to promote good government at all levels, and empower civil society to nurture and conserve their heritage resources so that they may be bequeathed to future generations; to lay down general principles for governing heritage resources management throughout the Republic; to introduce an integrated system for the identification, assessment and management of the heritage resources of South Africa; to establish the South African Heritage Resources Agency together with its Council to co-ordinate and promote the management of heritage resources at national level; to set norms and maintain essential national standards for the management of heritage resources in the Republic and to protect heritage resources of national significance; to control the export of nationally significant heritage objects and the import into the Republic of cultural property illegally exported from foreign countries; to enable the provinces to establish heritage authorities which must adopt powers to protect and manage certain categories of heritage resources; to provide for the protection and management of conservation-worthy places and areas by local authorities; and to provide for matters connected therewith.

Preamble.—THIS LEGISLATION aims to promote good management of the national estate, and to enable and encourage communities to nurture and conserve their legacy so that it may be bequeathed to future generations. Our heritage is unique and precious and it cannot be renewed. It helps us to define our cultural identity and therefore lies at the heart of our spiritual well-being and has the power to build our nation. It has the potential to affirm our diverse cultures, and in so doing shape our national character.

OUR HERITAGE celebrates our achievements and contributes to redressing past inequities. It educates, it deepens our understanding of society and encourages us to empathise with the experience of others. It facilitates healing and material and symbolic restitution and it promotes new and previously neglected research into our rich oral traditions and customs.

ARRANGEMENT OF SECTIONS

1. Application and interpretation
2. Definitions

CHAPTER I

SYSTEM FOR MANAGEMENT OF NATIONAL HERITAGE RESOURCES

Part 1: General Principles

3. National estate
4. Application
5. General principles for heritage resources management
6. Principles for management of heritage resources
7. Heritage assessment criteria and grading

8. Responsibilities and competence of heritage resources authorities and local authorities for identification and management of national estate
9. Rights, duties and exemptions of State and supported bodies
10. General principles of procedure

Part 2: Constitution, functions, powers and duties of heritage authorities

11. Establishment of South African Heritage Resources Agency
12. Object of SAHRA
13. Functions, powers and duties of SAHRA
14. Establishment and constitution of SAHRA Council
15. Chairperson of Council
16. Functions of Council
17. Meetings of Council
18. Committees of Council
19. Reimbursement of expenses incurred by members of Council and committees

20. Employees of Council
21. Finances and property
22. Reports
23. Establishment of provincial heritage resources authorities
24. Functions, powers and duties of provincial heritage resources authority
25. General powers and duties of heritage resources authorities
26. Delegation of functions or powers of heritage resources authorities

CHAPTER II

PROTECTION AND MANAGEMENT OF HERITAGE RESOURCES

Part 1: Formal Protections

27. National heritage sites and provincial heritage sites
28. Protected areas
29. Provisional protection
30. Heritage Registers
31. Heritage areas
32. Heritage objects

Part 2: General Protections

33. Import of objects protected in terms of laws of foreign states
34. Structures
35. Archaeology, palaeontology and meteorites
36. Burial grounds and graves
37. Public monuments and memorials
38. Heritage resources management

Part 3: Management

39. Inventory of national estate
40. National heritage resources assistance programme
41. Restitution of heritage objects

- 42. Heritage agreements
- 43. Incentives
- 44. Presentation of protected resources
- 45. Compulsory repair order
- 46. Expropriation
- 47. General policy

CHAPTER III

GENERAL PROVISIONS

Part 1: Enforcement, appeals, offences and penalties

- 48. Permits
- 49. Appeals
- 50. Appointment and powers of heritage inspectors
- 51. Offences and penalties

Part 2: Miscellaneous

- 52. Notices
- 53. Delegation of powers by Minister or MEC
- 54. By-laws by local authorities
- 55. Limitation of liability
- 56. Exercise of powers outside Republic
- 57. Applicability of provincial legislation
- 58. Transitional provisions and consequential amendments
- 59. Regulations
- 60. Repeal
- 61. Short title and commencement

Schedule Penalties for national heritage act

1. Application and interpretation.—This Act binds the State.
2. Definitions.—In this Act, unless the context requires otherwise—
 - “alter” means any action affecting the structure, appearance or physical properties of a place or object, whether by way of structural or other works, by painting, plastering or other decoration or any other means;
 - “archaeological” means—
 - (a) material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures;
 - (b) rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
 - (c) wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the Republic, as defined respectively in sections 3, 4 and 6 of the Maritime Zones Act, 1994 (Act No. 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation; and

(d) features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found;

“conservation”, in relation to heritage resources, includes protection, maintenance, preservation and sustainable use of places or objects so as to safeguard their cultural significance;

“Council” means the Council of the South African Heritage Resources Agency established in terms of section 14;

“cultural property agreement” in relation to a foreign state, means an agreement between South Africa and a foreign state or an international agreement to which South Africa and a foreign state are both parties, relating to the prevention of illicit international traffic in cultural property;

“cultural significance” means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance;

“Department” means the national department responsible for arts and culture and heritage;

“development” means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of a heritage authority in any way result in a change to the nature, appearance or physical nature of a place, or influence its stability and future well-being, including—

(a) construction, alteration, demolition, removal or change of use of a place or a structure at a place;

(b) carrying out any works on or over or under a place;

(c) subdivision or consolidation of land comprising, a place, including the structures or airspace of a place;

(d) constructing or putting up for display signs or hoardings;

(e) any change to the natural or existing condition or topography of land;

and

(f) any removal or destruction of trees, or removal of vegetation or topsoil;

“Director-General” means the Director-General of the Department;

“expropriate” means the process as determined by the terms of and according to procedures prescribed in the Expropriation Act, 1975 (Act No. 63 of 1975);

“foreign cultural property”, in relation to a reciprocating state, means any object that is specifically designated by that state as being of importance for archaeology, history, literature, art or science;

“Gazette” means the Government Gazette;

“grave” means a place of interment and includes the contents, headstone or other marker of such a place, and any other structure on or associated with such place;

“heritage agreement” means an agreement referred to in section 42;

“heritage register” means a list of heritage resources in a province;

“heritage resource” means any place or object of cultural significance;

“heritage resources authority” means the South African Heritage Resources Agency, established in terms of section 11, or, insofar as this Act is applicable in or in respect of a province, a provincial heritage resources authority;

“heritage site” means a place declared to be a national heritage site by SAHRA or a place declared to be a provincial heritage site by a provincial heritage resources authority;

“improvement”, in relation to heritage resources, includes the repair, restoration and rehabilitation of a place protected in terms of this Act;

“land” includes land covered by water and the air space above the land;

“living heritage” means the intangible aspects of inherited culture, and may include—

- (a) cultural tradition;
- (b) oral history;
- (c) performance;
- (d) ritual;
- (e) popular memory;
- (f) skills and techniques;
- (g) indigenous knowledge systems; and
- (h) the holistic approach to nature, society and social relationships;

“local authority” means a municipality as defined in section 10B of the Local Government Transition Act, 1993 (Act No. 209 of 1993);

“management”, in relation to heritage resources, includes the conservation, presentation and improvement of a place protected in terms of this Act;

“MEC”, unless otherwise stated and insofar as a provision of this Act is applicable in or in respect of a province, means the member of the executive council of a province responsible for cultural matters;

“meteorite” means any naturally-occurring object of extraterrestrial origin;

“Minister” means the Minister responsible for arts and culture;

“national estate” means the national estate as defined in section 3;

“national symbols” means any heraldic representation so determined under section 5 of the Heraldry Act, 1963 (Act No. 18 of 1963);

“object” means any movable property of cultural significance which may be protected in terms of any provisions of this Act, including—

- (a) any archaeological artefact;
- (b) palaeontological and rare geological specimens;
- (c) meteorites; and
- (d) other objects referred to in section 3;

“owner” includes the owner’s authorised agent and any person with a real interest in the property and—

(a) in the case of a place owned by the State or State-aided institutions, the Minister or any other person or body of persons responsible for the care, management or control of that place;

(b) in the case of tribal trust land, the recognised traditional authority;

“palaeontological” means any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace;

“place” includes—

(a) a site, area or region;

(b) a building or other structure which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure;

(c) a group of buildings or other structures which may include equipment, furniture, fittings and articles associated with or connected with such group of buildings or other structures;

(d) an open space, including a public square, street or park; and

(e) in relation to the management of a place, includes the immediate surroundings of a place;

“planning” means urban and regional planning, as contemplated in the Physical Planning Act, 1991 (Act No. 125 of 1991), and provincial town planning and land use planning legislation;

“planning authority” means an office of the State, including a province, a local authority or a regional authority, which is invested with a physical planning capacity;
“prescribe” means prescribed by regulation;

“presentation” includes—

- (a) the exhibition or display of;
- (b) the provision of access and guidance to;
- (c) the provision, publication or display of information in relation to; and
- (d) performances or oral presentations related to,

heritage resources protected in terms of this Act;

“provincial heritage resources authority”, insofar as this Act is applicable in a province, means an authority established by the MEC under section 23;

“public monuments and memorials” means all monuments and memorials—

(a) erected on land belonging to any branch of central, provincial or local government, or on land belonging to any organisation funded by or established in terms of the legislation of such a branch of government; or

(b) which were paid for by public subscription, government funds, or a public-spirited or military organisation, and are on land belonging to any private individual;

“reciprocating state” means a foreign state that is party to a cultural property agreement;

“regulations” means regulations made under this Act;

“SAHRA” means the South African Heritage Resources Agency, established in terms of section 11;

“site” means any area of land, including land covered by water, and including any structures or objects thereon;

“State” includes a province;

“structure” means any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith;

“supported body” means a body funded or financially supported by the State, and includes State-owned enterprises;

“this Act” includes the regulations;

“victims of conflict” means—

(a) certain persons who died in any area now included in the Republic as a direct result of any war or conflict as specified in the regulations, but excluding victims of conflict covered by the Commonwealth War Graves Act, 1992 (Act No. 8 of 1992);

(b) members of the forces of Great Britain and the former British Empire who died in active service in any area now included in the Republic prior to 4 August 1914;

(c) persons who, during the Anglo-Boer War (1899-1902) were removed as prisoners of war from any place now included in the Republic to any place outside South Africa and who died there; and

(d) certain categories of persons who died in the “liberation struggle” as defined in the regulations, and in areas included in the Republic as well as outside the Republic;

“wreck” has the meaning given under the definition of “archaeological” in this section.

CHAPTER I

SYSTEM FOR MANAGEMENT OF NATIONAL HERITAGE RESOURCES

Part 1: General Principles

3. National estate.—(1) For the purposes of this Act, those heritage resources of South Africa which are of cultural significance or other special value for the present community and for future generations must be considered part of the national estate and fall within the sphere of operations of heritage resources authorities.

(2) Without limiting the generality of subsection (1), the national estate may include—

- (a) places, buildings, structures and equipment of cultural significance;
- (b) places to which oral traditions are attached or which are associated with living heritage;
- (c) historical settlements and townscapes;
- (d) landscapes and natural features of cultural significance;
- (e) geological sites of scientific or cultural importance;
- (f) archaeological and palaeontological sites;
- (g) graves and burial grounds, including—
 - (i) ancestral graves;
 - (ii) royal graves and graves of traditional leaders;
 - (iii) graves of victims of conflict;
 - (iv) graves of individuals designated by the Minister by notice in the Gazette;
- (v) historical graves and cemeteries; and
- (vi) other human remains which are not covered in terms of the Human Tissue Act, 1983 (Act No. 65 of 1983);
- (h) sites of significance relating to the history of slavery in South Africa;
- (i) movable objects, including—
 - (i) objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens;
 - (ii) objects to which oral traditions are attached or which are associated with living heritage;
 - (iii) ethnographic art and objects;
 - (iv) military objects;
 - (v) objects of decorative or fine art;
 - (vi) objects of scientific or technological interest; and
 - (vii) books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings, excluding those that are public records as defined in section 1 of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996).

(3) Without limiting the generality of subsections (1) and (2), a place or object is to be considered part of the national estate if it has cultural significance or other special value because of—

- (a) its importance in the community, or pattern of South Africa's history;
- (b) its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
- (c) its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
- (d) its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
- (e) its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;

- (f) its importance in demonstrating a high degree of creative or technical achievement at a particular period;
- (g) its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
- (h) its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and
- (i) sites of significance relating to the history of slavery in South Africa.

4. Application.—This Chapter establishes the national system for the management of heritage resources which it applies throughout the Republic and—

- (a) also applies to the actions of the State and a local authority;
- (b) serves as guidelines by reference to which any heritage resources authority, whether established in terms of this Act or any other law, and any other competent authority must exercise any discretion or take any decision in terms of this Act or any other law dealing with heritage resources management;
- (c) serves as the general framework with which—
 - (i) any heritage resources authority must perform its functions and make recommendations; and
 - (ii) those recommendations must be considered by any competent authority in terms of this Act or any other law dealing with heritage resources management; and
- (d) establishes the South African Heritage Resources Agency to manage the national estate and makes provision for the establishment of provincial heritage resources authorities to manage provincial and local heritage resources.

5. General principles for heritage resources management.—(1) All authorities, bodies and persons performing functions and exercising powers in terms of this Act for the management of heritage resources must recognise the following principles:

- (a) Heritage resources have lasting value in their own right and provide evidence of the origins of South African society and as they are valuable, finite, non-renewable and irreplaceable they must be carefully managed to ensure their survival;
- (b) every generation has a moral responsibility to act as trustee of the national heritage for succeeding generations and the State has an obligation to manage heritage resources in the interests of all South Africans;
- (c) heritage resources have the capacity to promote reconciliation, understanding and respect, and contribute to the development of a unifying South African identity; and
- (d) heritage resources management must guard against the use of heritage for sectarian purposes or political gain.

(2) To ensure that heritage resources are effectively managed—

- (a) the skills and capacities of persons and communities involved in heritage resources management must be developed; and
- (b) provision must be made for the ongoing education and training of existing and new heritage resources management workers.

(3) Laws, procedures and administrative practices must—

- (a) be clear and generally available to those affected thereby;
- (b) in addition to serving as regulatory measures, also provide guidance and information to those affected thereby; and
- (c) give further content to the fundamental rights set out in the Constitution.

- (4) Heritage resources form an important part of the history and beliefs of communities and must be managed in a way that acknowledges the right of affected communities to be consulted and to participate in their management.
- (5) Heritage resources contribute significantly to research, education and tourism and they must be developed and presented for these purposes in a way that ensures dignity and respect for cultural values.
- (6) Policy, administrative practice and legislation must promote the integration of heritage resources conservation in urban and rural planning and social and economic development.
- (7) The identification, assessment and management of the heritage resources of South Africa must—
- (a) take account of all relevant cultural values and indigenous knowledge systems;
 - (b) take account of material or cultural heritage value and involve the least possible alteration or loss of it;
 - (c) promote the use and enjoyment of and access to heritage resources, in a way consistent with their cultural significance and conservation needs;
 - (d) contribute to social and economic development;
 - (e) safeguard the options of present and future generations; and
 - (f) be fully researched, documented and recorded.
6. Principles for management of heritage resources.—(1) SAHRA, after consultation with the Minister, may by notice in the Gazette—
- (a) prescribe any principle for heritage resources management in addition to, but not inconsistent with, the principles set out in section 5;
 - (b) prescribe any principle as set out in section 5 in greater detail, but not inconsistent therewith;
 - (c) publish for general information national policy relating to heritage resources management or any aspect thereof which is consistent with the principles set out in section 5 or prescribed under paragraphs (a) and (b), whereupon such principle or policy must apply throughout the Republic.
- (2) A provincial heritage resources authority may, by notice in the Provincial Gazette—
- (a) prescribe any principles for heritage resources management in addition to, but not inconsistent with, the principles set out in section 5 or prescribed by SAHRA under subsection (1);
 - (b) prescribe any principle as set out in section 5 or prescribed by SAHRA under subsection (1) in greater detail, but not inconsistent therewith; and
 - (c) publish for general information provincial policy relating to heritage resources management or any aspect thereof which is consistent with the principles set out in section 5 or prescribed under subsection (1) or paragraphs (a) and (b) of this subsection, whereupon such principle or policy shall apply in the province on the basis set out in section 5.
- (3) A heritage resources authority must, before prescribing any principle or general policy under subsection (1) or (2)—
- (i) make a draft of such principle or policy available to the public; and
 - (ii) consider any comment on such draft received from any person during a reasonable period after such publication.
7. Heritage assessment criteria and grading.—(1) SAHRA, in consultation with the Minister and the MEC of every province, must by regulation establish a system of

grading of places and objects which form part of the national estate, and which distinguishes between at least the categories—

(a) Grade I: Heritage resources with qualities so exceptional that they are of special national significance;

(b) Grade II: Heritage resources which, although forming part of the national estate, can be considered to have special qualities which make them significant within the context of a province or a region; and

(c) Grade III: Other heritage resources worthy of conservation, and which prescribes heritage resources assessment criteria, consistent with the criteria set out in section 3 (3), which must be used by a heritage resources authority or a local authority to assess the intrinsic, comparative and contextual significance of a heritage resource and the relative benefits and costs of its protection, so that the appropriate level of grading of the resource and the consequent responsibility for its management may be allocated in terms of section 8.

(2) A heritage resources authority may prescribe detailed heritage assessment criteria, consistent with the criteria set out in section 3 (3), for the assessment of Grade II and Grade III heritage resources in a province.

8. Responsibilities and competence of heritage resources authorities and local authorities for identification and management of national estate.—(1) There is a three-tier system for heritage resources management, in which national level functions are the responsibility of SAHRA, provincial level functions are the responsibility of provincial heritage resources authorities and local level functions are the responsibility of local authorities. Heritage resources authorities and local authorities are accountable for their actions and decisions and the performance of functions under this system.

(2) SAHRA is responsible for the identification and management of Grade I heritage resources and heritage resources in accordance with the applicable provisions of this Act, and shall co-ordinate and monitor the management of the national estate in the Republic.

(3) A provincial heritage resources authority is responsible for the identification and management of Grade II heritage resources and heritage resources which are deemed to be a provincial competence in terms of this Act.

(4) A local authority is responsible for the identification and management of Grade III heritage resources and heritage resources which are deemed to fall within their competence in terms of this Act.

(5) For the purpose of any application for a permit or other authorisation to perform any action which is controlled in terms of this Act or provincial heritage legislation, a formal protection by a heritage resources authority at a higher level takes precedence over any formal or general protection at a local level, without prejudice to any incentives offered at any level.

(6) (a) A provincial heritage resources authority or a local authority shall not perform any function in terms of this Act or any other law for the management of heritage resources unless it is competent to do so. The capacity of a provincial heritage resources authority or local authority shall be assessed in terms of criteria prescribed by the Minister, including the availability of adequate staff, expertise, experience and administrative systems, to be applied—

(i) by SAHRA, in the assessment of the capacity of provincial authorities to perform specific functions in relation to prescribed categories of heritage resources; and

(ii) by provincial heritage resources authorities, to establish the capacity of local authorities to perform any function under this Act:

Provided that, in the event of a dispute, the matter shall be submitted to arbitration.

(b) If an authority at provincial or local level does not have the capacity or is not competent to perform a specific function for which it is responsible under this section, that function shall be performed on an agency basis by an authority at a higher level or a competent authority on the same level.

(c) A provincial heritage resources authority or a local authority shall apply to the relevant authority for the assessment of its competence under paragraph (a) in the manner prescribed by the assessing authority, and may apply for reassessment within the period and on the conditions prescribed by the assessing authority.

(d) The assessing authority may at any time, and shall at least every two years, reassess the competence of a subordinate authority and review the assumption of functions and powers under this Act.

9. Rights, duties and exemptions of State and supported bodies.—(1) All branches of the State and supported bodies must give heritage resources authorities such assistance in the performance of their functions as is reasonably practicable.

(2) All branches of the State and supported bodies must, on the request of a heritage resources authority, make available for its use and incorporation into its data base any information which it has on record on heritage resources under its control: Provided that the body supplying such information may set out conditions regarding the disclosure and distribution of such information by the heritage resources authority.

(3) Each State department and supported body must—

(a) maintain and conserve the heritage resources under its control in accordance with standards and procedures set out in regulations by SAHRA in consultation with the Department of Public Works;

(b) submit annually to SAHRA a report on the maintenance and development of such resources;

(c) in accordance with regulations, on the request of the Minister, or within 10 years from the commencement of this Act, compile and submit to SAHRA, information on and an inventory of such heritage resources;

(d) on the request of the Minister and in accordance with regulations, prepare management plans for specified heritage resources;

(e) not take any action that adversely affects such a resource unless the authority concerned is satisfied that there is no feasible and prudent alternative to the taking of that action and that all measures that can reasonably be taken to minimise the adverse effect will be taken;

(f) at the initiation of the planning process of the project, or at least 90 days before taking any action that could adversely affect such heritage resource, whichever is the greater, inform SAHRA of the proposed action and give them a reasonable opportunity to consider and comment on it; and

(g) where the destruction of such heritage resources is permitted in terms of this Act, record such resources in accordance with standards set by SAHRA and undertake any other mitigating actions which may be required by SAHRA.

(4) Where SAHRA has been informed of a proposed action by a State Department or supported body, it must, as soon as practicable, submit its comments to the Department or supported body.

(5) An action for the purpose of this section shall be deemed to include the making of a recommendation which, if adopted, would affect a heritage resource, the making of

a decision, the approval of a programme, the issue of a licence or the granting of a permission.

(6) Compliance with subsection (3) does not exempt a State Department or supported body from complying with requirements in terms of this Act, regarding any heritage resource in its ownership which is protected in terms of this Act or equivalent provincial legislation.

(7) The head of a government body at the national level of government must—

(a) inform SAHRA of his or her intention to destroy or delete any architectural or technical drawings in whatever medium, as may be defined in the regulations published by SAHRA in consultation with the National Archivist; and

(b) make such drawings available to SAHRA free of charge if requested by SAHRA.

(8) The head of a government body at the provincial or local level of government must—

(a) inform the provincial heritage resources authority of his or her intention to destroy or delete any architectural or technical drawings in whatever medium; and

(b) make such drawings available to a heritage resources authority free of charge.

(9) The Registrar of Deeds must inform SAHRA or the relevant heritage resources authority, in a notice as prescribed, of the particulars of the registration of transfer or subdivision of any place which is formally protected by such heritage resources authority in terms of Part 1 of Chapter 2 of this Act, within 14 days of such registration.

(10) When—

(a) a place has been declared a national heritage site or a provincial heritage site under section 27;

(b) a place has been designated a protected area under section 28;

(c) a place has been provisionally protected for a period longer than six months under section 29;

(d) a place has been entered in a heritage register under section 30;

(e) a place has been included in a heritage area under section 31;

(f) a heritage agreement has been entered into in respect of a place for a period exceeding six months under section 42;

(g) an order of no development under section 51 (8) has been made in respect of a place,

the heritage resources authority concerned must furnish the Surveyor-General and the Registrar of Deeds in whose deeds registry the land in question is registered with—

(i) a copy of the notice in the Gazette or the Provincial Gazette;

(ii) the particulars of the protection;

(iii) a copy of any survey, including any diagram or plan, made under section 25 (2) (d); and

(iv) a copy of the relevant order of no development or of a heritage agreement.

(11) The Registrar of Deeds must—

(a) endorse the title deed of the place in question filed in the deeds office;

(b) make an entry in the appropriate registers and upon the owner's title deed as soon as it is lodged in the deeds office, relating to the particulars furnished in terms of subsection (10);

(c) identify the area of the protected place; and

(d) clearly state the particulars of the protection order or heritage agreement.

(12) The Surveyor-General must—

(a) endorse upon the relevant records filed in his or her office an entry referring to the notice furnished in terms of subsection (10); and

(b) state the particulars of the protection order or heritage agreement in broad terms.

(13) (a) When—

(i) any notice is amended or withdrawn under section 27 (7);

(ii) the designation of a protected area is withdrawn under section 28 (1) or (2);

(iii) a provisional protection for a period longer than six months is withdrawn under section 29 (1) (b) or (2) (b);

(iv) an entry in a heritage register is amended or deleted;

(v) a place is excluded from a heritage area; or

(vi) an order of no development is amended or repealed under section 51 (11),

the heritage resources authority concerned must furnish a copy of the notice or order to the Registrar of Deeds and the Surveyor-General.

(b) The Registrar of Deeds must make the necessary endorsement upon the relevant title deeds and in the appropriate registers.

(c) The Surveyor-General must make the necessary endorsement upon the relevant records filed in his or her office.

10. General principles of procedure.—(1) The general principles of procedure set out in subsection (2) apply to any decision regarding the administration and management of the national estate by an authority to which a responsibility has been assigned in terms of section 7 and any other competent authority to which functions and powers for the administration and management of the national estate have been assigned or delegated, including any decision—

(a) to formally protect a heritage resource by notice in the Gazette or Provincial Gazette;

(b) to issue or not to issue a permit; and

(c) taken by any person or authority to whom an appeal is made.

(2) The decisions contemplated in subsection (1) must be taken in accordance with the following general principles:

(a) The decisions must be consistent with the principles or policy set out in section 5 or prescribed under section 6;

(b) a meeting at which decisions are taken, must be open to the public and the agenda and minutes must be available for public scrutiny: Provided that when there is good reason to do so, a matter may, by decision of the majority of members present, be declared confidential and the discussion and minutes may be excepted from public scrutiny;

(c) a person who may be affected by a decision has the right of appearance at such meeting; and

(d) written reasons must be given for any decision upon request.

Part 2: Constitution, function, powers and duties of heritage resources authorities

11. Establishment of South African Heritage Resources Agency.—There is hereby established an organisation to be known as the South African Heritage Resources Agency (SAHRA) which shall be a body corporate capable of suing and being sued in

its corporate name and which shall be governed by a Council established in terms of section 14.

12. Object of SAHRA.—The object of SAHRA is to co-ordinate the identification and management of the national estate.

13. Functions, powers and duties of SAHRA.—(1) The general functions of SAHRA are to—

(a) establish national principles, standards and policy for the identification, recording and management of the national estate in terms of which heritage resources authorities and other relevant bodies must function with respect to South African heritage resources;

(b) co-ordinate the management of the national estate by all agencies of the State and other bodies and monitor their activities to ensure that they comply with national principles, standards and policy for heritage resources management;

(c) identify, record and manage nationally significant heritage resources and keep permanent records of such work;

(d) advise, assist and provide professional expertise to any authority responsible for the management of the national estate at provincial or local level, and assist any other body concerned with heritage resources management;

(e) promote and encourage public understanding and enjoyment of the national estate and public interest and involvement in the identification, assessment, recording and management of heritage resources;

(f) promote education and training in fields related to the management of the national estate; and

(g) perform any other functions assigned to it by this Act or as directed by the Minister.

(2) Without limiting the generality of subsection (1) and in addition to the general powers and duties conferred in terms of section 25, SAHRA—

(a) must investigate and advise the Council on—

(i) the state of South Africa's heritage resources and any steps necessary to protect and conserve them;

(ii) national policy for the management of the national estate;

(iii) legislative amendment and enactment for the management of the national estate;

(iv) the repatriation of heritage resources which have been removed from South Africa and which SAHRA considers to be significant as part of the national estate;

(v) the role of the national estate in the development and promotion of a cultural profile for South Africa;

(vi) action and expenditure by the State for the identification and management of heritage resources, including financial incentives and concessions for heritage resources management;

(vii) education and training at all levels to promote the effective identification and management of the national estate;

(viii) any matter related to the operation of this Act; and

(ix) any other matter pertaining to the national estate or its management;

(b) must establish and maintain, for its own use and for the use of all heritage authorities and bodies and the public, the national heritage resources library, including documentary and other records relating to the national estate;

(c) must promote the systematic identification and recording of the national estate by—

- (i) the development of a national strategy for the identification and assessment of heritage resources;
 - (ii) the establishment and funding of a standing South African Heritage Resources Survey which is tasked with annual projects aimed at identifying, assessing and documenting heritage resources;
 - (iii) the co-ordination and support of initiatives by provincial heritage resources authorities, any other bodies and persons to survey and record heritage resources;
 - (iv) the administration, co-ordination and funding of projects and research programmes aimed at the creation of graphic and other records of heritage resources;
 - (v) training programmes and other relevant activities aimed at conserving and documenting traditional South African building techniques and structural forms;
 - (vi) promoting the identification and recording of aspects of living heritage associated with heritage resources; and
 - (vii) projects aimed at increasing the volume and detail of information held in the inventory of the national estate referred to in section 39; and
- (d) must prescribe national norms and standards for the recording of information about heritage resources in data bases maintained by itself and by provincial heritage resources authorities.

14. Establishment and constitution of SAHRA Council.—(1) The affairs of SAHRA are under the control, management and direction of a Council consisting of—

- (a) at least nine but not more than 15 members appointed by the Minister in the prescribed manner, of which nine members must respectively represent each of the provinces of South Africa; and
- (b) the chief executive officer of SAHRA.

(2) The members of the Council contemplated in subsection (1) (a) must be appointed in accordance with the principles of transparency and representivity and their appointment must take into account the desirability that the members—

- (a) have among them qualifications or special experience or interest in fields relevant to heritage resources, and the financial knowledge needed for the efficient functioning of SAHRA; and
- (b) be representative of the relevant sectoral interests and the cultural and demographic characteristics of the population of the Republic.

(3) A member of the Council must vacate the office if the member—

- (a) resigns in writing;
- (b) has been absent from three consecutive meetings of the Council without the leave of the Council;
- (c) is an unrehabilitated insolvent;
- (d) is found to be of unsound mind by a competent court; or
- (e) is convicted of an offence involving dishonesty or bodily harm and is sentenced to imprisonment without the option of a fine.

(4) The Minister may, after consultation with the Council, remove a member of the Council from office if in the opinion of the Minister there are sound reasons for doing so after hearing the member on those reasons.

(5) A member of the Council holds office for a period not exceeding three years, and may be reappointed.

(6) No member may serve more than two consecutive terms.

(7) If a member of the Council dies or vacates the office before the expiration of the period for which the member has been appointed, another person may be appointed to

fill the vacancy for the unexpired portion of the period for which the member was appointed.

15. Chairperson of Council.—(1) The chairperson of the Council is elected from the appointed members of the Council and holds office for the period or the unexpired portion of the period for which he or she has been appointed as member of the Council, unless the Council otherwise determines.

(2) If the chairperson of the Council vacates the office as chairperson before the expiration of the period for which he or she was appointed, another member of the Council must, subject to subsection (1), be elected as a chairperson of the Council from the appointed members of the Council.

(3) If the chairperson of the Council is absent from a meeting of the Council or not able to preside at that meeting, the members present must elect one of their number to preside at that meeting and that person may, during that meeting and until the chairperson resumes his or her functions, perform all those functions.

16. Functions of Council.—The functions of the Council are to—

(a) advise the Minister on matters concerning heritage resources management;

(b) be responsible and accountable for the implementation of the functions, powers and duties of SAHRA;

(c) advise and assist SAHRA in the performance of its functions, powers and duties;

(d) promote the co-ordination of policy formulation and planning for the management of the national estate at national and provincial levels; and

(e) furnish the Minister with such information as the Minister may require.

17. Meetings of Council.—(1) The Council may meet as often as necessary, but at least twice a year.

(2) A quorum for a meeting of the Council shall be a majority of its members.

(3) Any decision of the Council shall be taken by resolution of the majority of the members present at any meeting of the Council, and, in the event of an equality of votes on any matter, the person presiding at the meeting in question shall have a casting vote in addition to his or her deliberative vote as a member of the Council.

18. Committees of Council.—The Council may establish committees to assist it in the performance of its functions and, in addition to any members, it may appoint to such committees persons whom the Council considers competent or who possess specific skills and expertise.

19. Reimbursement of expenses incurred by members of Council and committees.—The Minister may, with the concurrence of the Minister of Finance, determine the reimbursement of expenses incurred by members of the Council and any committees it may establish who are not in the full-time employ of the State.

20. Employees of Council.—(1) The Council must appoint a senior member of staff as chief executive officer, who must—

(a) be responsible for the management of the affairs of SAHRA and who must report on those affairs to the Council as the Council may require;

(b) be the accounting officer charged with the responsibility of accounting for all the money received and the utilisation thereof and be responsible for the property of SAHRA;

(c) furnish the Council with an annual report on the financial affairs of SAHRA;

(d) be responsible for the appointment and management of the staff in accordance with the staffing policy in terms of subsection (2); and

- (e) perform any other activities and duties assigned to the chief executive officer from time to time by the Council.
- (2) The Council must, in consultation with the chief executive officer, determine the staff needs and staffing policies of SAHRA and the posts, conditions of service, remuneration, allowances, subsidies and other benefits of the staff in accordance with a system approved by the Minister with the concurrence of the Minister of Finance.
- (3) The Council must designate one of the staff of SAHRA as acting chief executive officer when the office of chief executive officer is vacant or when the chief executive officer is absent.
21. Finances and property.—(1) The funds of SAHRA consists of—
- (a) moneys appropriated by Parliament to enable it to perform its functions and exercise its powers;
 - (b) fees and fines received under the regulations;
 - (c) fees received in payment of services;
 - (d) funds raised by and donations and contributions to it;
 - (e) trust funds vested in it;
 - (f) interest derived from investments; and
 - (g) moneys received from any other source.
- (2) Subject to this section, SAHRA must use its funds to defray expenditure in connection with the performance of its functions.
- (3) The Council may invest any money not required for immediate use or as a reasonable operating balance in accordance with the directions determined by the Minister in consultation with the Minister of Finance.
- (4) The Council may establish and operate a reserve fund and may deposit therein such amounts as become available from time to time.
- (5) SAHRA, with the approval of the Council—
- (a) may not lend or borrow any money without the consent of the Minister given with the concurrence of the Minister of Finance;
 - (b) may purchase or otherwise acquire, hold, let, hire or receive in trust any real right in any immovable or movable property; and
 - (c) may not make over to any person to hold in trust or sell, exchange or otherwise alienate, or hypothecate, burden with a servitude or otherwise confer any real right in immovable property, without the approval of the Minister given with the concurrence of the Minister of Finance.
- (6) Once during every financial year, at a time determined by the Minister, SAHRA must submit a statement of its estimated income and expenditure for the following financial year to the Minister for approval, granted with the concurrence of the Minister of Finance.
- (7) SAHRA may during the course of a financial year submit supplementary estimates of its expenditure for that financial year to the Minister for approval, granted with the concurrence of the Minister of Finance.
- (8) SAHRA must not incur any expenditure except in accordance with an estimate of expenditure approved under subsections (6) and (7).
- (9) SAHRA must—
- (a) keep full and correct accounts and records of all its financial transactions and affairs, including all its transactions in its capacity of trustee of any trust fund, and all properties under its control, and must ensure that all payments out of its funds are correctly made and properly authorised and that adequate control is maintained over its assets, or those in its custody, and the incurring of liabilities; and

(b) as soon as possible after the end of the financial year, draw up annual financial statements which must show money received and expenditure incurred and its assets and liabilities at the end of the financial year concerned.

(10) The financial year of SAHRA ends on 31 March each year.

(11) The accounts and annual financial statements referred to in subsection (9) (b) must be audited by the Auditor-General.

(12) The accounts and annual financial statements referred to in subsection (9) (b) must be available for public inspection.

22. Reports.—(1) As soon as practicable after the end of the financial year, SAHRA must compile and submit to the Minister a report on all its activities during that financial year, including a balance sheet and statements of income and expenditure certified by the Auditor-General.

(2) The report referred to in subsection (1) must include a description of the condition of the national estate during the period to which the report relates, including destruction and other losses incurred, threats to specific heritage resources or categories of heritage resources, and an account of offences and prosecutions and the results thereof.

(3) The Minister must table the report referred to in subsection (1) in Parliament within 14 days after receipt thereof if Parliament is in ordinary session or, if Parliament is not in ordinary session, within 14 days after the commencement of its next ordinary session.

23. Establishment of provincial heritage resources authorities.—An MEC may establish a provincial heritage resources authority which shall be responsible for the management of the relevant heritage resources within the province, which shall be a body corporate capable of suing and being sued in its corporate name and which shall be governed by a Council constituted as prescribed by regulations published in the Provincial Gazette: Provided that the members of the Council shall be appointed in a manner which applies the principles of transparency and representivity and takes into account special competence, experience and interest in the field of heritage resources.

24. Functions, powers and duties of provincial heritage resources authority.—(1) A provincial heritage authority must—

(a) advise the MEC on the implementation of this Act or relevant provincial or municipal legislation;

(b) annually submit a report to the MEC regarding its activities during that year;

(c) promote the systematic identification, recording and assessment of heritage resources and heritage objects which form part of the national estate in a province;

(d) protect and manage heritage resources in a province which fulfil the heritage assessment criteria prescribed under section 7 (1) for Grade II status;

(e) notify SAHRA of the presence of any heritage resource in the province which it considers fulfils the heritage assessment criteria prescribed under section 7 (1) for Grade I status, nominate such resource for national level protection and furnish SAHRA with the information in its possession relating to such resource;

(f) maintain data bases on heritage resources in accordance with national standards, and at regular intervals furnish SAHRA with such data;

(g) establish policy, objectives and strategy plans for heritage resources management in the province;

- (h) determine the competence of local authorities to manage heritage resources in accordance with the national system for the heritage grading of local authorities prescribed under section 8 (6);
- (i) co-ordinate and monitor the performance of local authorities in the implementation of their responsibilities in terms of this Act and provincial heritage legislation;
- (j) assist local authorities to manage heritage resources in their areas of jurisdiction; and
- (k) provide for any areas of responsibility in terms of this Act or any provincial heritage resources legislation when a local authority does not have competence, or has insufficient capacity, to perform a function in terms of the criteria prescribed under section 8 (6).

25. General powers and duties of heritage resources authorities.—(1) A heritage resources authority must—

- (a) furnish information, advice and assistance to enhance public sensitivity towards and awareness of the need for management of the national estate;
- (b) maintain a list of conservation bodies which have, in accordance with regulations by the heritage resources authority concerned, registered their interest in—
 - (i) a geographical area; or
 - (ii) a category of heritage resources;
- (c) regularly inspect heritage resources which are formally protected by the heritage resources authority concerned in terms of any provision of Part 1 of Chapter II;
- (d) endeavour to assist any community or body of persons with an established interest in any heritage resource to obtain reasonable access to such heritage resource, should they request it, and may for this purpose—
 - (i) enter into negotiations with the owner of such resource;
 - (ii) facilitate the making of arrangements as may be required for the achievement of such access, including the execution of a heritage agreement under section 42; and
 - (iii) if such negotiations are unsuccessful, refer the matter to the Minister or MEC, as the case may be; and
- (e) make arrangements to ensure the protection and management of all heritage resources and property owned or controlled by it or vested in it.

(2) A heritage resources authority may—

- (a) promote and engage in research relating to the identification, assessment and management of the national estate as necessary for the performance of its functions;
- (b) publish, or by any other means make available or distribute in any form, or cause to be published or distributed, any knowledge and information relating to the national estate and any of its functions or activities;
- (c) inspect or document any heritage resource—
 - (i) which has the potential to become protected in terms of this Act;
 - (ii) which is, or which the heritage authority has reason to believe may be, so protected; or
 - (iii) which it wishes to document for research purposes, for purposes of building up a public record of heritage resources or as part of an investigation into a suspected offence in terms of this Act,
 and must maintain a register of such inspections;

(d) whenever it is investigating the desirability of protecting any place in terms of this Act, take such steps as it considers necessary—

(i) for erecting beacons on the corners of and surveying and preparing a diagram or plan of such place; or

(ii) for determining by survey the location of such place or object in relation to the beacons and boundaries of the land on which it is situated;

(e) undertake or make arrangements for the presentation of any place under its control or, after consultation with the Department concerned, any heritage site which is owned by the State;

(f) by agreement with the authority or body concerned, co-operate in the management of any heritage resource which is owned or controlled by the State or a supported body;

(g) lend anything under its control to a museum or public institution, subject to such conditions as it deems necessary and appropriate;

(h) subject to the provisions of section 59, make and from time to time amend regulations relating to any matter which the heritage authority concerned considers to be necessary or expedient to prescribe to fulfil its functions and implement its powers and duties under this Act, including—

(i) the standards of practice and qualifications required of individuals, institutions or other bodies for the performance of work on heritage resources protected in terms of, and in the various fields covered by, this Act; and

(ii) the monitoring of activities at protected sites;

(i) create and where necessary register with the relevant authorities a badge, or an emblem for the authority, any of its projects or any category of protection provided for in terms of this Act;

(j) where appropriate, affix to or otherwise display at any place protected in terms of this Act a badge or other sign indicating its status;

(k) produce, acquire and market products relating to the national estate, or enter into arrangements for the production, acquisition and marketing of such products;

(l) recover costs incurred by it and, where appropriate, charge for the provision of services rendered in terms of this Act, including but not limited to the—

(i) processing of applications received;

(ii) carrying out of investigations;

(iii) production, acquisition and marketing of products; and

(iv) provision of information;

(m) arrange for the provision of insurance cover for—

(i) itself against any loss, damage, risk or liability which it may suffer or incur regarding any property under its control;

(ii) members of the council of a heritage resources authority, co-opted members, members of committees and members of its staff, in respect of bodily injury, illness, disablement or death incurred wholly and directly in the course of the performance of their duties on behalf of the heritage resources authority concerned;

(n) enter into contracts; and

(o) employ consultants to assist in the performance of its functions.

26. Delegation of functions or powers of heritage resources authorities.—

(1) Subject to subsection (3), the Minister or MEC, as the case may be, may make regulations to enable a heritage resources authority to delegate in writing any of its functions or powers under this Act to all or any of the following:

(a) In the case of SAHRA, any member of the Council;

(b) in the case of a provincial heritage resources authority, any member of its council;

(c) a committee or any member of a committee;

(d) any employee, heritage inspector, volunteer or other representative of the authority concerned;

(e) specified office bearers or members of a conservation body registered with it in terms of section 25 (1) (b);

(f) in the case of SAHRA, a provincial heritage resources authority, provincial government, local authority, and any other authority which shows competence to perform such functions, by agreement with such authority;

(g) in the case of a provincial heritage resources authority, a local authority or any other body which is competent to perform such functions, by agreement with such authority or body.

(2) A power delegated under subsection (1), when exercised by the delegate, shall for the purposes of this Act be deemed to be exercised by the heritage resources authority concerned: Provided that a delegate shall be held accountable to the heritage resources authority for all actions performed by him, her or it during the period of delegation.

(3) A heritage resources authority may not delegate power to do any of the following:

(a) Delegate any of its functions or powers under this section;

(b) make a recommendation to the Minister or MEC in terms of this Act;

(c) borrow money under section 21 (5) (a);

(d) acquire or dispose of real property under section 21 (5) (b) or (c); or

(e) adopt any statement of general policy or conservation management

plan under section 47.

(4) A delegation under this section shall be revocable at will and no such delegation shall prevent the exercise of any power by the heritage resources authority: Provided that the delegation of any power to a provincial heritage resources authority in terms of an agreement under subsection (1) (f) shall only be revoked by SAHRA with the consent of the Minister, after SAHRA has consulted such provincial heritage resources authority.

CHAPTER II

PROTECTION AND MANAGEMENT OF HERITAGE RESOURCES

Part 1: Formal protections

27. National heritage sites and provincial heritage sites.—(1) SAHRA must identify those places with qualities so exceptional that they are of special national significance in terms of the heritage assessment criteria set out in section 3 (2) and prescribed under section 6 (1) and (2), and must investigate the desirability of their declaration as national heritage sites.

(2) A provincial heritage resources authority must identify those places which have special qualities which make them significant in the context of the province or a region in terms of the heritage assessment criteria set out in section 3 (2) and prescribed under section 6 (1) and (2) and must investigate the desirability of their declaration as provincial heritage sites.

(3) Any person may submit a nomination to SAHRA for a place to be declared a national heritage site or to the provincial heritage resources authority for a place to be declared a provincial heritage site. The heritage resources authority concerned may prescribe the format and procedures for such nominations.

(4) A written motivation for the declaration of a place as a heritage site must be prepared and kept on record by the heritage resources authority.

- (5) SAHRA may, by notice in the Gazette, declare any place referred to in subsection (1) to be a national heritage site.
- (6) A provincial heritage resources authority may, by notice in the Provincial Gazette, declare any place referred to in subsection (2) and described in the notice to be a provincial heritage site.
- (7) The heritage resources authority concerned may, by similar notice—
- (a) amend any notice published under subsection (5) or (6); or
 - (b) withdraw any notice published under subsection (5) or (6) or paragraph (a) of this subsection.
- (8) Before declaration of a place as a heritage site, or amendment or withdrawal of a notice under subsection (7), the heritage resources authority—
- (a) must notify the owner;
 - (b) must notify the mortgage holder, the occupier and any other person with a registered interest in the property;
 - (c) must notify all conservation bodies which have, in terms of section 25 (1) (b), registered their interest in the geographical area in which the proposed heritage site is situated, and give them at least 60 days to make submissions regarding the proposed declaration, amendment or withdrawal, and in the case of the owner, to propose conditions under which the action will be acceptable. All submissions must be considered by the heritage resources authority before a final decision is made; and
 - (d) before notifying the owner as provided in paragraph (a), must give to the owner reasonable opportunity for representations or submissions to be made in regard to the proposed notification.
- (9) A heritage resources authority may at any time withdraw a notice which it has served in terms of subsection (8) (a).
- (10) For the purposes of subsections (15) to (22), a place shall be deemed to be protected as a heritage site for six months from the date of service of a notice under subsection (8) (a) or until the notice is withdrawn or the place is declared to be a heritage site, whichever is the shorter period.
- (11) Subject to subsection (12), if the owner objects to the proposed declaration of a place or proposes conditions which the heritage resources authority reasonably considers to be unacceptable, the heritage resources authority may, prior to the expiry of the notice in terms of subsection (10), renew a notice under subsection (8) (a), whereupon the protection under subsection (10) shall be extended for a further six months. If during this time consultation between the heritage resources authority and the owner fails to lead to the withdrawal of the owner's objection or the proposal of acceptable conditions, the heritage resources authority may declare the place to be a heritage site.
- (12) The Minister, on the advice of SAHRA, must prescribe circumstances in which the State, a local authority or a supported body may object to the declaration as a heritage site of a place which it owns or controls.
- (13) SAHRA must inform the provincial heritage resources authority, the provincial planning authority and the local authority within whose area of jurisdiction a national heritage site falls, within 30 days of its declaration.
- (14) A provincial heritage resources authority must inform SAHRA, the provincial planning authority and the local authority within whose area of jurisdiction a provincial heritage site falls, within 30 days of its declaration.
- (15) SAHRA is responsible for the protection of national heritage sites in accordance with the provisions of this section.

- (16) A provincial heritage resources authority is responsible for the protection of provincial heritage sites in accordance with the provisions of this section.
- (17) Except in cases where the heritage resources authority considers it inappropriate, all heritage sites must be marked with a badge indicating their status.
- (18) No person may destroy, damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of any heritage site without a permit issued by the heritage resources authority responsible for the protection of such site.
- (19) The responsible heritage resources authority may make regulations pertaining to heritage sites under its control, or to any other heritage site with the consent of the owner of that site—
- (a) safeguarding heritage sites from destruction, damage, disfigurement, excavation or alteration;
 - (b) regulating the conditions of use of any heritage site or the conditions for any development thereof;
 - (c) regulating the admission of members of the public to a heritage site, and the fees payable for such admission.
- (20) Any branch of the State or supported body which is the owner of a heritage site must maintain such site according to a minimum standard and according to a procedure prescribed by the responsible heritage resources authority after consultation with the relevant Departments of Works.
- (21) The responsible heritage resources authority may, by agreement with the owner of a heritage site—
- (a) conserve or improve any heritage site;
 - (b) construct fences, walls or gates around or on a heritage site;
 - (c) acquire or construct and maintain an access road to a heritage site over any land, and construct upon such land fences, walls or gates; or
 - (d) erect signs on or near a heritage site.
- (22) No person may damage any fence, wall or gate constructed or sign erected by a heritage resources authority in terms of subsection (21).
- (23) (a) All reproduction rights either in two or three dimensions in respect of a heritage site, subject to any existing rights and the agreement of the owner of such site, belong to the State and vest in the heritage resources authority responsible for the protection of such site or, by agreement, with the authority or public institution responsible for the management of such site.
- (b) Subject to the provisions of paragraph (a), no person other than the owner of the site may make such reproduction for profit without a permit issued by SAHRA or a provincial heritage resources authority, as the case may be, which may prescribe the fees payable in respect of such reproduction and must deposit such fees in a trust fund dedicated to the conservation of such site or of heritage resources in general.
28. Protected areas.—(1) SAHRA may, with the consent of the owner of an area, by notice in the Gazette designate as a protected area—
- (a) such area of land surrounding a national heritage site as is reasonably necessary to ensure the protection and reasonable enjoyment of such site, or to protect the view of and from such site; or
 - (b) such area of land surrounding any wreck as is reasonably necessary to ensure its protection; or
 - (c) such area of land covered by a mine dump.
- (2) A provincial heritage resources authority may, with the consent of the owner of an area, by notice in the Provincial Gazette designate as a protected area—

(a) such area of land surrounding a provincial heritage site as is reasonably necessary to ensure the protection and reasonable enjoyment of such site, or to protect the view of and from such site; or

(b) such area of land surrounding any archaeological or palaeontological site or meteorite as is reasonably necessary to ensure its protection.

(3) No person may damage, disfigure, alter, subdivide or in any other way develop any part of a protected area unless, at least 60 days prior to the initiation of such changes, he or she has consulted the heritage resources authority which designated such area in accordance with a procedure prescribed by that authority.

(4) With regard to an area of land covered by a mine dump referred to in subsection (1) (c) SAHRA must make regulations providing for the protection of such areas as are seen to be of national importance in consultation with the owner, the Minister of Minerals and Energy and interested and affected parties within the mining community.

(5) A heritage resources authority may make regulations providing for specific protections for any protected area which it has designated, including the prohibition or control of specified activities by any person in the designated area.

(6) A local authority may, with the agreement of the heritage resources authority which designated a protected area, make provision in its town planning scheme or in by-laws for the management of such area.

29. Provisional protection.—(1) SAHRA, or a provincial heritage resources authority, may, subject to subsection (4), by notice in the Gazette or the Provincial Gazette, as the case may be—

(a) provisionally protect for a maximum period of two years any—

(i) protected area;

(ii) heritage resource, the conservation of which it considers to be threatened and which threat it believes can be alleviated by negotiation and consultation; or

(iii) heritage resource, the protection of which SAHRA or the provincial heritage resources authority wishes to investigate in terms of this Act; and

(b) withdraw any notice published under paragraph (a).

(2) A local authority may, subject to subsection (4), by notice in the Provincial Gazette—

(a) provisionally protect for a maximum period of three months any place which it considers to be conservation-worthy, the conservation of which the local authority considers to be threatened and which threat it believes can be alleviated by negotiation and consultation; and

(b) withdraw any notice published under paragraph (a):

Provided that it notifies the provincial heritage resources authority within seven days of such provisional protection.

(3) A provincial heritage resources authority may, by notice in the Provincial Gazette, revoke a provisional protection by a local authority under subsection (2) or provisionally protect a place concerned in accordance with subsection (1).

(4) A heritage resources authority or a local authority may not provisionally protect any heritage resource unless it has notified the owner of the resource in writing of the proposed provisional protection.

(5) A heritage resource shall be deemed to be provisionally protected for 30 days from the date of service of a notice under subsection (4) or until the notice is withdrawn or the resource is provisionally protected by notice in the Gazette or the Provincial Gazette, whichever is the shorter period.

(6) A heritage authority or a local authority may at any time withdraw a notice which it has issued under subsection (4).

(7) SAHRA shall inform the relevant provincial heritage authority and local authority within 30 days of the publication or withdrawal of a notice under subsection (1).

(8) A provincial heritage resources authority shall inform the relevant local authority within 30 days of the publication or withdrawal of a notice under subsection (1).

(9) A local authority shall inform the provincial heritage authority of the withdrawal of a notice under subsection (2) (b).

(10) No person may damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of a provisionally protected place or object without a permit issued by a heritage resources authority or local authority responsible for the provisional protection.

30. Heritage Registers.—(1) A provincial heritage resources authority must compile and maintain a heritage register listing the heritage resources in the province which it considers to be conservation-worthy in terms of the heritage assessment criteria set out in section 3 (3) and prescribed under section 7.

(2) Subject to subsection (7), a provincial heritage resources authority may, by notice in the Provincial Gazette, list a heritage resource or amend or delete an entry in a heritage register.

(3) Heritage resources must be listed in accordance with—

(a) the sub-categories of Grade II and Grade III heritage resources prescribed under section 7, if any;

(b) the areas of jurisdiction of local authorities; and

(c) any additional categories prescribed by the provincial heritage resources authority in consultation with SAHRA.

(4) A provincial heritage resources authority must prescribe the procedure and information required for—

(a) the nomination of a resource for listing in a heritage register; and

(b) the compilation of an inventory of heritage resources referred to in subsection (5),

which shall require at least compliance with such minimum standards as may be prescribed by SAHRA for the recording of information under section 39.

(5) At the time of the compilation or revision of a town or regional planning scheme or a spatial development plan, or at any other time of its choosing, or at the initiative of a provincial heritage resources authority where in the opinion of a provincial heritage resources authority the need exists, a planning authority shall compile an inventory of the heritage resources which fall within its area of jurisdiction and submit such inventory to the relevant provincial heritage resources authority, which shall list in the heritage register those heritage resources which fulfil the assessment criteria under subsection (1).

(6) A provincial heritage resources authority may approve an inventory of heritage resources submitted to it by any person for listing in the heritage register.

(7) A provincial heritage resources authority shall not list a place in a heritage register without having consulted the owner of such place regarding inter alia the provisions to be established under subsection (11) for the protection of the place.

(8) The MEC may, after consultation with the MEC for local government, prescribe the process of consultation referred to in subsection (7).

(9) On publication of a notice in the Provincial Gazette concerning the listing in the heritage register of a place within its area of jurisdiction, or the amendment or

deletion of an entry for such place, a local authority must notify the owner of such place.

(10) A local authority shall notify SAHRA and the provincial heritage resources authority when a place within its area of jurisdiction which is listed in the heritage register is destroyed, whereupon the provincial heritage resources authority shall record the destruction of the place against the entry in the heritage register for that place, and SAHRA shall record such destruction in the inventory of the national estate.

(11) Within six months of the publication of a notice in the Provincial Gazette concerning the inclusion in the heritage register of a place falling within its area of jurisdiction, every local authority must make provision for the protection of such place through the provisions of its planning scheme or by-laws under this Act: Provided that any such protective provisions shall be jointly approved by the provincial heritage resources authority, the relevant local authority and the provincial planning authority, and provided further that—

(a) the special consent of the local authority shall be required for any alteration to or development affecting a place listed in the heritage register;

(b) the local authority must, prior to the consideration of an application under paragraph (a), notify any conservation bodies which have, in terms of section 25 (1) (b), registered their interest in the geographical area or type of property concerned and give them a reasonable period in which to register an objection or make other representations with respect to the application;

(c) in assessing an application under paragraph (a), the local authority shall consider—

(i) the cultural significance of the place and how this could be affected by the proposed alteration or development; and

(ii) any objection or representations under paragraph (b);

(d) where the local authority resolves to approve an application under paragraph (a) which would materially affect the cultural significance of the place and an objection to such approval has been registered under paragraph (b), unless the conservation body concerned withdraws such objection, the objection shall be deemed to be an appeal in terms of section 49 and the local authority shall submit the application and all relevant information to the relevant appeal body; and

(e) in the event of any alteration or development of a place listed in a heritage register being undertaken without the consent of the local authority, the local authority may require the owner to stop such work instantly and restore the site to its previous condition within a specified period. If the owner fails to comply with the local authority's requirements the local authority shall have the right to carry out such restoration work itself and recover the cost thereof from the owner.

(12) A provincial heritage resources authority or a local authority within whose area of jurisdiction such site is located may provisionally protect any place in an inventory referred to in subsections (5) and (6): Provided that such provisional protection shall be withdrawn when the place is listed in the heritage register.

(13) A local authority may mark any place falling within its area of jurisdiction listed in a heritage register with a badge indicating its status.

(14) Inclusion of a place in a heritage register shall not exempt any person from complying with the provisions of sections 35 and 36.

31. Heritage areas.—(1) A planning authority must at the time of revision of a town or regional planning scheme, or the compilation or revision of a spatial plan, or at the initiative of the provincial heritage resources authority where in the opinion of the

provincial heritage resources authority the need exists, investigate the need for the designation of heritage areas to protect any place of environmental or cultural interest.

(2) Where the provincial heritage resources authority is of the opinion that the need exists to protect a place of environmental or cultural interest as a heritage area, it may request a planning authority to investigate its designation in accordance with proposals submitted by the provincial heritage resources authority with its request. The planning authority must inform the provincial heritage resources authority within 60 days of receipt of such a request whether it is willing or able to comply with the request.

(3) Where the planning authority informs the provincial heritage resources authority that it is willing and able, the provincial heritage resources authority must assist the planning authority to investigate the designation of the place as a heritage area.

(4) Where the planning authority does not so inform the provincial heritage resources authority, or informs the provincial heritage resources authority that it is not so willing and able, the provincial heritage resources authority may investigate the designation of the place as a heritage area and, with the approval of the MEC, designate such place to be a heritage area by notice in the Provincial Gazette.

(5) A local authority may, by notice in the Provincial Gazette, designate any area or land to be a heritage area on the grounds of its environmental or cultural interest or the presence of heritage resources, provided that prior to such designation it shall consult—

(a) the provincial heritage resources authority; and

(b) owners of property in the area and any affected community,

regarding inter alia the provisions to be established under subsection (7) for the protection of the area.

(6) The MEC may, after consultation with the MEC responsible for local government, publish regulations setting out the process of consultation referred to in subsection (5).

(7) A local authority must provide for the protection of a heritage area through the provisions of its planning scheme or by-laws under this Act, provided that any such protective provisions shall be jointly approved by the provincial heritage resources authority, the provincial planning authority and the local authority, and provided further that—

(a) the special consent of the local authority shall be required for any alteration or development affecting a heritage area;

(b) in assessing an application under paragraph (a) the local authority must consider the significance of the area and how this could be affected by the proposed alteration or development; and

(c) in the event of any alteration or development being undertaken in a heritage area without the consent of the local authority, it shall have the power to require the owner to stop such work instantly and restore the site to its previous condition within a specified period. If the owner fails to comply with the requirements of the local authority, the local authority shall have the right to carry out such restoration work itself and recover the cost thereof from the owner.

(8) A local authority may erect signage indicating its status at or near a heritage area.

(9) Particular places within a heritage area may, in addition to the general provisions governing the area, be afforded further protection in terms of this Act or other heritage legislation.

32. Heritage objects.—(1) An object or collection of objects, or a type of object or list of objects, whether specific or generic, that is part of the national estate and the

export of which SAHRA deems it necessary to control, may be declared a heritage object, including—

- (a) objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects, meteorites and rare geological specimens;
- (b) visual art objects;
- (c) military objects;
- (d) numismatic objects;
- (e) objects of cultural and historical significance;
- (f) objects to which oral traditions are attached and which are associated with living heritage;
- (g) objects of scientific or technological interest;
- (h) books, records, documents, photographic positives and negatives, graphic material, film or video or sound recordings, excluding those that are public records as defined in section 1 of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996), or in a provincial law pertaining to records or archives; and
- (i) any other prescribed category.

(2) For the purposes of this section, an object within a type of objects declared to be a heritage object is deemed to be a heritage object.

(3) Before declaring any object contemplated in subsection (1) as a heritage object, SAHRA may give to the owner such prior opportunity for representations or submissions to be made in regard to the proposed declaration as may be practicable in the circumstances and in such manner as may be prescribed. Nothing herein contained shall oblige SAHRA to give such prior opportunity if the circumstances militate against this.

(4) SAHRA with the approval of the Minister may, by notice in the Gazette—

- (a) declare an object, or a collection thereof, or a type of object or list of objects, whether specific or generic, to be a heritage object;
- (b) amend any notice published under paragraph (a); or
- (c) withdraw any notice published under paragraph (a) or amended under paragraph (b).

(5) SAHRA may not exercise its power under subsection (4) unless—

- (a) in the case of a specific object or collection, it has served on the owner a notice of its intention and has given him or her at least 60 days to lodge an objection or suggest reasonable conditions regarding the care and custody of such object under which such declaration is acceptable; or

- (b) in the case of a type of objects, it has—

- (i) published a notice of provisional declaration in the Gazette;

[General Note: Declaration of types of heritage objects published under Government Notice No. 1313 in Government Gezette 23952 of 25 October, 2002 and under Government Notice No. 1512 in Government Gezette 24116 of 6 December, 2002.]

- (ii) by public advertisement and any other means it considers appropriate, made known publicly the effect of the declaration and its purpose; and

- (iii) invited any interested person who might be adversely affected to make submissions to or lodge objections with SAHRA within 60 days from the date of the notice,

and has considered all such submissions and objections.

(6) An object or collection shall be deemed to be protected as a heritage object for six months from the date of service or publication of a notice under subsection (5) (a) or

- (5) (b) (i), or until such notice is withdrawn or the object or collection or type of objects is declared to be a heritage object, whichever is the shorter period.
- (7) SAHRA must maintain a register of heritage objects in which all objects, collections of objects and types of objects which have been declared heritage objects must be listed.
- (a) The register shall be in two parts:
 - (i) Part I: Heritage objects listed by type.
 - (ii) Part II A: Specific heritage objects as listed in the inventory of a public museum in South Africa or otherwise displayed or kept in secure conditions.
 - (iii) Part II B: Other specific heritage objects.
 - (b) SAHRA may prescribe the further division of the parts of the register into categories or other subdivisions.
- (8) SAHRA must make available to the public, subject to subsection (9), a summary of information contained in the register.
- (9) Where it is necessary to ensure the proper protection of a heritage object which is entered in the register, no information which may identify the location of the object must be accessible to any person except with the express consent of SAHRA, for so long as SAHRA may determine.
- (10) SAHRA may designate any person or any institution in South Africa as an expert examiner for the purposes of this section, on the basis of his, her or its special knowledge.
- (11) SAHRA may provide to the owner or custodian of a heritage object listed in Part II of the register of heritage objects a certificate or badge indicating its status.
- (12) The owner of a heritage object listed in Part II of the register of heritage objects must notify SAHRA of the name and address of the new owner when such object is sold or otherwise alienated and must provide the new owner or custodian with any certificate or badge under subsection (11) relating to such a heritage object.
- (13) No person may destroy, damage, disfigure or alter any heritage object, or disperse any collection which is listed in Part II of the register, without a permit issued by SAHRA.
- (14) SAHRA may make regulations relating to the registration of dealers in heritage objects and the control of trade in heritage objects.
- (15) It is the responsibility of the owner or custodian of a heritage object listed in Part II of the register of heritage objects, to keep the heritage object in good condition and in a secure place.
- (16) The owner or custodian of a heritage object, listed in Part II of the register of heritage objects, must immediately report to SAHRA any loss of or damage to such a heritage object or any part thereof upon discovery of such loss or damage.
- (17) No person may carry out any work of restoration or repair of a heritage object, listed in Part II of the register of heritage objects, without a permit issued by a duly authorised representative of SAHRA.
- (18) On application by the owner or custodian of a heritage object listed in Part II of the register of heritage objects, SAHRA may at its discretion assist in funding any restoration or repair work undertaken by a restoration or repair craftsman approved by SAHRA.
- (19) No person may export or attempt to export from South Africa any heritage object without a permit issued by SAHRA.
- (20) No heritage object may be removed from South Africa other than through a customs port of entry, and the relevant export permit issued under subsection (19) or

certificate of exemption issued under subsection (32) must be produced to a custom officer before removal from South Africa is effected or allowed.

(21) An application for such an export permit must be made in the manner and contain such information as prescribed by SAHRA.

(22) On receipt of an application to export a heritage object SAHRA may refer it to one or more expert examiners, who must submit to SAHRA a written report on the application.

(23) SAHRA must consider the report and—

(a) issue a permit to export the object concerned, subject to such conditions, if any, as SAHRA considers necessary; or

(b) refuse to issue a permit.

(24) In considering an application to export any object of a type listed in Part I of the register of heritage objects permanently, an expert examiner and SAHRA must consider whether the object—

(a) is of outstanding significance by reason of its close association with South African history or culture, its aesthetic qualities, or its value in the study of the arts or sciences; and

(b) is of such a degree of national importance that its loss to South Africa would significantly diminish the national heritage,
and if satisfied that the object fulfils both these criteria, may not recommend the issue of a permit, or issue a permit, as the case may be, to export the object permanently.

(25) In the event of SAHRA refusing to issue an export permit the applicant may, within 30 days after such refusal, by written notice require the compulsory purchase of the heritage object to which such refusal relates.

(26) On receipt of a notification under subsection (25) SAHRA must—

(a) if it is of the opinion that a fair offer to purchase the object concerned might be made by a person or public authority in South Africa within the following six months, establish a delay period of not less than two months and not more than six months during which an export permit may not be issued in respect of such object; or

(b) on its own behalf or on behalf of a public institution or authority in South Africa or a person who will undertake to keep the object in the country, offer to purchase the object either by an immediate cash payment or by payment of compensation in such manner as the Minister in consultation with the Minister of Finance may determine; or

(c) in any other case, issue a permit to export the object concerned.

(27) Where SAHRA establishes a delay period under subsection (26) (a) in respect of a heritage object, it—

(a) must give written notice of the delay period to the applicant, and the Minister;

(b) must advise such institutions and public authorities in South Africa as it sees fit of the delay period and of the object in respect of which such delay period was established;

(c) may by public advertisement or any other means it deems appropriate make known the delay period and the object in respect of which it was established; and

(d) may stipulate that the heritage object concerned is deposited on temporary loan with a specified South African museum or public authority for the duration of the delay period.

(28) SAHRA, in consultation with the Minister, may extend a delay period established under subsection (26) (a) for a maximum period of two years.

(29) In the event that—

(a) during a delay period established under subsection (26) (a), an offer to purchase the heritage object concerned is made and the applicant and a public authority or person making such offer cannot agree as to the amount of a fair cash offer; or

(b) SAHRA and the applicant cannot agree as to the amount of a fair offer or compensation under subsection (26) (b), such dispute must be arbitrated by a panel appointed by the Minister, consisting of equal representatives of dealers in heritage objects, museums and collectors of heritage objects, which must determine the amount of a fair cash offer to purchase such heritage object and must notify the parties concerned and SAHRA thereof.

(30) Where a delay period established under subsection (26) (a) expires without a fair offer being made to purchase the heritage object concerned, SAHRA must forthwith on the request of the applicant issue a permit to export such heritage object.

(31) Where a delay period established under subsection (26) (a) expires and SAHRA is satisfied that a fair offer to purchase the heritage object concerned has been made, SAHRA may not issue a permit to export such heritage object.

(32) A person who intends to import an object which is of a type listed in Part I of the register of heritage objects, for temporary purposes or in circumstances in which the person may subsequently wish to export the object, may apply to SAHRA for a certificate of exemption authorising the export of the object concerned for the period specified in the certificate.

Part 2: General protections

33. Import of objects protected in terms of laws of foreign states.—(1) No person may import into South Africa any foreign cultural property other than through a customs port of entry, and the export permit or other permission issued in the country of origin of such object must be produced to a customs officer before import to South Africa is effected or allowed.

(2) After a cultural property agreement between South Africa and a reciprocating state comes into force, no person may import into South Africa any foreign cultural property that has been illegally exported from a reciprocating state.

(3) A customs officer who has reason to believe that a person is attempting to import an object in contravention of subsection (1) or (2), may withhold the object concerned and such object must be kept in the custody of SAHRA until such time, not exceeding six months, as an investigation into the provenance of such object is completed.

(4) SAHRA may, with the consent of the Minister and the Minister of Foreign Affairs, liaise and co-operate with the authority responsible for the protection of cultural property in any reciprocating state and may enter into agreements with any such authority with regard to the return to the country of origin of any heritage object or cultural property which is illegally imported into South Africa or the reciprocating state, whether specifically or in general.

34. Structures.—(1) No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.

(2) Within three months of the refusal of the provincial heritage resources authority to issue a permit, consideration must be given to the protection of the place concerned in terms of one of the formal designations provided for in Part 1 of this Chapter.

(3) The provincial heritage resources authority may at its discretion, by notice in the Provincial Gazette, make an exemption from the requirements of subsection (1) within a defined geographical area, or for certain defined categories of site within a

defined geographical area, provided that it is satisfied that heritage resources falling into the defined area or category have been identified and are adequately provided for in terms of the provisions of Part 1 of this Chapter.

(4) Should the provincial heritage resources authority believe it to be necessary it may, following a three-month notice period published in the Provincial Gazette, withdraw or amend a notice under subsection (3).

35. Archaeology, palaeontology and meteorites.—(1) Subject to the provisions of section 8, the protection of archaeological and palaeontological sites and material and meteorites is the responsibility of a provincial heritage resources authority: Provided that the protection of any wreck in the territorial waters and the maritime cultural zone shall be the responsibility of SAHRA.

(2) Subject to the provisions of subsection (8) (a), all archaeological objects, palaeontological material and meteorites are the property of the State. The responsible heritage authority must, on behalf of the State, at its discretion ensure that such objects are lodged with a museum or other public institution that has a collection policy acceptable to the heritage resources authority and may in so doing establish such terms and conditions as it sees fit for the conservation of such objects.

(3) Any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development or agricultural activity must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority.

(4) No person may, without a permit issued by the responsible heritage resources authority—

- (a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
- (b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
- (c) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or
- (d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.

(5) When the responsible heritage resources authority has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no application for a permit has been submitted and no heritage resources management procedure in terms of section 38 has been followed, it may—

- (a) serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order;
- (b) carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary;
- (c) if mitigation is deemed by the heritage resources authority to be necessary, assist the person on whom the order has been served under paragraph (a) to apply for a permit as required in subsection (4); and

(d) recover the costs of such investigation from the owner or occupier of the land on which it is believed an archaeological or palaeontological site is located or from the person proposing to undertake the development if no application for a permit is received within two weeks of the order being served.

(6) The responsible heritage resources authority may, after consultation with the owner of the land on which an archaeological or palaeontological site or a meteorite is situated, serve a notice on the owner or any other controlling authority, to prevent activities within a specified distance from such site or meteorite.

(7) (a) Within a period of two years from the commencement of this Act, any person in possession of any archaeological or palaeontological material or object or any meteorite which was acquired other than in terms of a permit issued in terms of this Act, equivalent provincial legislation or the National Monuments Act, 1969 (Act No. 28 of 1969), must lodge with the responsible heritage resources authority lists of such objects and other information prescribed by that authority. Any such object which is not listed within the prescribed period shall be deemed to have been recovered after the date on which this Act came into effect.

(b) Paragraph (a) does not apply to any public museum or university.

(c) The responsible authority may at its discretion, by notice in the Gazette or the Provincial Gazette, as the case may be, exempt any institution from the requirements of paragraph (a) subject to such conditions as may be specified in the notice, and may by similar notice withdraw or amend such exemption.

(8) An object or collection listed under subsection (7)—

(a) remains in the ownership of the possessor for the duration of his or her lifetime, and SAHRA must be notified who the successor is; and

(b) must be regularly monitored in accordance with regulations by the responsible heritage authority.

36. Burial grounds and graves.—(1) Where it is not the responsibility of any other authority, SAHRA must conserve and generally care for burial grounds and graves protected in terms of this section, and it may make such arrangements for their conservation as it sees fit.

(2) SAHRA must identify and record the graves of victims of conflict and any other graves which it deems to be of cultural significance and may erect memorials associated with the grave referred to in subsection (1), and must maintain such memorials.

(3) No person may, without a permit issued by SAHRA or a provincial heritage resources authority—

(a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;

(b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or

(c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.

(4) SAHRA or a provincial heritage resources authority may not issue a permit for the destruction or damage of any burial ground or grave referred to in subsection

(3) (a) unless it is satisfied that the applicant has made satisfactory arrangements for the exhumation and re-interment of the contents of such graves, at the cost of the

applicant and in accordance with any regulations made by the responsible heritage resources authority.

(5) SAHRA or a provincial heritage resources authority may not issue a permit for any activity under subsection (3) (b) unless it is satisfied that the applicant has, in accordance with regulations made by the responsible heritage resources authority—

- (a) made a concerted effort to contact and consult communities and individuals who by tradition have an interest in such grave or burial ground; and
- (b) reached agreements with such communities and individuals regarding the future of such grave or burial ground.

(6) Subject to the provision of any other law, any person who in the course of development or any other activity discovers the location of a grave, the existence of which was previously unknown, must immediately cease such activity and report the discovery to the responsible heritage resources authority which must, in co-operation with the South African Police Service and in accordance with regulations of the responsible heritage resources authority—

- (a) carry out an investigation for the purpose of obtaining information on whether or not such grave is protected in terms of this Act or is of significance to any community; and
- (b) if such grave is protected or is of significance, assist any person who or community which is a direct descendant to make arrangements for the exhumation and re-interment of the contents of such grave or, in the absence of such person or community, make any such arrangements as it deems fit.

(7) (a) SAHRA must, over a period of five years from the commencement of this Act, submit to the Minister for his or her approval lists of graves and burial grounds of persons connected with the liberation struggle and who died in exile or as a result of the action of State security forces or agents provocateur and which, after a process of public consultation, it believes should be included among those protected under this section.

(b) The Minister must publish such lists as he or she approves in the Gazette.

(8) Subject to section 56 (2), SAHRA has the power, with respect to the graves of victims of conflict outside the Republic, to perform any function of a provincial heritage resources authority in terms of this section.

(9) SAHRA must assist other State Departments in identifying graves in a foreign country of victims of conflict connected with the liberation struggle and, following negotiations with the next of kin, or relevant authorities, it may re-inter the remains of that person in a prominent place in the capital of the Republic.

37. Public monuments and memorials.—Public monuments and memorials must, without the need to publish a notice to this effect, be protected in the same manner as places which are entered in a heritage register referred to in section 30.

38. Heritage resources management.—(1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as—

- (a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
- (b) the construction of a bridge or similar structure exceeding 50 m in length;
- (c) any development or other activity which will change the character of a site—
 - (i) exceeding 5 000m² in extent; or
 - (ii) involving three or more existing erven or subdivisions thereof; or

(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or

(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;

(d) the re-zoning of a site exceeding 10 000m² in extent; or

(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority,

must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

(2) The responsible heritage resources authority must, within 14 days of receipt of a notification in terms of subsection (1)—

(a) if there is reason to believe that heritage resources will be affected by such development, notify the person who intends to undertake the development to submit an impact assessment report. Such report must be compiled at the cost of the person proposing the development, by a person or persons approved by the responsible heritage resources authority with relevant qualifications and experience and professional standing in heritage resources management; or

(b) notify the person concerned that this section does not apply.

(3) The responsible heritage resources authority must specify the information to be provided in a report required in terms of subsection (2) (a): Provided that the following must be included:

(a) The identification and mapping of all heritage resources in the area affected;

(b) an assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6 (2) or prescribed under section 7;

(c) an assessment of the impact of the development on such heritage resources;

(d) an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;

(e) the results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;

(f) if heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and

(g) plans for mitigation of any adverse effects during and after the completion of the proposed development.

(4) The report must be considered timeously by the responsible heritage resources authority which must, after consultation with the person proposing the development, decide—

(a) whether or not the development may proceed;

(b) any limitations or conditions to be applied to the development;

(c) what general protections in terms of this Act apply, and what formal protections may be applied, to such heritage resources;

(d) whether compensatory action is required in respect of any heritage resources damaged or destroyed as a result of the development; and

(e) whether the appointment of specialists is required as a condition of approval of the proposal.

(5) A provincial heritage resources authority shall not make any decision under subsection (4) with respect to any development which impacts on a heritage resource protected at national level unless it has consulted SAHRA.

(6) The applicant may appeal against the decision of the provincial heritage resources authority to the MEC, who—

(a) must consider the views of both parties; and

(b) may at his or her discretion—

(i) appoint a committee to undertake an independent review of the impact assessment report and the decision of the responsible heritage authority; and

(ii) consult SAHRA; and

(c) must uphold, amend or overturn such decision.

(7) The provisions of this section do not apply to a development described in subsection (1) affecting any heritage resource formally protected by SAHRA unless the authority concerned decides otherwise.

(8) The provisions of this section do not apply to a development as described in subsection (1) if an evaluation of the impact of such development on heritage resources is required in terms of the Environment Conservation Act, 1989 (Act No. 73 of 1989), or the integrated environmental management guidelines issued by the Department of Environment Affairs and Tourism, or the Minerals Act, 1991 (Act No. 50 of 1991), or any other legislation: Provided that the consenting authority must ensure that the evaluation fulfils the requirements of the relevant heritage resources authority in terms of subsection (3), and any comments and recommendations of the relevant heritage resources authority with regard to such development have been taken into account prior to the granting of the consent.

(9) The provincial heritage resources authority, with the approval of the MEC, may, by notice in the Provincial Gazette, exempt from the requirements of this section any place specified in the notice.

(10) Any person who has complied with the decision of a provincial heritage resources authority in subsection (4) or of the MEC in terms of subsection (6) or other requirements referred to in subsection (8), must be exempted from compliance with all other protections in terms of this Part, but any existing heritage agreements made in terms of section 42 must continue to apply.

Part 3: Management

39. Inventory of national estate.—(1) For the purposes of the consolidation and co-ordination of information on heritage resources, SAHRA must compile and maintain an inventory of the national estate, which must be in the form of a data base of information on heritage resources which it considers to be worthy of conservation, including—

(a) all places and objects with which it and its predecessors have been involved;

(b) all places and objects protected through the publication of notices in the Gazette or Provincial Gazette, whether in terms of this Act or provincial legislation;

(c) places and objects subject to general protections in terms of this Act or provincial legislation for the management of heritage resources; and

(d) any other place and object which it considers to be of interest, and for this purpose it must co-ordinate, and may prescribe, national standards for the recording of information by provincial heritage authorities.

(2) Heritage resources must be listed in the inventory in the format and under the categories prescribed by SAHRA.

(3) SAHRA may from time to time, after consultation with the relevant provincial heritage resources authority and the local authority concerned, make, amend or delete entries in the inventory: Provided that—

(a) all places listed in any heritage register must be entered in the inventory;

(b) a local authority must inform SAHRA on the destruction of a place listed in a heritage register, whereupon SAHRA must record such destruction in the inventory.

(4) A provincial heritage resources authority must, within 30 days of the listing of a heritage resource in a heritage register or the amendment or deletion of an entry, notify SAHRA and provide details of the listing, amendment or deletion.

(5) A provincial heritage resources authority must, at regular intervals in the manner prescribed by SAHRA, provide SAHRA with any information about heritage resources in the province which would increase the volume and detail of information held in the inventory.

(6) Any person has access to the inventory at the offices of SAHRA: Provided that information may be withheld if its disclosure may impact negatively on the privacy or economic interests of the owner or any person with an interest in a property, or a potential investor, or on the continued conservation of a heritage resource.

(7) SAHRA must at regular intervals, publish a summary and analysis of the inventory of the national estate.

40. National heritage resources assistance programme.—(1) Subject to section 21, SAHRA may provide financial assistance in the form of a grant or a loan to an approved body or an individual for any project which contributes to the purpose, and is in accordance with the principles as prescribed.

(2) SAHRA must prescribe the procedures for applications for approval and granting of financial assistance and the criteria for the assessment of projects.

(3) A loan may be approved in such amount and subject to such terms and conditions as SAHRA determines: Provided that a loan must be—

(a) at the rate of interest for the time being fixed by the Minister, in consultation with the Minister of Finance; or

(b) if the Minister, in consultation with the Minister of Finance, so approves—

(i) at the rate of interest fixed by the Minister in respect of that loan; or

(ii) without interest.

(4) Any financial assistance in terms of this section is to be provided out of a fund reserved by SAHRA for this purpose, which shall be called the National Heritage Resources Fund.

41. Restitution of heritage objects.—(1) When a community or body with a bona fide interest makes a claim for the restitution of a movable heritage resource which is part of the national estate and is held by or curated in a publicly funded institution, the institution concerned must enter into a process of negotiation with the claimants regarding the future of the resource.

(2) The Minister may make regulations regarding the establishment of bona fide interest in terms of subsection (1) and the conditions under which such claims may be made.

(3) In the absence of an agreement on a heritage resource which is the subject of negotiations in terms of subsection (1), the claimants or the institution concerned may appeal to the Minister, who must, with due regard to subsection 5 (4) and in a spirit of compromise—

(a) mediate between the parties concerned with the aim of finding a mutually satisfactory solution; and

(b) in the absence of agreement between the parties concerned, make a final decision on the future of the resource, including any conditions necessary to ensure its safety, the conditions of access of the claimants or the institution or any other interested party to the resource, or any other appropriate conditions.

42. Heritage agreements.—(1) (a) SAHRA, or a provincial heritage resources authority may negotiate and agree with a provincial authority, local authority, conservation body, person, or community for the execution of a heritage agreement to provide for the conservation, improvement or presentation of a clearly defined heritage resource: Provided that the consent of the owner of such resource must be given.

(b) Such a heritage agreement must be in the form of a binding contract.

(2) A heritage agreement may include such terms and conditions as the parties think fit, including provision for public access, and provision for financial or other assistance from the heritage authority concerned.

(3) Without limiting subsection (2), a heritage agreement may be expressed to have effect in perpetuity or for any specified term, or to terminate upon the happening of a specific event.

(4) A heritage agreement may, with the consent of the owner of the resource concerned, be varied or cancelled by agreement between the parties.

(5) The consent of the owner of the resource concerned to the heritage agreement or any variation of the heritage agreement may be given, subject to the inclusion in the heritage agreement of any additional provisions or modified provisions, or to the deletion of such provisions, as the owner giving the consent considers necessary.

(6) Nothing in this Act requires a heritage resources authority to negotiate or agree with any person or authority to enter into or execute any heritage agreement.

(7) A heritage agreement in respect of a place attached to the land is binding on the owner of the place, as at the date of execution of the agreement while the agreement remains in force.

(8) The owner of a national heritage site, a provincial heritage site or a place listed in a heritage register may, by a heritage agreement entered into with the heritage resources authority or local authority responsible for the protection of such place, or any person or body approved by such authority, appoint the heritage resources authority or the local authority or the person or body concerned, the guardian of the place.

(9) The heritage agreement referred to in subsection (7) or (8) may provide for—

(a) the maintenance and management of the place;

(b) the custody of the place and the duties of any person who may be employed in connection therewith;

(c) the occupation or use of the place by the owner or otherwise;

(d) the restriction of the right of the owner or occupier to do certain acts or things on or near the place;

(e) the facilities of access to be permitted to the public and to persons deputed by the guardian to inspect or maintain the place;

(f) the presentation of the place;

(g) the notice to be given to the guardian in case the owner intends to offer the land on which the place is situated for sale, lease or other disposal, and the right to be reserved to the guardian to have first refusal of such sale, lease or other disposal;

- (h) the payment of any expenses incurred by the owner or by the guardian in connection with the maintenance of the place;
- (i) any other matter connected with the protection or management of the place which is agreed to by the owner and the guardian;
- (j) the duration of the agreement, with provision for the earlier termination thereof by any party thereto; and
- (k) the procedure for the resolution of any dispute arising out of the agreement.

(10) The owner of a place which is under guardianship shall, except as expressly provided by this Act, continue to have the same estate, right, title and interest in and to the place as before.

(11) Every heritage agreement has effect according to its tenor but subject to the provisions of this Act: Provided that—

- (a) the execution of a heritage resources agreement in respect of a heritage resource must not prevent the heritage authority responsible for its protection from exercising any powers in this Act in relation to that resources; and

- (b) nothing in terms of any heritage agreement shall permit or allow any person to carry out any act contrary to this Act.

43. Incentives.—(1) On advice from SAHRA the Minister, in concurrence with the Minister of Finance, may publish regulations on financial incentives for the conservation of heritage resources which form part of the national estate, or otherwise promote the purpose of this Act.

(2) An MEC or a local authority may in planning schemes or in by-laws under this Act or by any other means provide incentives for the conservation of heritage resources as provided for in subsection (1).

44. Presentation of protected resources.—(1) Heritage resources authorities and local authorities must, wherever appropriate, co-ordinate and promote the presentation and use of places of cultural significance and heritage resources which form part of the national estate and for which they are responsible in terms of section 5 for public enjoyment, education, research and tourism, including—

- (a) the erection of explanatory plaques and interpretive facilities, including interpretive centres and visitor facilities;

- (b) the training and provision of guides;

- (c) the mounting of exhibitions;

- (d) the erection of memorials; and

- (e) any other means necessary for the effective presentation of the national estate.

(2) Where a heritage resource which is formally protected in terms of Part 1 of this Chapter is to be presented, the person wishing to undertake such presentation must, at least 60 days prior to the institution of interpretive measures or manufacture of associated material, consult with the heritage resources authority which is responsible for the protection of such heritage resource regarding the contents of interpretive material or programmes.

(3) A person may only erect a plaque or other permanent display or structure associated with such presentation in the vicinity of a place protected in terms of this Act in consultation with the heritage resources authority responsible for the protection of the place.

45. Compulsory repair order.—(1) When the heritage resources authority responsible for the protection of a heritage site considers that such site—

- (a) has been allowed to fall into disrepair for the purpose of—

- (i) effecting or enabling its destruction or demolition;
- (ii) enabling the development of the designated land; or
- (iii) enabling the development of any land adjoining the designated land; or
- (b) is neglected to such an extent that it will lose its potential for

conservation,

the heritage resources authority may serve on the owner an order to repair or maintain such site, to the satisfaction of the heritage resources authority, within a reasonable period of time as specified in the order: Provided that the heritage resources authority must specify only such work as, in its opinion, is necessary to prevent any further deterioration in the condition of the place.

(2) Subject to subsection (3), upon failure of the owner to comply with the terms of an order under subsection (1) within the specified time, the authority which served the order may itself take such steps as may be necessary for the repair or maintenance thereof and recover the costs from the owner.

(3) If the owner can show good cause, he or she may, within 21 days of the service of a repair order under subsection (1)—

(a) apply to the heritage resources authority which served the repair order for the extension of the time specified in the order; or

(b) appeal to the Minister, in the manner prescribed under section 49.

46. Expropriation.—(1) The Minister may, on the advice of SAHRA and after consultation with the Minister of Finance, purchase or, subject to compensation, expropriate any property for conservation or any other purpose under this Act if that purpose is a public purpose or is in the public interest.

(2) The Expropriation Act, 1975 (Act No. 63 of 1975), applies to all expropriations under this Act, and any reference to the Minister of Public Works in that Act must be read as a reference to the Minister for the purposes of such expropriation.

(3) Notwithstanding the provisions of subsection (2), the amount of compensation and the time and manner of payment must be determined in accordance with section 25 (3) of the Constitution, and the owner of the property in question must be given a hearing before any property is expropriated.

47. General policy.—(1) SAHRA and a provincial heritage resources authority—

(a) must, within three years after the commencement of this Act, adopt statements of general policy for the management of all heritage resources owned or controlled by it or vested in it; and

(b) may from time to time amend such statements so that they are adapted to changing circumstances or in accordance with increased knowledge; and

(c) must review any such statement within 10 years after its adoption.

(2) Each heritage resources authority must adopt for any place which is protected in terms of this Act and is owned or controlled by it or vested in it, a plan for the management of such place in accordance with the best environmental, heritage conservation, scientific and educational principles that can reasonably be applied taking into account the location, size and nature of the place and the resources of the authority concerned, and may from time to time review any such plan.

(3) A conservation management plan may at the discretion of the heritage resources authority concerned and for a period not exceeding 10 years, be operated either solely by the heritage resources authority or in conjunction with an environmental or tourism authority or under contractual arrangements, on such terms and conditions as the heritage resources authority may determine.

(4) Regulations by the heritage resources authority concerned must provide for a process whereby, prior to the adoption or amendment of any statement of general

policy or any conservation management plan, the public and interested organisations are notified of the availability of a draft statement or plan for inspection, and comment is invited and considered by the heritage resources authority concerned.

(5) A heritage resources authority may not act in any manner inconsistent with any statement of general policy or conservation management plan.

(6) All current statements of general policy and conservation management plans adopted by a heritage resources authority must be available for public inspection on request.

CHAPTER III

GENERAL PROVISIONS

Part 1: Enforcement, appeals, offences and penalties

48. Permits.—(1) A heritage resources authority may prescribe the manner in which an application is made to it for any permit in terms of this Act and other requirements for permit applications, including—

(a) any particulars or information to be furnished in the application and any documents, drawings, plans, photographs and fees which should accompany the application;

(b) minimum qualifications and standards of practice required of persons making application for a permit to perform specified actions in relation to particular categories of protected heritage resources;

(c) standards and conditions for the excavation and curation of archaeological and palaeontological objects and material and meteorites recovered by authority of a permit;

(d) the conditions under which, before a permit is issued, a financial deposit must be lodged and held in trust for the duration of the permit or such period as the heritage resources authority may specify, and conditions of forfeiture of such deposit;

(e) conditions for the temporary export and return of objects protected under section 32 or section 35;

(f) the submission of reports on work done under authority of a permit; and

(g) the responsibilities of the heritage resources authority regarding monitoring of work done under authority of a permit.

(2) On application by any person in the manner prescribed under subsection (1), a heritage resources authority may in its discretion issue to such person a permit to perform such actions at such time and subject to such terms, conditions and restrictions or directions as may be specified in the permit, including a condition—

(a) that the applicant give security in such form and such amount determined by the heritage resources authority concerned, having regard to the nature and extent of the work referred to in the permit, to ensure the satisfactory completion of such work or the curation of objects and material recovered during the course of the work; or

(b) providing for the recycling or deposit in a materials bank of historical building materials; or

(c) stipulating that design proposals be revised; or

(d) regarding the qualifications and expertise required to perform the actions for which the permit is issued.

(3) A heritage resources authority may at its discretion, in respect of any heritage resource protected by it in terms of the provisions of Chapter II, by notice in the Gazette or the Provincial Gazette, as the case may be, grant an exemption from the

requirement to obtain a permit from it for such activities or class of activities by such persons or class of persons in such circumstances as are specified in the notice.

49. Appeals.—(1) Regulations by the Minister and the MEC must provide for a system of appeal to the SAHRA Council or a provincial heritage resources council against a decision of a committee or other delegated representative of SAHRA or a provincial heritage resources authority.

(2) Anybody wishing to appeal against a decision of the SAHRA Council or the council of a provincial heritage resources authority must notify the Minister or MEC in writing within 30 days. The Minister or MEC shall then appoint an independent tribunal, consisting of three experts, having expertise regarding the matter.

(3) The tribunal contemplated in subsection (2), in considering the appeal referred to it by the Minister or the MEC, must have due regard to—

- (a) the cultural significance of the heritage resources in question;
- (b) heritage conservation principles; and
- (c) any other relevant factor which is brought to its attention by the

appellant or the heritage resources authority.

50. Appointment and powers of heritage inspectors.—(1) SAHRA or a provincial heritage resources authority may, in writing, appoint heritage inspectors: Provided that if a heritage inspector is a staff member of a government department or supported body, such appointment must only be made by agreement with the Minister or other person in charge of the administration of such department or body.

(2) By force of this section, each member of the South African Police Services and each customs and excise officer is deemed to be a heritage inspector.

(3) The heritage resources authority must issue to each heritage inspector, other than a person referred to in subsection (2), an identity card containing a photograph and the signature of the heritage inspector.

(4) For the purposes of this section, a reference to an identity card in relation to a person referred to in subsection (2), is a reference to written evidence of the fact that he or she is a member of the bodies referred to in subsection (2).

(5) A person who ceases to be a heritage inspector must forthwith return his or her identity card to the heritage authority concerned.

(6) A heritage inspector, other than a customs and excise officer or a member of the South African Police Services in uniform, may not exercise his or her powers in terms of this Act in relation to another person unless the heritage inspector first produces the identity card for inspection by the other person: Provided that if the production of the identity card would endanger the health or safety of the heritage inspector, he or she must produce it as soon as is practicable to do so.

(7) Subject to the provisions of any other law, a heritage inspector or any person authorised by a heritage resources authority in writing, may at all reasonable times enter upon any land or premises for the purpose of inspecting any heritage resource protected in terms of the provisions of this Act, or any other property in respect of which the heritage resources authority is exercising its functions and powers in terms of this Act, and may take photographs, make measurements and sketches and use any other means of recording information necessary for the purposes of this Act.

(8) A heritage inspector may at any time inspect work being done under a permit issued in terms of this Act and may for that purpose at all reasonable times enter any place protected in terms of this Act.

(9) Where a heritage inspector has reasonable grounds to suspect that an offence in terms of this Act has been, is being, or is about to be committed, the heritage inspector may with such assistance as he or she thinks necessary—

- (a) enter and search any place, premises, vehicle, vessel or craft, and for that purpose stop and detain any vehicle, vessel or craft, in or on which the heritage inspector believes, on reasonable grounds, there is evidence related to that offence;
- (b) confiscate and detain any heritage resource or evidence concerned with the commission of the offence pending any further order from the responsible heritage resources authority; and
- (c) take such action as is reasonably necessary to prevent the commission of an offence in terms of this Act.

(10) A heritage inspector may, if there is reason to believe that any work is being done or any action is being taken in contravention of this Act or the conditions of a permit issued in terms of this Act, order the immediate cessation of such work or action pending any further order from the responsible heritage resources authority.

(11) A heritage inspector may require any person who he or she has reason to believe has committed an offence in terms of this Act to supply his or her name and address and reasonable evidence of his or her identity, and may arrest a person who refuses to comply with those requirements.

(12) A person—

- (a) must comply with a request or requirement lawfully made in terms of this section to the extent that the person is capable of complying with it;
- (b) may not knowingly furnish information that is false or misleading; and
- (c) may not hinder or obstruct any heritage inspector in the exercise of his or her powers in terms of this section.

51. Offences and penalties.—(1) Notwithstanding the provisions of any other law, any person who contravenes—

- (a) sections 27 (18), 29 (10), 32 (13) or 32 (19) is guilty of an offence and liable to a fine or imprisonment or both such fine and imprisonment as set out in item 1 of the Schedule;
- (b) sections 33 (2), 35 (4) or 36 (3) is guilty of an offence and liable to a fine or imprisonment or both such fine and imprisonment as set out in item 2 of the Schedule;
- (c) sections 28 (3) or 34 (1) is guilty of an offence and liable to a fine or imprisonment or both such fine and imprisonment as set out in item 3 of the Schedule;
- (d) sections 27 (22), 32 (15), 33 (1), 35 (6) or 44 (3) is guilty of an offence and liable to a fine or imprisonment or both such fine and imprisonment as set out in item 4 of the Schedule;
- (e) sections 27 (23) (b), 32 (17), 35 (3), 36 (3) or 51 (8) is guilty of an offence and liable to a fine or imprisonment or both such fine and imprisonment as set out in item 5 of the Schedule;
- (f) sections 32 (13), 32 (16), 32 (20), 35 (7) (a), 44 (2), 50 (5) or 50 (12) is guilty of an offence and liable to a fine or imprisonment or both such fine and imprisonment as set out in item 6 of the Schedule.

(2) The Minister, with the concurrence of the relevant MEC, may prescribe a penalty of a fine or of imprisonment for a period not exceeding six months for any contravention or failure to comply with regulations by heritage resources authorities or by-laws by local authorities.

(3) The Minister or the MEC, as the case may be, may make regulations in terms of which the magistrate of the district concerned may—

- (a) levy admission of guilt fines up to a maximum amount of R10 000 for infringement of the terms of this Act for which such heritage resources authority is responsible; and

(b) serve a notice upon a person who is contravening a specified provision of this Act or has not complied with the terms of a permit issued by such authority, imposing a daily fine of R50 for the duration of the contravention, subject to a maximum period of 365 days.

(4) The Minister may from time to time by regulation adjust the amounts referred to in subsection (3) in order to account for the effect of inflation.

(5) Any person who—

(a) fails to provide any information that is required to be given, whether or not on the request of a heritage resources authority, in terms of this Act;

(b) for the purpose of obtaining, whether for himself or herself or for any other person, any permit, consent or authority in terms of this Act, makes any statement or representation knowing it to be false or not knowing or believing it to be true;

(c) fails to comply with or performs any act contrary to the terms, conditions, restrictions or directions subject to which any permit, consent or authority has been issued to him or her in terms of this Act;

(d) obstructs the holder of a permit in terms of this Act in exercising a right granted to him or her by means of such a permit;

(e) damages, takes or removes, or causes to be damaged, taken or removed from a place protected in terms of this Act any badge or sign erected by a heritage authority or a local authority under section 25 (2) (j) or section 27 (17), any interpretive display or any other property or thing;

(f) receives any badge, emblem or any other property or thing unlawfully taken or removed from a place protected in terms of this Act; and

(g) within the terms of this Act, commits or attempts to commit any other unlawful act, violates any prohibition or fails to perform any obligation imposed upon him or her by its terms, or who counsels, procures, solicits or employs any other person to do so,

shall be guilty of an offence and upon conviction shall be liable to such maximum penalties, in the form of a fine or imprisonment or both such fine and such imprisonment, as shall be specified in the regulations under subsection (3).

(6) Any person who believes that there has been an infringement of any provision of this Act, may lay a charge with the South African Police Services or notify a heritage resources authority.

(7) A magistrate's court shall, notwithstanding the provisions of any other law, be competent to impose any penalty under this Act.

(8) When any person has been convicted of any contravention of this Act which has resulted in damage to or alteration of a protected heritage resource the court may—

(a) order such person to put right the result of the act of which he or she was found guilty, in the manner so specified and within such period as may be so specified, and upon failure of such person to comply with the terms of such order, order such person to pay to the heritage resources authority responsible for the protection of such resource a sum equivalent to the cost of making good; or

(b) when it is of the opinion that such person is not in a position to make good damage done to a heritage resource by virtue of the offender not being the owner or occupier of a heritage resource or for any other reason, or when it is advised by the heritage resources authority responsible for the protection of such resource that it is unrealistic or undesirable to require that the results of the act be made good, order such person to pay to the heritage resources authority a sum equivalent to the cost of making good.

- (9) In addition to other penalties, if the owner of a place has been convicted of an offence in terms of this Act involving the destruction of, or damage to, the place, the Minister on the advice of SAHRA or the MEC on the advice of a provincial heritage resources authority, may serve on the owner an order that no development of such place may be undertaken, except making good the damage and maintaining the cultural value of the place, for a period not exceeding 10 years specified in the order.
- (10) Before making the order, the local authority and any person with a registered interest in the land must be given a reasonable period to make submissions on whether the order should be made and for how long.
- (11) An order of no development under subsection (9) attaches to the land and is binding not only on the owner as at the date of the order, but also on any person who becomes an owner of the place while the order remains in force.
- (12) The Minister on the advice of SAHRA, may reconsider an order of no development and may in writing amend or repeal such order.
- (13) In any case involving vandalism, and whenever else a court deems it appropriate, community service involving conservation of heritage resources may be substituted for, or instituted in addition to, a fine or imprisonment.
- (14) Where a court convicts a person of an offence in terms of this Act, it may order the forfeiture to SAHRA or the provincial heritage resources authority concerned, as the case may be, of a vehicle, craft, equipment or any other thing used or otherwise involved in the committing of the offence.
- (15) A vehicle, craft, equipment or other thing forfeited under subsection (14) may be sold or otherwise disposed of as the heritage resources authority concerned deems fit.

Part 2: Miscellaneous

52. Notices.—(1) SAHRA may, by publication of a further notice, amend or withdraw any notice which it has published in the Gazette.
- (2) A provincial heritage resources authority may by publication of a further notice amend or withdraw any notice which it has published in the Provincial Gazette.
- (3) SAHRA or a provincial heritage resources authority may prescribe the manner in which legally enforceable property descriptions may be published in notices in the Gazette or in the Provincial Gazette, as the case may be, in terms of the provisions of this Act including—
- (a) methods of technology permissible in measuring areas; and
 - (b) methods to be used in compensating for margins of error in measurement.
53. Delegation of powers by Minister or MEC.—(1) The Minister may delegate any power, duty or function conferred or imposed upon him or her under this Act to the Deputy Minister or the incumbent of a designated post in the Department.
- (2) The Minister may delegate any power, duty or function conferred or imposed upon him or her under this Act to the incumbency of a designated post in the provincial department responsible for culture.
54. By-laws by local authorities.—(1) A local authority may, with the approval of the provincial heritage resources authority, make by-laws—
- (a) regulating the admission of the public to any place protected under this Act to which the public is allowed access and which is under its control, and the fees payable for such admission;
 - (b) regulating the conditions of use of any place protected under this Act which is under its control;
 - (c) for the protection and management of a protected area;
 - (d) for the protection and management of places in a heritage register;

(e) for the protection and management of heritage areas; and
(f) providing incentives for the conservation of any place protected under this Act within its area of jurisdiction.

(2) Any by-laws made under this section may prescribe fines for contravention thereof or failure to comply therewith, not exceeding an amount prescribed by the Minister under section 51 (2).

55. Limitation of liability.—No person is liable in respect of anything done in terms of this Act in good faith and without negligence.

56. Exercise of powers outside Republic.—(1) A heritage resources authority may assist and co-operate with heritage bodies outside the Republic.

(2) If agreed upon between the Government of South Africa and the government of any other state, SAHRA has power, with the concurrence of the Minister, to perform in that state any functions which a heritage resources authority would be capable of performing in South Africa in terms of this Act.

(3) The Minister may make regulations concerning the application of any international convention, treaty or agreement relating to the protection of heritage resources which, in accordance with sections 231 to 233 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996), forms part of the law of the Republic.

57. Applicability of provincial legislation.—Without prejudice to the provisions of this Act, in any province which has enacted legislation for the establishment of a provincial heritage resources authority and the management of heritage resources at provincial level, the provisions of such legislation must, as far as they relate to provincial areas of competence, take precedence over the equivalent provisions of this Act.

58. Transitional provisions and consequential amendments.—(1) For the purposes of this section, “the previous Act” means the National Monuments Act, 1969 (Act No. 28 of 1969).

(2) The National Monuments Council established by section 2 of the previous Act is hereby abolished and all its assets, rights, liabilities and obligations shall devolve upon SAHRA without formal transfer and without payment of any duties, taxes, fees or other charges. The officer in charge of registration of deeds registry must, on submission of the title deed and on application by the authority concerned, endorse such a title deed with regard to such development.

(3) Any person who was in the employment of the Council referred to in subsection (2), is regarded to have been appointed under this Act.

(4) The remuneration and other conditions of service of an employee contemplated in subsection (3) may not be less favourable than the remuneration and other conditions of service to which that employee was entitled to before.

(5) If a person appointed under subsection (3) or a person regarded to be so appointed, is dismissed, that person may within 14 days after the date of notification of the dismissal, appeal in writing against the dismissal to the Minister, who may confirm, vary or set aside the dismissal.

(6) The National Monuments Council library shall become part of the national heritage resources library established under section 13 (2) (b).

(7) The committees established by section 3A of the previous Act are hereby abolished and all their assets, rights, liabilities and obligations shall devolve upon SAHRA without formal transfer and without payment of any duties, taxes, fees or other charges.

(8) Unless it would in any particular case obviously be inappropriate, any reference in any law, document or register, to the National Monuments Council must be construed as a reference to SAHRA and any such reference to an officer or employee of the National Monuments Council must be construed as a reference to an employee of SAHRA performing functions or exercising powers similar to those of the first-mentioned officer or employee.

(9) All trust funds for which the National Monuments Council acted as trustee, including the War Graves Trust Fund referred to in section 9A of the previous Act, shall on the date of commencement of this Act become vested in SAHRA as part of the National Heritage Resources Fund referred to in section 40, and SAHRA must act as trustee on the same terms and conditions as existed prior to the commencement of this Act.

(10) On the establishment of a provincial heritage resources authority, arrangements must be made for the transfer of such assets, rights, liabilities and obligations of SAHRA in that province to the provincial heritage resources authority as the Minister and the MEC deem fit.

(11) Sites and objects which prior to the commencement of this Act were protected by notices in the Gazette in terms of the previous Act, shall, subject to the provisions of any provincial legislation for heritage resources conservation and any agreement in that regard, and without the need for the publication of notices in the Gazette, continue to be protected in terms of the following provisions of this Act:

(a) Immovable national monuments in terms of section 10 of the previous Act shall be provincial heritage resources sites: Provided that within five years of the commencement of this Act, the provincial heritage resources authorities in consultation with SAHRA, must assess the significance of such sites in accordance with the heritage assessment criteria set out in section 3 (3) and prescribed under section 7 (1) and SAHRA must declare any place which fulfils the criteria for Grade I status a national heritage site;

(b) immovable properties entered in the register in terms of section 5 (1) of the previous Act must be entered in the heritage register for the province in which they are situated and in the inventory of the national estate;

(c) conservation areas in terms of section 5 (9) of the previous Act shall be heritage areas: Provided that where no provision has been made for the protection of such areas in by-laws under the previous Act or in a town or regional planning scheme—

(i) sections 31 (7) (a), (b) and (c) of this Act automatically apply to such heritage areas; and

(ii) the local or other planning authority concerned must provide for the protection of such area in accordance with the provisions of section 31 within three years of the commencement of this Act;

(d) provisionally declared immovable properties in terms of section 5 (1) (c) of the previous Act are provisionally protected for such remaining period as specified in the notice of provisional declaration;

(e) national gardens of remembrance in terms of section 9C of the previous Act are provincial heritage sites;

(f) cultural treasures in terms of section 5 (c) and movable national monuments in terms of section 10 of the previous Act are heritage objects.

(12) A notice under section 10 (3) (a) or 5 (5) (b) of the previous Act which was served within six months prior to the commencement of this Act shall be deemed to

be a notice served by a provincial heritage resources authority in terms of section 27 (8) or section 29 (1) and (2) of this Act, as the case may be.

(13) A permit issued under the previous Act shall be deemed to be a permit issued by the responsible heritage authority under the relevant section of this Act.

59. Regulations.—The Minister may, by notice in the Gazette make regulations regarding—

- (a) any matter which may or shall be prescribed in terms of this Act;
- (b) any other matter which may be necessary or expedient in order to

achieve the objects of this Act.

60. Repeal.—The National Monuments Act, 1969 (Act No. 28 of 1969), and section 41 (2) of the Environment Conservation Act, 1989 (Act No. 73 of 1989), are hereby repealed.

61. Short title and commencement.—This Act shall be called the National Heritage Resources Act, 1999, and shall come into operation on a date to be fixed by the President by proclamation in the Gazette.

Schedule

PENALTIES FOR NATIONAL HERITAGE ACT

(Section 51)

1. A fine or imprisonment for a period not exceeding five years or to both such fine and imprisonment.
2. A fine or imprisonment for a period not exceeding three years or to both such fine and imprisonment.
3. A fine or imprisonment for a period not exceeding two years or to both such fine and imprisonment.
4. A fine or imprisonment for a period not exceeding one year or to both such fine and imprisonment.
5. A fine or imprisonment for a period not exceeding six months or to both such fine and imprisonment.
6. A fine or imprisonment for a period not exceeding three months or to both such fine and imprisonment.

Summary

NATIONAL ENVIRONMENTAL MANAGEMENT ACT NO. 107 OF 1998

Purpose

The purpose of this act is to provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of state; to provide for the prohibition, restriction or control of activities which are likely to have a detrimental effect on the environment; and to provide for matters connected therewith.

Principles

The undermentioned principles apply to all actions of state that may significantly affect the environment and—

- (a) shall apply alongside all other appropriate and relevant considerations, including the State's responsibility to respect, protect, promote and fulfil the social and economic rights in Chapter 2 of the Constitution and in particular the basic needs of categories of persons disadvantaged by unfair discrimination;
- (b) serve as the general framework within which environmental management and implementation plans must be formulated;
- (c) serve as guidelines by reference to which any organ of state must exercise any function when taking any decision in terms of this Act or any statutory provision concerning the protection of the environment;
- (d) serve as principles by reference to which a conciliator appointed under this Act must make recommendations; and
- (e) guide the interpretation, administration and implementation of this Act, and any other law concerned with the protection or management of the environment.

Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.

Development must be socially, environmentally and economically sustainable.

Sustainable development requires the consideration of all relevant factors including the following:

- (i) that the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- (ii) that pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- (iii) that the disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied;

- (iv) that waste is avoided, or where it cannot be altogether avoided, minimised and reused or recycled where possible and otherwise disposed of in a responsible manner;
- (v) that the use and exploitation of non renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource;
- (vi) that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised;
- (vii) that a risk adverse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and
- (viii) that negative impacts on the environment and on people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied.

Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated, and it must take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option.

Environmental justice must be pursued so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons.

Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing must be pursued and special measures may be taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination.

Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle.

The participation of all interested and affected parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured.

Decisions must take into account the interests, needs and values of all interested and affected parties, and this includes recognising all forms of knowledge, including traditional and ordinary knowledge.

Community well being and empowerment must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means.

The social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment.

The right of workers to refuse work that is harmful to human health or the environment and to be informed of dangers must be respected and protected.

Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law.

There must be intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment.

Global and international responsibilities relating to the environment must be discharged in the national interest.

The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage.

PROCEDURES FOR COOPERATIVE GOVERNANCE

Environmental implementation plans and management plans.

Every national department listed in Schedule 1 as exercising functions which may affect the environment and every province must prepare an environmental implementation plan within one year of the promulgation of this Act and at least every four years thereafter.

Every national department listed in Schedule 2 as exercising functions involving the management of the environment must prepare an environmental management plan within one year of the promulgation of this Act and at least every four years thereafter.

Every organ of state referred to in subsections (1) and (2) must, in its preparation of an environmental implementation plan or environmental management plan, and before submitting such plan take into consideration every other environmental implementation plan and environmental management plan already adopted with a view to achieving consistency among such plans.

The purpose of environmental implementation and management plans is to—

(a) coordinate and harmonise the environmental policies, plans, programmes and decisions of the various national departments that exercise functions that may affect the environment or are entrusted with powers and duties aimed at the achievement, promotion, and protection of a sustainable environment, and of provincial and local spheres of government, in order to—

(i) minimise the duplication of procedures and functions; and
(ii) promote consistency in the exercise of functions that may affect the environment;

- (b) give effect to the principle of cooperative government in Chapter 3 of the Constitution;
- (c) secure the protection of the environment across the country as a whole;
- (d) prevent unreasonable actions by provinces in respect of the environment that are prejudicial to the economic or health interests of other provinces or the country as a whole; and
- (e) enable the Minister to monitor the achievement, promotion, and protection of a sustainable environment.

Every environmental implementation plan must contain:

- (a) a description of policies, plans and programmes that may significantly affect the environment;
- (b) a description of the manner in which the relevant national department or province will ensure that the policies, plans and programmes referred to in paragraph (a) will comply with the principles set out in section 2 as well as any national norms and standards as envisaged under section 146 (2) (b) (i) of the Constitution and set out by the Minister, or by any other Minister, which have as their objective the achievement, promotion, and protection of the environment;
- (c) a description of the manner in which the relevant national department or province will ensure that its functions are exercised so as to ensure compliance with relevant legislative provisions, including the principles set out in section 2, and any national norms and standards envisaged under section 146 (2) (b) (i) of the Constitution and set out by the Minister, or by any other Minister, which have as their objective the achievement, promotion, and protection of the environment; and
- (d) recommendations for the promotion of the objectives and plans for the implementation of the procedures and regulations referred to in Chapter 5.

Every environmental management plan must contain—

- (a) a description of the functions exercised by the relevant department in respect of the environment;
- (b) a description of environmental norms and standards, including norms and standards contemplated in section 146 (2) (b) (i) of the Constitution, set or applied by the relevant department;
- (c) a description of the policies, plans and programmes of the relevant department that are designed to ensure compliance with its policies by other organs of state and persons;
- (d) a description of priorities regarding compliance with the relevant department's policies by other organs of state and persons;
- (e) a description of the extent of compliance with the relevant department's policies by other organs of state and persons;
- (f) a description of arrangements for cooperation with other national departments and spheres of government, including any existing or proposed memoranda of understanding entered into, or delegation or assignment of powers to other organs of state, with a bearing on environmental management; and
- (g) proposals for the promotion of the objectives and plans for the implementation of the procedures and regulations referred to in Chapter 5.

Every organ of state must exercise every function it may have, or that has been assigned or delegated to it, by or under any law, and that may significantly affect the

protection of the environment, substantially in accordance with the environmental implementation plan or the environmental management plan prepared, submitted and adopted by that organ of state in accordance with this Chapter

Each provincial government must ensure that—

- (a) the relevant provincial environmental implementation plan is complied with by each municipality within its province and for this purpose the provisions of subsections (2) and (3) must apply with the necessary changes; and
- (b) municipalities adhere to the relevant environmental implementation and management plans, and the principles contained in section 2 in the preparation of any policy, programme or plan, including the establishment of integrated development plans and land development objectives.

INTEGRATED ENVIRONMENTAL MANAGEMENT

The general objective of integrated environmental management is to—

- (a) promote the integration of the principles of environmental management set out in section 2 into the making of all decisions which may have a significant effect on the environment;
- (b) identify, predict and evaluate the actual and potential impact on the environment, socio economic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities, with a view to minimising negative impacts, maximising benefits, and promoting compliance with the principles of environmental management set out in section 2;
- (c) ensure that the effects of activities on the environment receive adequate consideration before actions are taken in connection with them;
- (d) ensure adequate and appropriate opportunity for public participation in decisions that may affect the environment;
- (e) ensure the consideration of environmental attributes in management and decision making which may have a significant effect on the environment; and
- (f) identify and employ the modes of environmental management best suited to ensuring that a particular activity is pursued in accordance with the principles of environmental management set out in the act

In order to give effect to the general objectives of integrated environmental management laid down in this Chapter, the potential impact on—

- (a) the environment;
- (b) socio economic conditions; and
- (c) the cultural heritage,

of activities that require authorisation or permission by law and which may significantly affect the environment, must be considered, investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorising, permitting, or otherwise allowing the implementation of an activity.

The Minister may with the concurrence of the MEC, and every MEC may with the concurrence of the Minister, in the prescribed manner—

- (a) identify activities which may not be commenced without prior authorisation from the Minister or MEC;

- (b) identify geographical areas in which specified activities may not be commenced without prior authorisation from the Minister or MEC and specify such activities;
- (c) make regulations in respect of such authorisations;
- (d) identify existing authorised and permitted activities which must be considered, assessed, evaluated and reported on; and
- (e) prepare compilations of information and maps that specify the attributes of the environment in particular geographical areas, including the sensitivity, extent, interrelationship and significance of such attributes which must be taken into account by every organ of state charged by law with authorising, permitting or otherwise allowing the implementation of a new activity, or with considering, assessing and evaluating an existing activity:

Procedures for the investigation, assessment and communication of the potential impact of activities must, as a minimum, ensure the following:

- (a) Investigation of the environment likely to be significantly affected by the proposed activity and alternatives thereto;
- (b) investigation of the potential impact, including cumulative effects, of the activity and its alternatives on the environment, socio economic conditions and cultural heritage, and assessment of the significance of that potential impact;
- (c) investigation of mitigation measures to keep adverse impacts to a minimum, as well as the option of not implementing the activity;
- (d) public information and participation, independent review and conflict resolution in all phases of the investigation and assessment of impacts;
- (e) reporting on gaps in knowledge, the adequacy of predictive methods and underlying assumptions, and uncertainties encountered in compiling the required information;
- (f) investigation and formulation of arrangements for the monitoring and management of impacts, and the assessment of the effectiveness of such arrangements after their implementation;
- (g) coordination and cooperation between organs of state in the consideration of assessments where an activity falls under the jurisdiction of more than one organ of state;
- (h) that the findings and recommendations flowing from such investigation, and the general objectives of integrated environmental management laid down in this Act and the principles of environmental management set out in section 2 are taken into account in any decision made by an organ of state in relation to the proposed policy, programme, plan or project; and
- (i) that environmental attributes identified in the compilation of information and maps.

COMPLIANCE, ENFORCEMENT AND PROTECTION

The Director General or a provincial head of department may, after consultation with any other organ of state concerned and after having given adequate opportunity to affected persons to inform him or her of their relevant interests, direct any person who fails to take the measures required to—

- (a) investigate, evaluate and assess the impact of specific activities and report thereon;
- (b) commence taking specific reasonable measures before a given date;
- (c) diligently continue with those measures; and
- (d) complete them before a specified reasonable date:

Provided that the Director General or a provincial head of department may, if urgent action is necessary for the protection of the environment, issue such directive, and consult and give such opportunity to inform as soon thereafter as is reasonable.

ENVIRONMENTAL MANAGEMENT COOPERATION AGREEMENTS

The Minister and every MEC and municipality, may enter into environmental management cooperation agreements with any person or community for the purpose of promoting compliance with the principles laid down in this Act.

Environmental management cooperation agreements must—

- (a) only be entered into with the agreement of—
 - (i) every organ of state which has jurisdiction over any activity to which such environmental management cooperation agreement relates;
 - (ii) the Minister and the MEC concerned;
- (b) only be entered into after compliance with such procedures for public participation as may be prescribed by the Minister; and
- (c) comply with such regulations as may be prescribed under section 45.

Environmental management cooperation agreements may contain—

- (a) an undertaking by the person or community concerned to improve on the standards laid down by law for the protection of the environment which are applicable to the subject matter of the agreement;
- (b) a set of measurable targets for fulfilling the undertaking in (a), including dates for the achievement of such targets; and
- (c) provision for—
 - (i) periodic monitoring and reporting of performance against targets;
 - (ii) independent verification of reports;
 - (iii) regular independent monitoring and inspections;
 - (iv) verifiable indicators of compliance with any targets, norms and standards laid down in the agreement as well as any obligations laid down by law;
- (d) the measures to be taken in the event of non compliance with commitments in the agreement, including where appropriate penalties for non compliance and the provision of incentives to the person or community.

NATIONAL ENVIRONMENTAL MANAGEMENT ACT
NO. 107 OF 1998

[View Regulation]

[ASSENTED TO 19 NOVEMBER, 1998]

[DATE OF COMMENCEMENT: 29 JANUARY, 1999]

(English text signed by the President)

as amended by

National Environmental Management Amendment Act, No. 56 of 2002

ACT

To provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of state; to provide for the prohibition, restriction or control of activities which are likely to have a detrimental effect on the environment; and to provide for matters connected therewith.

[Long title amended by s. 3 of Act No. 56 of 2002.]

Preamble.—WHEREAS many inhabitants of South Africa live in an environment that is harmful to their health and wellbeing;

everyone has the right to an environment that is not harmful to his or her health or wellbeing;

the State must respect, protect, promote and fulfill the social, economic and environmental rights of everyone and strive to meet the basic needs of previously disadvantaged communities;

inequality in the distribution of wealth and resources, and the resultant poverty, are among the important causes as well as the results of environmentally harmful practices;

sustainable development requires the integration of social, economic and environmental factors in the planning, implementation and evaluation of decisions to ensure that development serves present and future generations;

everyone has the right to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that—
prevent pollution and ecological degradation;

promote conservation; and

secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development;

the environment is a functional area of concurrent national and provincial legislative competence, and all spheres of government and all organs of state must cooperate with, consult and support one another;

AND WHEREAS it is desirable—

that the law develops a framework for integrating good environmental management into all development activities;

that the law should promote certainty with regard to decisionmaking by organs of state on matters affecting the environment;

that the law should establish principles guiding the exercise of functions affecting the environment;

that the law should ensure that organs of state maintain the principles guiding the exercise of functions affecting the environment;

that the law should establish procedures and institutions to facilitate and promote cooperative government and intergovernmental relations;

that the law should establish procedures and institutions to facilitate and promote public participation in environmental governance;
that the law should be enforced by the State and that the law should facilitate the enforcement of environmental laws by civil society:

ARRANGEMENT OF SECTIONS

1. Definitions

CHAPTER 1

NATIONAL ENVIRONMENTAL MANAGEMENT PRINCIPLES

2. Principles

CHAPTER 2

INSTITUTIONS

Part 1: National Environmental Advisory Forum

3. Establishment, objects and functions of National Environmental Advisory Forum
4. Composition
5. Conditions of appointment to Forum
6. Functioning of Forum

Part 2: Committee for Environmental Coordination

7. Establishment, objects and functions of Committee
8. Composition of Committee
9. Meetings of Committee, subcommittees and working groups
10. Report of Committee

CHAPTER 3

PROCEDURES FOR COOPERATIVE GOVERNANCE

11. Environmental implementation plans and management plans
12. Purpose and objects of environmental implementation plans and environmental management plans
13. Content of environmental implementation plans
14. Content of environmental management plans
15. Submission, scrutiny and adoption of environmental implementation plans and environmental management plans
16. Compliance with environmental implementation plans and environmental management plans

CHAPTER 4

FAIR DECISIONMAKING AND CONFLICT MANAGEMENT

17. Reference to conciliation
18. Conciliation
19. Arbitration
20. Investigation

21. Appointment of panel and remuneration
22. Relevant considerations, report and designated officer

CHAPTER 5 INTEGRATED ENVIRONMENTAL MANAGEMENT

23. General objectives
24. Implementation

CHAPTER 6 INTERNATIONAL OBLIGATIONS AND AGREEMENTS

25. Incorporation of international environmental instruments
26. Reports
27. Application

CHAPTER 7 COMPLIANCE AND ENFORCEMENT

Part 1: Environmental hazards

28. Duty of care and remediation of environmental damage
29. Protection of workers refusing to do environmentally hazardous work
30. Control of emergency incidents

Part 2: Information, enforcement and compliance

31. Access to environmental information and protection of whistleblowers
32. Legal standing to enforce environmental laws
33. Private prosecution
34. Criminal proceedings

CHAPTER 8 ENVIRONMENTAL MANAGEMENT COOPERATION AGREEMENTS

35. Conclusion of agreements

CHAPTER 9 ADMINISTRATION OF ACT

36. Expropriation
37. Reservation
38. Intervention in litigation
39. Agreements
40. Appointment of employees on contract
41. Assignment of powers
42. Delegation
43. Appeal to Minister
44. Regulations in general
45. Regulations for management cooperation agreements
46. Model environmental management bylaws

47. Procedure for making regulations

CHAPTER 10 GENERAL AND TRANSITIONAL PROVISIONS

48. State bound
49. Limitation of liability
50.
51. Savings
52. Short title
53. Commencement
Schedule 1
Schedule 2
Schedule 3

1. Definitions.—(1) In this Act, unless the context requires otherwise—

“activities” includes policies, programmes, plans and projects;

[Definition of “activities” substituted by s. 1 of Act No. 56 of 2002.]

Wording of Sections

“Agenda 21” means the document by that name adopted at the United Nations Conference of Environment and Development held in Rio de Janeiro, Brazil in June 1992;

“best practicable environmental option” means the option that provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term;

“commercially confidential information” means commercial information, the disclosure of which would prejudice to an unreasonable degree the commercial interests of the holder: Provided that details of emission levels and waste products must not be considered to be commercially confidential notwithstanding any provision of this Act or any other law;

“Committee” means the Committee for Environmental Coordination referred to in section 7;

“community” means any group of persons or a part of such a group who share common interests, and who regard themselves as a community;

“Constitution” means the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996);

“Department” means the Department of Environmental Affairs and Tourism;

“DirectorGeneral” means the DirectorGeneral of Environmental Affairs and Tourism;

“ecosystem” means a dynamic system of plant, animal and microorganism communities and their nonliving environment interacting as a functional unit;

“environment” means the surroundings within which humans exist and that are made up of—

(i) the land, water and atmosphere of the earth;

(ii) microorganisms, plant and animal life;

(iii) any part or combination of (i) and (ii) and the interrelationships among and between them; and

(iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing;

“environmental implementation plan” means an implementation plan referred to in section 11;

“environmental management cooperation agreement” means an agreement referred to in section 35 (1);

“environmental management plan” means a management plan referred to in section 11;

“financial year” means a period commencing on 1 April of any year and ending on 31 March of the following year;

“Forum” means the National Environmental Advisory Forum referred to in section 3;

“hazard” means a source of or exposure to danger;

“international environmental instrument” means any international agreement, declaration, resolution, convention or protocol which relates to the management of the environment;

“MEC” means the Member of the Executive Council to whom the Premier has assigned the performance in the province of the functions entrusted to a MEC by or under such a provision;

“Minister” means the Minister of Environmental Affairs and Tourism;

“national department” means a department of State within the national sphere of government;

“organ of state” means organ of state as defined in the Constitution;

“person” includes a juristic person;

“pollution” means any change in the environment caused by—

- (i) substances;
- (ii) radioactive or other waves; or
- (iii) noise, odours, dust or heat,

emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or wellbeing or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future;

“prescribe” means prescribe by regulation in the Gazette;

“provincial head of department” means the head of the provincial department responsible for environmental affairs;

“regulation” means a regulation made under this Act;

“state land” means land which vests in the national or a provincial government, and includes land below the high water mark and the Admiralty Reserve, but excludes land belonging to a local authority;

“sustainable development” means the integration of social, economic and environmental factors into planning, implementation and decisionmaking so as to ensure that development serves present and future generations;

“this Act” includes the schedules, and regulations and any notice issued under the Act.

(2) Words derived from the word or terms defined have corresponding meanings, unless the context indicates otherwise.

(3) A reasonable interpretation of a provision which is consistent with the purpose of this Act must be preferred over an alternative interpretation which is not consistent with the purpose of this Act.

(4) Neither—

- (a) a reference to a duty to consult specific persons or authorities, nor
- (b) the absence of any reference in this Act to a duty to consult or give a hearing,

exempts the official or authority exercising a power or performing a function from the duty to act fairly.

CHAPTER 1

NATIONAL ENVIRONMENTAL MANAGEMENT PRINCIPLES

2. Principles.—(1) The principles set out in this section apply throughout the Republic to the actions of all organs of state that may significantly affect the environment and—

(a) shall apply alongside all other appropriate and relevant considerations, including the State's responsibility to respect, protect, promote and fulfil the social and economic rights in Chapter 2 of the Constitution and in particular the basic needs of categories of persons disadvantaged by unfair discrimination;

(b) serve as the general framework within which environmental management and implementation plans must be formulated;

(c) serve as guidelines by reference to which any organ of state must exercise any function when taking any decision in terms of this Act or any statutory provision concerning the protection of the environment;

(d) serve as principles by reference to which a conciliator appointed under this Act must make recommendations; and

(e) guide the interpretation, administration and implementation of this Act, and any other law concerned with the protection or management of the environment.

(2) Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.

(3) Development must be socially, environmentally and economically sustainable.

(4) (a) Sustainable development requires the consideration of all relevant factors including the following:

(i) That the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;

(ii) that pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;

(iii) that the disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied;

(iv) that waste is avoided, or where it cannot be altogether avoided, minimised and reused or recycled where possible and otherwise disposed of in a responsible manner;

(v) that the use and exploitation of nonrenewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource;

(vi) that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised;

(vii) that a riskaverse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and

(viii) that negative impacts on the environment and on people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied.

(b) Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated, and it must take into account the

- effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option.
- (c) Environmental justice must be pursued so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons.
 - (d) Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing must be pursued and special measures may be taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination.
 - (e) Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle.
 - (f) The participation of all interested and affected parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured.
 - (g) Decisions must take into account the interests, needs and values of all interested and affected parties, and this includes recognising all forms of knowledge, including traditional and ordinary knowledge.
 - (h) Community wellbeing and empowerment must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means.
 - (i) The social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment.
 - (j) The right of workers to refuse work that is harmful to human health or the environment and to be informed of dangers must be respected and protected.
 - (k) Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law.
 - (l) There must be intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment.
 - (m) Actual or potential conflicts of interest between organs of state should be resolved through conflict resolution procedures.
 - (n) Global and international responsibilities relating to the environment must be discharged in the national interest.
 - (o) The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage.
 - (p) The costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.
 - (q) The vital role of women and youth in environmental management and development must be recognised and their full participation therein must be promoted.
 - (r) Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

CHAPTER 2

INSTITUTIONS

Part 1: National Environmental Advisory Forum

3. Establishment, objects and functions of National Environmental Advisory Forum.—(1) The National Environmental Advisory Forum is hereby established.

(2) The object of the Forum is to—

- (a) inform the Minister of the views of stakeholders regarding the application of the principles set out in section 2; and
- (b) advise the Minister on—
 - (i) any matter concerning environmental management and governance and specifically the setting and achievement of objectives and priorities for environmental governance; and
 - (ii) appropriate methods of monitoring compliance with the principles set out in section 2.

(3) The Forum may, on its own initiative and after consultation with the DirectorGeneral, draw the Minister's attention to any matter concerning environmental management requiring attention, and the Minister may refer matters for consideration by the Forum.

4. Composition.—(1) The Forum consists of at least 12 but not more than 15 members appointed by the Minister.

(2) The Minister appoints persons who represent stakeholders, and persons who have experience, expertise or skills necessary to enable the Forum to carry out its functions: Provided that the Minister must take into account the desirability of appointing women, youth and persons disadvantaged by unfair discrimination and ensuring representation of vulnerable and disadvantaged persons.

(3) Before persons contemplated in subsection (2) are appointed, the Minister must—

- (a) invite nominations from organised labour, organised business, nongovernmental organisations and communitybased organisations in a manner that he or she may consider appropriate, and invite nominations from others by notice in the Gazette, at least two nationally distributed newspapers, appropriate local newspapers and on the radio specifying a period within which nominations must be submitted;
- (b) stipulate in such notice, the procedure to be adopted regarding such nominations; and
- (c) consult with—
 - (i) the MECs; and
 - (ii) the Committees of the National Assembly and the National Council of Provinces that scrutinise environmental affairs.

(4) The Minister appoints the chairperson of the Forum.

(5) (a) Each member of the Forum designates, with the concurrence of the Minister and the organisation or person who nominated him or her, an alternate to take his or her place if he or she is unable to attend a meeting of the Forum.

(b) The Minister may appoint a replacement for a member who vacates his or her office in terms of section 5 (3), and the Minister may invite nominations from the sector or organisation that nominated such member.

(6) The replacement must serve for the balance of the term of the person he or she replaces.

5. Conditions of appointment to Forum.—(1) A member of the Forum holds office for a period of two years.

(2) At the expiry of his or her term of office a member may be appointed for one further term.

- (3) A member or replacement member of the Forum must vacate his or her office if—
- (a) the Minister at any time terminates such term of office for good reason;
 - (b) he or she can no longer perform his or her duties on the Forum;
 - (c) he or she is convicted of a criminal offence, involving dishonesty, and is sentenced to imprisonment without the option of a fine;
 - (d) he or she is absent from more than two consecutive meetings of the Forum without the leave of the chairperson; or
 - (e) he or she resigns by way of written notice to the Minister.

(4) Members of the Forum and members of a committee of the Forum may be paid such remuneration and allowances for their services as the Minister may determine with the concurrence of the Minister of Finance.

(5) If any member of the Forum or his or her spouse has a direct or indirect financial interest in any matter before the Forum, he or she shall disclose such interest and may not take part in any discussion regarding such matter.

6. Functioning of Forum.—(1) The Minister must—

- (a) lay down rules for the functioning of the Forum, including—
 - (i) by publication in the Gazette, a constitution for the Forum which may contain provisions relating to—
 - (aa) advice on matters related to Chapter 6;
 - (bb) participation in meetings relating to international environmental matters;

- (c) subcommittees and working groups of the Forum;
- (ii) the manner and timing of reports by the Forum; and
- (iii) consultation with the Director General;
- (b) with the concurrence of the Minister of Finance make available funds for the functioning of the Forum for purposes other than the payment of remuneration referred to in section 5 (4), from—

- (i) money appropriated by Parliament for this purpose; and
 - (ii) funds obtained from donations or grants.
- (2) The Director General may—
- (a) designate as many officers and employees as he or she may deem necessary to assist the Forum in the performance of its work; and
 - (b) engage persons on contract to assist the Forum in the performance of its work.

(3) The Minister must present an annual report to Parliament on the work of the Forum, including the following:

- (a) the work plan for the next year;
- (b) information and recommendations submitted; and
- (c) financial report and budget.

(4) The meetings of the Forum must be open to the public and all documents considered or produced by the Forum must be available for inspection by the public.

Part 2: Committee for Environmental Coordination

7. Establishment, objects and functions of Committee.—(1) The Committee for Environmental Coordination is hereby established.

(2) The object of the Committee is to promote the integration and coordination of environmental functions by the relevant organs of state, and in particular to promote the achievement of the purpose and objectives of environmental implementation plans and environmental management plans as set out in section 12.

(3) The functions of the Committee shall include the following:

- (a) scrutinising, reporting and making recommendations on the environmental implementation plans submitted to it in accordance with section 15;
- (b) investigating and making recommendations regarding the assignment and delegation of functions between organs of state under this Act or any other law affecting the environment and regarding the practical working arrangements, including memoranda of understanding, between the organs of state represented by members and other organs of state;
- (c) investigating and recommending the establishment of mechanisms in each province, with the concurrence of the MEC, for providing a single point in the province for the receipt of applications for authorisations, licences and similar permissions required for activities under legal provisions concerned with the protection of the environment where such authorisations, licences or permissions are required from more than one organ of state, and procedures for the coordinated consideration of such applications by the organs of state concerned;
- (d) making recommendations to coordinate the application of integrated environmental management as contemplated in Chapter 5, including cooperation in environmental assessment procedures and requirements and making determinations regarding the prevention of duplication of efforts as contemplated in section 24 (4);
- (e) making recommendations aimed at securing compliance with the principles set out in section 2 and national norms and standards contemplated in section 146 (2) (b) (i) of the Constitution;
- (f) making recommendations regarding the harmonisation of the environmental functions of all relevant national departments and spheres of government;
- (g) advising the Minister on providing guidelines for the preparation of environmental management plans and environmental implementation plans; and
- (h) endeavouring to ensure compliance with the principle set out in section 2 (2) by making appropriate recommendations, requiring reports from its members and advising government on law reform.

8. Composition of Committee.—(1) The Committee comprises:

- (a) the DirectorGeneral: Environmental Affairs and Tourism, who acts as chairperson;
- (b) the DirectorGeneral: Water Affairs and Forestry;
- (c) the DirectorGeneral: Minerals and Energy;
- (d) the DirectorGeneral: Land Affairs;
- (e) the DirectorGeneral: Constitutional Development;
- (f) the DirectorGeneral: Housing;
- (g) the DirectorGeneral: Agriculture;
- (h) the DirectorGeneral: Health;
- (i) the DirectorGeneral: Labour;
- (j) the DirectorGeneral: Arts, Culture, Science and Technology;
- (k) the provincial heads of department appointed by the Minister with the concurrence of the MEC;
- (l) a representative of the national organisation recognised in terms of section 2 of the Organised Local Government Act, 1997 (Act No. 52 of 1997), appointed by the Minister with the concurrence of that organisation; and
- (m) any other DirectorGeneral appointed by the Minister with the concurrence of the Minister under whose portfolio that Department falls.

(2) (a) The Committee may coopt persons to assist it in carrying out its functions.

- (b) The Committee may invite persons to attend its meetings and to assist it in carrying out its functions.
- (3) In making the appointments as contemplated in subsection (2) (a), the Committee must give due consideration to representation of the local sphere of government.
- (4) Every member of the Committee referred to in subsection (1), must appoint an alternate member with the necessary authority from his or her department or provincial government.
- (5) The alternate member appointed under subsection (4) must act in such member's absence or inability to act as member of the Committee.
9. Meetings of Committee, subcommittees and working groups.—(1) The Committee meets at least four times a year.
- (2) The DirectorGeneral determines—
- (a) the procedure for convening meetings of the Committee;
 - (b) the quorum for meetings;
 - (c) procedures at meetings; and
 - (d) records the Committee must keep.
- (3) The DirectorGeneral furnishes the Minister with copies of the minutes of all meetings, within three weeks of such meetings.
- (4) The Committee may establish ad hoc and permanent subcommittees to assist the Committee in the performance of its functions, and such subcommittees may include persons who need not necessarily be members of the Committee.
- (5) The Committee may establish ad hoc working groups to assist a subcommittee in the performance of its functions, and such working groups may include persons who need not necessarily be members of the subcommittee.
- (6) Every subcommittee established in terms of subsection (4) must report at each meeting of the Committee on its own activities as well as those of any working groups established in terms of subsection (5) to assist the subcommittee.
10. Report of Committee.—(1) The Committee presents an annual report on its activities to the Minister on the following:
- (a) the work of the Committee and the work plan for the next year;
 - (b) comments submitted to the DirectorGeneral on the environmental implementation and environmental management plans received;
 - (c) recommendations made in respect of environmental implementation and environmental management plans received;
 - (d) recommendations made in order to secure compliance with the principles set out in section 2 and national norms and standards;
 - (e) law reform undertaken and proposed by organs of state represented on the Committee;
 - (f) compliance with environmental implementation and management plans by municipalities; and
 - (g) any other matter relevant to the coordination of policies, plans and programmes that may affect the environment.

(2) At the request of members of the public, the Committee must make copies available of the report contemplated in subsection (1).

(3) The Minister must present an annual report to Parliament on the work of the Committee, including the matters listed in subsection (1).

CHAPTER 3

PROCEDURES FOR COOPERATIVE GOVERNANCE

11. Environmental implementation plans and management plans.—(1) Every national department listed in Schedule 1 as exercising functions which may affect the

environment and every province must prepare an environmental implementation plan within one year of the promulgation of this Act and at least every four years thereafter.

(2) Every national department listed in Schedule 2 as exercising functions involving the management of the environment must prepare an environmental management plan within one year of the promulgation of this Act and at least every four years thereafter.

(3) Every national department that is listed in both Schedule 1 and Schedule 2 may prepare a consolidated environmental implementation and management plan.

(4) Every organ of state referred to in subsections (1) and (2) must, in its preparation of an environmental implementation plan or environmental management plan, and before submitting such plan take into consideration every other environmental implementation plan and environmental management plan already adopted with a view to achieving consistency among such plans.

(5) The Minister may by notice in the Gazette—

(a) extend the date for the submission of any environmental implementation plans and environmental management plans for periods not exceeding 12 months;

(b) on application by any organ of state, or on his or her own initiative with the agreement of the relevant Minister where it concerns a national department, and after consultation with the Committee, amend Schedules 1 and 2.

(6) The DirectorGeneral must, at the request of a national department or province assist with the preparation of an environmental implementation plan.

(7) The preparation of environmental implementation plans and environmental management plans may consist of the assembly of information or plans compiled for other purposes and may form part of any other process or procedure.

(8) The Minister may issue guidelines to assist provinces and national departments in the preparation of environmental implementation and environmental management plans.

12. Purpose and objects of environmental implementation plans and environmental management plans.—The purpose of environmental implementation and management plans is to—

(a) coordinate and harmonise the environmental policies, plans, programmes and decisions of the various national departments that exercise functions that may affect the environment or are entrusted with powers and duties aimed at the achievement, promotion, and protection of a sustainable environment, and of provincial and local spheres of government, in order to—

(i) minimise the duplication of procedures and functions; and

(ii) promote consistency in the exercise of functions that may affect the environment;

(b) give effect to the principle of cooperative government in Chapter 3 of the Constitution;

(c) secure the protection of the environment across the country as a whole;

(d) prevent unreasonable actions by provinces in respect of the environment that are prejudicial to the economic or health interests of other provinces or the country as a whole; and

(e) enable the Minister to monitor the achievement, promotion, and protection of a sustainable environment.

13. Content of environmental implementation plans.—(1) Every environmental implementation plan must contain:

(a) a description of policies, plans and programmes that may significantly affect the environment;

(b) a description of the manner in which the relevant national department or province will ensure that the policies, plans and programmes referred to in paragraph (a) will comply with the principles set out in section 2 as well as any national norms and standards as envisaged under section 146 (2) (b) (i) of the Constitution and set out by the Minister, or by any other Minister, which have as their objective the achievement, promotion, and protection of the environment;

(c) a description of the manner in which the relevant national department or province will ensure that its functions are exercised so as to ensure compliance with relevant legislative provisions, including the principles set out in section 2, and any national norms and standards envisaged under section 146 (2) (b) (i) of the Constitution and set out by the Minister, or by any other Minister, which have as their objective the achievement, promotion, and protection of the environment; and

(d) recommendations for the promotion of the objectives and plans for the implementation of the procedures and regulations referred to in Chapter 5.

(2) The Minister may, after consultation with the Committee, make regulations for the purpose of giving effect to subsections (1) (b) and (c).

14. Content of environmental management plans.—Every environmental management plan must contain—

(a) a description of the functions exercised by the relevant department in respect of the environment;

(b) a description of environmental norms and standards, including norms and standards contemplated in section 146 (2) (b) (i) of the Constitution, set or applied by the relevant department;

(c) a description of the policies, plans and programmes of the relevant department that are designed to ensure compliance with its policies by other organs of state and persons;

(d) a description of priorities regarding compliance with the relevant department's policies by other organs of state and persons;

(e) a description of the extent of compliance with the relevant department's policies by other organs of state and persons;

(f) a description of arrangements for cooperation with other national departments and spheres of government, including any existing or proposed memoranda of understanding entered into, or delegation or assignment of powers to other organs of state, with a bearing on environmental management; and

(g) proposals for the promotion of the objectives and plans for the implementation of the procedures and regulations referred to in Chapter 5.

15. Submission, scrutiny and adoption of environmental implementation plans and environmental management plans.—(1) Every environmental implementation plan and every environmental management plan must be submitted to the Committee by a date to be set by the Minister.

(2) (a) The Committee scrutinises every environmental implementation plan and either recommends adoption of such plan or reports to the Minister as well as every other Minister responsible for a department which is represented on the Committee and every Provincial Premier concerned on the extent to which the environmental implementation plan concerned fails to comply with—

(i) the principles in section 2;

- (ii) the purpose and objectives of environmental implementation plans; or
- (iii) any relevant environmental management plan,

and specifies changes needed in the environmental implementation plan concerned.

(b) If the Committee recommends adoption of an environmental implementation plan, then the relevant organ of state must adopt and publish its plan in the relevant Gazette within 90 days of such approval and the plan becomes effective from the date of such publication.

(3) Any difference or disagreement between the Committee and a national department regarding either a failure to submit or the content of an environmental implementation plan may, if it cannot be resolved by agreement between the parties concerned, be referred by the DirectorGeneral for determination by the Minister in consultation with the Ministers responsible for the Department of Land Affairs, Department of Water Affairs and Forestry, Department of Minerals and Energy and Department of Constitutional Development.

(4) Any difference or disagreement between the Committee and a province regarding either a failure to submit or the content of an environmental implementation plan may, if it cannot be resolved by agreement between the parties concerned, be referred by the DirectorGeneral to conciliation in accordance with Chapter 4 and if such conciliation fails, or where the DirectorGeneral does not refer the dispute to conciliation, to the Minister with a request for intervention in accordance with section 100 of the Constitution: Provided that such disputes shall be dealt with in accordance with the act contemplated in section 41 (2) of the Constitution, once promulgated.

(5) A national department which has submitted an environmental management plan must adopt and publish its plan in the Gazette within 90 days of such submission and the plan becomes effective from the date of such publication.

(6) The exercise of functions by organs of state may not be delayed or postponed on account of—

- (a) the failure of any organ of state to submit an environmental implementation plan;
- (b) the scrutiny of any environmental implementation plan by the Committee;
- (c) the amendment of any environmental implementation plan following scrutiny of the plan by the Committee;
- (d) any difference or disagreement regarding any environmental implementation plan and the resolution of that difference or disagreement; or
- (e) the failure of any organ of state to adopt and publish its environmental implementation or management plan.

16. Compliance with environmental implementation plans and environmental management plans.—(1) (a) Every organ of state must exercise every function it may have, or that has been assigned or delegated to it, by or under any law, and that may significantly affect the protection of the environment, substantially in accordance with the environmental implementation plan or the environmental management plan prepared, submitted and adopted by that organ of state in accordance with this Chapter: Provided that any substantial deviation from an environmental management plan or environmental implementation plan must be reported forthwith to the DirectorGeneral and the Committee.

(b) Every organ of state must report annually within four months of the end of its financial year on the implementation of its adopted environmental management plan or environmental implementation plan to the DirectorGeneral and the Committee.

(c) The Minister may, after consultation with the Committee, recommend to any organ of state which has not submitted and adopted an environmental implementation plan or environmental management plan, that it comply with a specified provision of an adopted environmental implementation plan or submitted environmental management plan.

(2) The DirectorGeneral monitors compliance with environmental implementation plans and environmental management plans and may—

(a) take any steps or make any inquiries he or she deems fit in order to determine if environmental implementation plans and environmental management plans are being complied with by organs of state; and

(b) if, as a result of any steps taken or inquiry made under paragraph (a), he or she is of the opinion that an environmental implementation plan and an environmental management plan is not substantially being complied with, serve a written notice on the organ of state concerned, calling on it to take such specified steps as the DirectorGeneral considers necessary to remedy the failure of compliance.

(3) (a) Within 30 days of the receipt of a notice contemplated in subsection (2) (b), an organ of state must respond to the notice in writing setting out any—

(i) objections to the notice;

(ii) steps that will be taken to remedy failures of compliance; or

(iii) other information that the organ of state considers relevant to the

notice.

(b) After considering the representations from the organ of state and any other relevant information, the DirectorGeneral must within 30 days of receiving a response referred to in paragraph (a) issue a final notice—

(i) confirming, amending or cancelling the notice referred to in subsection

(2) (b);

(ii) specify steps and a time period within which steps must be taken to remedy the failure of compliance.

(c) If, after compliance with the provisions of paragraphs (a) and (b) there still remains a difference or disagreement between the organs of state and the DirectorGeneral, the organ of state may request the Minister to refer any difference or disagreement between itself and the DirectorGeneral regarding compliance with an environmental implementation plan, or the steps necessary to remedy a failure of compliance, to conciliation in accordance with Chapter 4.

(d) Where an organ of state does not submit any difference or disagreement to conciliation in accordance with paragraph (c), or if conciliation fails to resolve the matter, the DirectorGeneral may within 60 days of the final notice referred to in paragraph (b) if the matter has not been submitted to conciliation, or within 30 days of the date of conciliation, as the case may be—

(i) where the organ of state belongs to the provincial sphere of government, request the Minister to intervene in accordance with section 100 of the Constitution: Provided that such a difference or disagreement must be dealt with in accordance with the Act contemplated in section 41 (2) of the Constitution once promulgated;

(ii) where the organ of state belongs to the local sphere of government, request the MEC to intervene in accordance with section 139 of the Constitution: Provided that such a difference or disagreement must be dealt with in accordance with the Act contemplated in section 41 (2) of the Constitution once promulgated; or

(iii) where the organ of state belongs to the national sphere of government refer the matter for determination by the Minister in consultation with the Ministers

responsible for the Department of Land Affairs, Department of Water Affairs and Forestry, Department of Minerals and Energy and Department of Constitutional Development.

(4) Each provincial government must ensure that—

(a) the relevant provincial environmental implementation plan is complied with by each municipality within its province and for this purpose the provisions of subsections (2) and (3) must apply with the necessary changes; and

(b) municipalities adhere to the relevant environmental implementation and management plans, and the principles contained in section 2 in the preparation of any policy, programme or plan, including the establishment of integrated development plans and land development objectives.

(5) The DirectorGeneral must keep a record of all environmental implementation plans and environmental management plans, relevant agreements between organs of state and any reports submitted under subsection (1) (b); and such plans, reports and agreements must be available for inspection by the public.

CHAPTER 4

FAIR DECISIONMAKING AND CONFLICT MANAGEMENT

17. Reference to conciliation.—(1) Any Minister, MEC or Municipal Council—

(a) where a difference or disagreement arises concerning the exercise of any of its functions which may significantly affect the environment, or

(b) before whom an appeal arising from a difference or disagreement regarding the protection of the environment is brought under any law, may, before reaching a decision, consider the desirability of first referring the matter to conciliation and—

(i) must if he, she or it considers conciliation appropriate either—

(aa) refer the matter to the DirectorGeneral for conciliation under this Act;

or

(bb) appoint a conciliator on the conditions, including timelimits, that he, she or it may determine; or

(cc) where a conciliation or mediation process is provided for under any other relevant law administered by such Minister, MEC or Municipal Council, refer the matter for mediation or conciliation under such other law; or

(ii) if he, she or it considers conciliation inappropriate or if conciliation has failed, make a decision: Provided that the provisions of section 4 of the Development Facilitation Act, 1995 (Act No. 67 of 1995), shall prevail in respect of decisions in terms of that Act and laws contemplated in subsection 1 (c) thereof.

(2) Anyone may request the Minister, a MEC or Municipal Council to appoint a facilitator to call and conduct meetings of interested and affected parties with the purpose of reaching agreement to refer a difference or disagreement to conciliation in terms of this Act, and the Minister, MEC or Municipal Council may, subject to section 22, appoint a facilitator and determine the manner in which the facilitator must carry out his or her tasks, including timelimits.

(3) A court or tribunal hearing a dispute regarding the protection of the environment may order the parties to submit the dispute to a conciliator appointed by the DirectorGeneral in terms of this Act and suspend the proceedings pending the outcome of the conciliation.

18. Conciliation.—(1) Where a matter has been referred to conciliation in terms of this Act, the DirectorGeneral may, on the conditions, including timelimits, that he or she may determine, appoint a conciliator acceptable to the parties to assist in resolving a difference or disagreement: Provided that if the parties to the difference or

disagreement do not reach agreement on the person to be appointed, the DirectorGeneral may appoint a person who has adequate experience in or knowledge of conciliation of environmental disputes.

(2) A conciliator appointed in terms of this Act must attempt to resolve the matter—

- (a) by obtaining such information whether documentary or oral as is relevant to the resolution of the difference or disagreement;
- (b) by mediating the difference or disagreement;
- (c) by making recommendations to the parties to the difference or disagreement; or

(d) in any other manner that he or she considers appropriate.

(3) In carrying out his or her functions, a conciliator appointed in terms of this Act must take into account the principles contained in section 2.

(4) A conciliator may keep or cause to be kept, whether in writing or by mechanical or electronic means, a permanent record of all or part of the proceedings relating to the conciliation of a matter.

(5) Where such record has been kept, any member of the public may obtain a readable copy of the record upon payment of a fee as approved by Treasury.

(6) Where conciliation does not resolve the matter, a conciliator may enquire of the parties whether they wish to refer the matter to arbitration and may with their concurrence endeavour to draft terms of reference for such arbitration.

(7) (a) The conciliator must submit a report to the DirectorGeneral, the parties and the person who referred the matter for conciliation, setting out the result of his or her conciliation, and indicating whether or not an agreement has been reached.

(b) In the event of no agreement having been reached, the report may contain his or her recommendations and reasons therefor.

(c) Where relevant, the report must contain the conciliator's comments on the conduct of the parties.

(d) The report and any agreement reached as a result of the conciliation must be available for inspection by the public and any member of the public may obtain a copy thereof upon payment of a fee as approved by Treasury.

(8) The DirectorGeneral may from time to time with the concurrence of the Minister of Finance, appoint persons or organisations with relevant knowledge or expertise to provide conciliation and mediation services.

19. Arbitration.—(1) A difference or disagreement regarding the protection of the environment may be referred to arbitration in terms of the Arbitration Act, 1965 (Act No. 42 of 1965).

(2) Where a dispute or disagreement referred to in subsection (1) is referred to arbitration the parties thereto may appoint as arbitrator a person from the panel of arbitrators established in terms of section 21.

20. Investigation.—The Minister may at any time appoint one or more persons to assist either him or her or, after consultation with a Municipal Council or MEC or another national Minister, to assist such a Municipal Council or MEC or another national Minister in the evaluation of a matter relating to the protection of the environment by obtaining such information, whether documentary or oral, as is relevant to such evaluation and to that end—

(a) the Minister may by notice in the Gazette give such person or persons the powers of a Commission of Inquiry under the Commissions Act, 1947 (Act No. 8 of 1947);

(b) the Minister may make rules by notice in the Gazette for the conduct of the inquiry: Provided that the decision of the inquiry and the reasons therefor must be reduced to writing;

(c) the DirectorGeneral must designate, subject to the provisions of the Public Service Act, 1994 (Proclamation No. 103 of 1994), as many officers and employees of the Department as may be necessary to assist such person and any work may be performed by a person other than such officer or employee at the remuneration and allowances which the Minister with the concurrence of the Minister of Finance may determine.

21. Appointment of panel and remuneration.—(1) The Minister may, with the concurrence of the Minister of Finance, determine remuneration and allowances, either in general or in any particular case, to be paid from money appropriated by Parliament for that purpose to any person or persons appointed in terms of this Act to render facilitation, conciliation, arbitration or investigation services, who are not in the fulltime employment of the State.

(2) The Minister may create a panel or panels of persons from which appointment of facilitators and arbitrators in terms of this Act may be made, or contracts entered into in terms of this Act.

(3) The Minister may, pending the establishment of a panel or panels in terms of subsection (2), adopt the panel established in terms of section 31 (1) of the Land Reform (Labour Tenants) Act, 1996 (Act No. 3 of 1996).

22. Relevant considerations, report and designated officer.—(1) Decisions under this Act concerning the reference of a difference or disagreement to conciliation, the appointment of a conciliator, the appointment of a facilitator, the appointment of persons to conduct investigations, and the conditions of such appointment, must be made taking into account—

(a) the desirability of resolving differences and disagreements speedily and cheaply;

(b) the desirability of giving indigent persons access to conflict resolution measures in the interest of the protection of the environment;

(c) the desirability of improving the quality of decisionmaking by giving interested and affected persons the opportunity to bring relevant information to the decisionmaking process;

(d) any representations made by persons interested in the matter; and

(e) such other considerations relating to the public interest as may be relevant.

(2) (a) The DirectorGeneral shall keep a record and prepare an annual report on environmental conflict management for submission to the Committee and the Forum, for the purpose of evaluating compliance and conflict management measures in respect of environmental laws.

(b) The record and report referred to in paragraph (a) may include the following:

(i) Proceedings under this chapter, including reports of conciliators and agreements reached;

(ii) proceedings under Chapter 7, including complaints, charges and judgments;

(iii) proceedings under other laws listed in Schedule 3;

(iv) proceedings by the Human Rights Commission and the Public Protector.

(c) The DirectorGeneral shall designate an officer to provide information to the public on appropriate dispute resolution mechanisms for referral of disputes and complaints.

(d) The reports, records and agreements referred to in this subsection must be available for inspection by the public.

CHAPTER 5

INTEGRATED ENVIRONMENTAL MANAGEMENT

23. General objectives.—(1) The purpose of this Chapter is to promote the application of appropriate environmental management tools in order to ensure the integrated environmental management of activities.

(2) The general objective of integrated environmental management is to—

(a) promote the integration of the principles of environmental management set out in section 2 into the making of all decisions which may have a significant effect on the environment;

(b) identify, predict and evaluate the actual and potential impact on the environment, socioeconomic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities, with a view to minimising negative impacts, maximising benefits, and promoting compliance with the principles of environmental management set out in section 2;

(c) ensure that the effects of activities on the environment receive adequate consideration before actions are taken in connection with them;

(d) ensure adequate and appropriate opportunity for public participation in decisions that may affect the environment;

(e) ensure the consideration of environmental attributes in management and decisionmaking which may have a significant effect on the environment; and

(f) identify and employ the modes of environmental management best suited to ensuring that a particular activity is pursued in accordance with the principles of environmental management set out in section 2.

(3) The DirectorGeneral must coordinate the activities of organs of state referred to in section 24 (1) and assist them in giving effect to the objectives of this section and such assistance may include training, the publication of manuals and guidelines and the coordination of procedures.

24. Implementation.—(1) In order to give effect to the general objectives of integrated environmental management laid down in this Chapter, the potential impact on—

(a) the environment;

(b) socioeconomic conditions; and

(c) the cultural heritage,

of activities that require authorisation or permission by law and which may significantly affect the environment, must be considered, investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorising, permitting, or otherwise allowing the implementation of an activity.

(2) The Minister may with the concurrence of the MEC, and every MEC may with the concurrence of the Minister, in the prescribed manner—

(a) identify activities which may not be commenced without prior authorisation from the Minister or MEC;

(b) identify geographical areas in which specified activities may not be commenced without prior authorisation from the Minister or MEC and specify such activities;

(c) make regulations in accordance with subsections (3) and (4) in respect of such authorisations;

(d) identify existing authorised and permitted activities which must be considered, assessed, evaluated and reported on; and

(e) prepare compilations of information and maps that specify the attributes of the environment in particular geographical areas, including the sensitivity, extent, interrelationship and significance of such attributes which must be taken into account by every organ of state charged by law with authorising, permitting or otherwise allowing the implementation of a new activity, or with considering, assessing and evaluating an existing activity:

Provided that where authorisation for an activity falls under the jurisdiction of another Minister, a decision in respect of paragraph (a) or (b) must be taken in consultation with such other Minister.

(3) (a) The investigation, assessment and communication of the potential impact of activities contemplated in subsection (1) must take place in accordance with procedures complying with subsection (7).

(b) Every Minister and MEC responsible for an organ of state that is charged by law with authorising, permitting, or otherwise allowing an activity contemplated in subsection (1) may prescribe regulations laying down the procedures to be followed and the report to be prepared for the purpose of compliance with paragraph (a).

(c) Any regulations made in terms of this subsection or any other law that contemplates the assessment of the potential environmental impact of activities must, notwithstanding any other law, comply with subsection (7).

(d) This section does not affect the validity of any law contemplated in paragraph (c) that is in force at the commencement of this Act, including the provisions and regulations referred to in section 50 (2): Provided that paragraph (a) must nevertheless be complied with.

(4) Before any regulations are prescribed under this section or any other law that contemplates the assessment of the potential environmental impact of activities, and notwithstanding such other law—

(a) a Minister or MEC must submit a draft of such regulations to the Committee;

(b) the Committee must within 30 days of the receipt of such draft regulations—

(i) determine whether the draft regulations would bring about a duplication of effort by persons initiating activities contemplated in subsection (1) in the investigation and assessment of the potential impacts of activities that require authorisation or permission from more than one organ of state; and

(ii) approve the draft regulations unless they would bring about such a duplication of effort; or

(iii) specify amendments to be made to such draft regulations in order to avoid such a duplication of effort;

(c) a Minister or MEC must—

(i) where such draft regulations have been approved by the Committee, follow the procedure prescribed in section 47; or

(ii) give effect to the amendments specified by the Committee, and thereafter follow the procedure prescribed in section 47.

(5) Compliance with the procedure laid down by a Minister or MEC does not remove the need to obtain authorisation for that activity from any other organ of state charged

by law with authorising, permitting or otherwise allowing the implementation of the activity.

(6) The Minister may make regulations in accordance with subsections (3) and (4) stipulating the procedure to be followed and the report to be prepared in investigating, assessing and communicating potential impacts for the purpose of complying with subsection (1) where—

(a) the activity will affect the interest of more than one province or traverse international boundaries;

(b) the activity will affect compliance with obligations resting on the Republic under customary or conventional international law; or

(c) an activity contemplated in subsection (1) is not dealt with in regulations made under subsection (3).

(7) Procedures for the investigation, assessment and communication of the potential impact of activities must, as a minimum, ensure the following:

(a) Investigation of the environment likely to be significantly affected by the proposed activity and alternatives thereto;

(b) investigation of the potential impact, including cumulative effects, of the activity and its alternatives on the environment, socioeconomic conditions and cultural heritage, and assessment of the significance of that potential impact;

(c) investigation of mitigation measures to keep adverse impacts to a minimum, as well as the option of not implementing the activity;

(d) public information and participation, independent review and conflict resolution in all phases of the investigation and assessment of impacts;

(e) reporting on gaps in knowledge, the adequacy of predictive methods and underlying assumptions, and uncertainties encountered in compiling the required information;

(f) investigation and formulation of arrangements for the monitoring and management of impacts, and the assessment of the effectiveness of such arrangements after their implementation;

(g) coordination and cooperation between organs of state in the consideration of assessments where an activity falls under the jurisdiction of more than one organ of state;

(h) that the findings and recommendations flowing from such investigation, and the general objectives of integrated environmental management laid down in this Act and the principles of environmental management set out in section 2 are taken into account in any decision made by an organ of state in relation to the proposed policy, programme, plan or project; and

(i) that environmental attributes identified in the compilation of information and maps as contemplated in subsection (2) (e) are considered.

CHAPTER 6

INTERNATIONAL OBLIGATIONS AND AGREEMENTS

25. Incorporation of international environmental instruments.—(1) Where the Republic is not yet bound by an international environmental instrument, the Minister may make a recommendation to Cabinet and Parliament regarding accession to and ratification of an international environmental instrument, which may deal with the following:

(a) Available resources to ensure implementation;

(b) views of interested and affected parties;

(c) benefits to the Republic;

(d) disadvantages to the Republic;

- (e) the estimated date when the instrument is to come into effect;
- (f) the estimated date when the instrument will become binding on the Republic;
- (g) the minimum number of states required to sign the instrument in order for it to come into effect;
- (h) the respective responsibilities of all national departments involved;
- (i) the potential impact of accession on national parties;
- (j) reservations to be made, if any; and
- (k) any other matter which in the opinion of the Minister is relevant.

(2) Where the Republic is a party to an international environmental instrument the Minister, after compliance with the provisions of section 231 (2) and (3) of the Constitution, may publish the provisions of the international environmental instrument in the Gazette and any amendment or addition to such instrument.

(3) The Minister may introduce legislation in Parliament or make such regulations as may be necessary for giving effect to an international environmental instrument to which the Republic is a party, and such legislation and regulations may deal with inter alia the following—

- (a) the coordination of the implementation of the instrument;
- (b) the allocation of responsibilities in terms of the instrument, including those of other organs of state;
- (c) the gathering of information, including for the purposes of compiling and updating reports required in terms of the instrument and for submission to Parliament;
- (d) the dissemination of information related to the instrument and reports from international meetings;
- (e) initiatives and steps regarding research, education, training, awareness raising and capacity building;
- (f) ensuring public participation;
- (g) implementation of and compliance with the provisions of the instrument, including the creation of offences and the prescription of penalties where applicable; and
- (h) any other matter necessary to give effect to the instrument.

(4) The Minister may prior to a recommendation referred to in subsection (1), publish a notice in the Gazette, stating his or her intention to make such recommendation and inviting written comments.

26. Reports.—(1) The Minister must report to Parliament once a year regarding international environmental instruments for which he or she is responsible and such report may include details on—

- (a) participation in international meetings concerning international environmental instruments;
- (b) progress in implementing international environmental instruments to which the Republic is a party;
- (c) preparations undertaken in respect of international instruments to which the Republic is likely to become a party;
- (d) initiatives and negotiations within the region of Southern Africa;
- (e) the efficacy of coordination mechanisms; and
- (f) legislative measures that have been taken and the time frames within which it is envisaged that their objectives will be achieved.

(2) (a) The Minister must initiate an Annual Performance Report on Sustainable Development to meet the government's commitment to Agenda 21.

- (b) (i) The Annual Performance Report must cover all relevant activities of all national departments and spheres of government.
- (ii) All relevant organs of state must provide information to the Minister by a date to be determined by the Minister for the purposes of the report referred to in paragraph (a) and this may consist of an assembly of information compiled for other purposes.
- (c) The Minister may appoint persons as he or she considers necessary to act as a Secretariat to ensure preparation of the report.
- (d) The purpose of the report shall be to—
- (i) provide an audit and a report of the government's performance in respect of Agenda 21;
 - (ii) review procedures for coordinating policies and budgets to meet the objectives of Agenda 21; and
 - (iii) review progress on a public educational programme to support the objectives of Agenda 21.

27. Application.—(1) This Chapter applies to any international environmental instrument whether the Republic became a party to it before or after the coming into force of this Act.

(2) The provisions of any international environmental instrument published in accordance with this section are evidence of the contents of the international environmental instrument in any proceedings or matter in which the provisions of the instrument come into question.

CHAPTER 7

COMPLIANCE, ENFORCEMENT AND PROTECTION

Part 1: Environmental hazards

28. Duty of care and remediation of environmental damage.—(1) Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.

(2) Without limiting the generality of the duty in subsection (1), the persons on whom subsection (1) imposes an obligation to take reasonable measures, include an owner of land or premises, a person in control of land or premises or a person who has a right to use the land or premises on which or in which—

- (a) any activity or process is or was performed or undertaken; or
- (b) any other situation exists,

which causes, has caused or is likely to cause significant pollution or degradation of the environment.

(3) The measures required in terms of subsection (1) may include measures to—

- (a) investigate, assess and evaluate the impact on the environment;
- (b) inform and educate employees about the environmental risks of their work and the manner in which their tasks must be performed in order to avoid causing significant pollution or degradation of the environment;
- (c) cease, modify or control any act, activity or process causing the pollution or degradation;
- (d) contain or prevent the movement of pollutants or the causant of degradation;
- (e) eliminate any source of the pollution or degradation; or
- (f) remedy the effects of the pollution or degradation.

(4) The DirectorGeneral or a provincial head of department may, after consultation with any other organ of state concerned and after having given adequate opportunity to affected persons to inform him or her of their relevant interests, direct any person who fails to take the measures required under subsection (1) to—

- (a) investigate, evaluate and assess the impact of specific activities and report thereon;
- (b) commence taking specific reasonable measures before a given date;
- (c) diligently continue with those measures; and
- (d) complete them before a specified reasonable date:

Provided that the DirectorGeneral or a provincial head of department may, if urgent action is necessary for the protection of the environment, issue such directive, and consult and give such opportunity to inform as soon thereafter as is reasonable.

(5) The DirectorGeneral or a provincial head of department, when considering any measure or time period envisaged in subsection (4), must have regard to the following:

- (a) the principles set out in section 2;
- (b) the provisions of any adopted environmental management plan or environmental implementation plan;
- (c) the severity of any impact on the environment and the costs of the measures being considered;
- (d) any measures proposed by the person on whom measures are to be imposed;
- (e) the desirability of the State fulfilling its role as custodian holding the environment in public trust for the people;
- (f) any other relevant factors.

(6) If a person required under this Act to undertake rehabilitation or other remedial work on the land of another, reasonably requires access to, use of or a limitation on use of that land in order to effect rehabilitation or remedial work, but is unable to acquire it on reasonable terms, the Minister may—

- (a) expropriate the necessary rights in respect of that land for the benefit of the person undertaking the rehabilitation or remedial work, who will then be vested with the expropriated rights; and
- (b) recover from the person for whose benefit the expropriation was effected all costs incurred.

(7) Should a person fail to comply, or inadequately comply, with a directive under subsection (4), the DirectorGeneral or provincial head of department may take reasonable measures to remedy the situation.

(8) Subject to subsection (9), the DirectorGeneral or provincial head of department may recover all costs incurred as a result of it acting under subsection (7) from any or all of the following persons—

- (a) any person who is or was responsible for, or who directly or indirectly contributed to, the pollution or degradation or the potential pollution or degradation;
- (b) the owner of the land at the time when the pollution or degradation or the potential for pollution or degradation occurred, or that owner's successor in title;
- (c) the person in control of the land or any person who has or had a right to use the land at the time when—
 - (i) the activity or the process is or was performed or undertaken; or
 - (ii) the situation came about; or
- (d) any person who negligently failed to prevent—
 - (i) the activity or the process being performed or undertaken; or

(ii) the situation from coming about:

Provided that such person failed to take the measures required of him or her under subsection (1).

(9) The DirectorGeneral or provincial head of department may in respect of the recovery of costs under subsection (8), claim proportionally from any other person who benefited from the measures undertaken under subsection (7).

(10) The costs claimed under subsections (6), (8) and (9) must be reasonable and may include, without being limited to, labour, administrative and overhead costs.

(11) If more than one person is liable under subsection (8), the liability must be apportioned among the persons concerned according to the degree to which each was responsible for the harm to the environment resulting from their respective failures to take the measures required under subsections (1) and (4).

(12) Any person may, after giving the DirectorGeneral or provincial head of department 30 days' notice, apply to a competent court for an order directing the DirectorGeneral or any provincial head of department to take any of the steps listed in subsection (4) if the DirectorGeneral or provincial head of department fails to inform such person in writing that he or she has directed a person contemplated in subsection (8) to take one of those steps, and the provisions of section 32 (2) and (3) shall apply to such proceedings with the necessary changes.

(13) When considering any application in terms of subsection (12), the court must take into account the factors set out in subsection (5).

29. Protection of workers refusing to do environmentally hazardous work.—

(1) Notwithstanding the provisions of any other law, no person is civilly or criminally liable or may be dismissed, disciplined, prejudiced or harassed on account of having refused to perform any work if the person in good faith and reasonably believed at the time of the refusal that the performance of the work would result in an imminent and serious threat to the environment.

(2) An employee who has refused to perform work in terms of subsection (1) must as soon thereafter as is reasonably practicable notify the employer either personally or through a representative that he or she has refused to perform work and give the reason for the refusal.

(3) Subsection (1) applies whether or not the person refusing to work has used or exhausted any other applicable external or internal procedure or otherwise remedied the matter concerned.

(4) No person may advantage or promise to advantage any person for not exercising his or her right in terms of subsection (1).

(5) No person may threaten to take any action contemplated by subsection (1) against a person because that person has exercised or intends to exercise his or her right in terms of subsection (1).

30. Control of emergency incidents.—(1) In this section—

(a) “incident” means an unexpected sudden occurrence, including a major emission, fire or explosion leading to serious danger to the public or potentially serious pollution of or detriment to the environment, whether immediate or delayed;

(b) “responsible person” includes any person who—

(i) is responsible for the incident;

(ii) owns any hazardous substance involved in the incident; or

(iii) was in control of any hazardous substance involved in the incident at the time of the incident;

(c) “relevant authority” means—

- (i) a municipality with jurisdiction over the area in which an incident occurs;
- (ii) a provincial head of department or any other provincial official designated for that purpose by the MEC in a province in which an incident occurs;
- (iii) the DirectorGeneral;
- (iv) any other DirectorGeneral of a national department.

(2) Where this section authorises a relevant authority to take any steps, such steps may only be taken by—

- (a) the person referred to in subsection (1) (c) (iv) if no steps have been taken by any of the other persons listed in subsection (1) (c);
- (b) the person referred to in subsection (1) (c) (iii) if no steps have been taken by any of the persons listed in subsection (1) (c) (i) and (c) (ii);
- (c) the person referred to in subsection (1) (c) (ii) if no steps have been taken by the person listed in subsection (1) (c) (i):

Provided that any relevant authority may nevertheless take such steps if it is necessary to do so in the circumstances and no other person referred to in subsection (1) (c) has yet taken such steps.

(3) The responsible person or, where the incident occurred in the course of that person's employment, his or her employer must forthwith after knowledge of the incident, report through the most effective means reasonably available—

- (a) the nature of the incident;
- (b) any risks posed by the incident to public health, safety and property;
- (c) the toxicity of substances or byproducts released by the incident; and
- (d) any steps that should be taken in order to avoid or minimise the effects of the incident on public health and the environment to—
 - (i) the DirectorGeneral;
 - (ii) the South African Police Services and the relevant fire prevention service;
 - (iii) the relevant provincial head of department or municipality; and
 - (iv) all persons whose health may be affected by the incident.

(4) The responsible person or, where the incident occurred in the course of that person's employment, his or her employer, must, as soon as reasonably practicable after knowledge of the incident—

- (a) take all reasonable measures to contain and minimise the effects of the incident, including its effects on the environment and any risks posed by the incident to the health, safety and property of persons;
- (b) undertake cleanup procedures;
- (c) remedy the effects of the incident;
- (d) assess the immediate and longterm effects of the incident on the environment and public health.

(5) The responsible person or, where the incident occurred in the course of that person's employment, his or her employer, must, within 14 days of the incident, report to the DirectorGeneral, provincial head of department and municipality such information as is available to enable an initial evaluation of the incident, including—

- (a) the nature of the incident;
- (b) the substances involved and an estimation of the quantity released and their possible acute effect on persons and the environment and data needed to assess these effects;
- (c) initial measures taken to minimise impacts;

(d) causes of the incident, whether direct or indirect, including equipment, technology, system, or management failure; and

(e) measures taken and to be taken to avoid a recurrence of such incident.

(6) A relevant authority may direct the responsible person to undertake specific measures within a specific time to fulfil his or her obligations under subsections (4) and (5): Provided that the relevant authority must, when considering any such measure or time period, have regard to the following:

(a) the principles set out in section 2;

(b) the severity of any impact on the environment as a result of the incident and the costs of the measures being considered;

(c) any measures already taken or proposed by the person on whom measures are to be imposed, if applicable;

(d) the desirability of the State fulfilling its role as custodian holding the environment in public trust for the people;

(e) any other relevant factors.

(7) A verbal directive must be confirmed in writing at the earliest opportunity, which must be within seven days.

(8) Should—

(a) the responsible person fail to comply, or inadequately comply with a directive under subsection (6);

(b) there be uncertainty as to who the responsible person is; or

(c) there be an immediate risk of serious danger to the public or potentially serious detriment to the environment,

a relevant authority may take the measures it considers necessary to—

(i) contain and minimise the effects of the incident;

(ii) undertake cleanup procedures; and

(iii) remedy the effects of the incident.

(9) A relevant authority may claim reimbursement of all reasonable costs incurred by it in terms of subsection (8) from every responsible person jointly and severally.

(10) A relevant authority which has taken steps under subsections (6) or (8) must, as soon as reasonably practicable, prepare comprehensive reports on the incident, which reports must be made available through the most effective means reasonably available to—

(a) the public;

(b) the DirectorGeneral;

(c) the South African Police Services and the relevant fire prevention service;

(d) the relevant provincial head of department or municipality; and

(e) all persons who may be affected by the incident.

Part 2: Information, enforcement and compliance

31. Access to environmental information and protection of whistleblowers.—

(1) Access to information held by the State is governed by the statute contemplated under section 32 (2) of the Constitution: Provided that pending the promulgation of such statute, the following provisions shall apply:

(a) every person is entitled to have access to information held by the State and organs of state which relates to the implementation of this Act and any other law affecting the environment, and to the state of the environment and actual and future threats to the environment, including any emissions to water, air or soil and the production, handling, transportation, treatment, storage and disposal of hazardous waste and substances;

(b) organs of state are entitled to have access to information relating to the state of the environment and actual and future threats to the environment, including any emissions to water, air or soil and the production, handling, transportation, treatment, storage and disposal of hazardous waste held by any person where that information is necessary to enable such organs of state to carry out their duties in terms of the provisions of this Act or any other law concerned with the protection of the environment or the use of natural resources;

(c) a request for information contemplated in paragraph (a) can be refused only:

(i) if the request is manifestly unreasonable or formulated in too general a manner;

(ii) if the public order or national security would be negatively affected by the supply of the information; or

(iii) for the reasonable protection of commercially confidential information;

(iv) if the granting of information endangers or further endangers the protection of the environment; and

(v) for the reasonable protection of personal privacy.

(2) Subject to subsection (3), the Minister may make regulations regarding access by members of the public to privately held information relating to the implementation of this Act and any other law concerned with the protection of the environment and may to this end prescribe the manner in which such information must be kept: Provided that such regulations are reasonable and justifiable in an open and democratic society based on human dignity, equality and freedom.

(3) The Minister must take into account—

(a) the principles set out in section 2;

(b) the provisions of subsection (1) (c);

(c) the provisions of international law and foreign law; and

(d) any other relevant considerations.

(4) Notwithstanding the provisions of any other law, no person is civilly or criminally liable or may be dismissed, disciplined, prejudiced or harassed on account of having disclosed any information, if the person in good faith reasonably believed at the time of the disclosure that he or she was disclosing evidence of an environmental risk and the disclosure was made in accordance with subsection (5).

(5) Subsection (4) applies only if the person concerned—

(a) disclosed the information concerned to—

(i) a committee of Parliament or of a provincial legislature;

(ii) an organ of state responsible for protecting any aspect of the environment or emergency services;

(iii) the Public Protector;

(iv) the Human Rights Commission;

(v) any attorneygeneral or his or her successor;

(vi) more than one of the bodies or persons referred to in subparagraphs (i) to (v);

(b) disclosed the information concerned to one or more news media and on clear and convincing grounds believed at the time of the disclosure—

(i) that the disclosure was necessary to avert an imminent and serious threat to the environment, to ensure that the threat to the environment was properly and timeously investigated or to protect himself or herself against serious or irreparable harm from reprisals; or

(ii) giving due weight to the importance of open, accountable and participatory administration, that the public interest in disclosure of the information clearly outweighed any need for nondisclosure;

(c) disclosed the information concerned substantially in accordance with any applicable external or internal procedure, other than the procedure contemplated in paragraph (a) or (b), for reporting or otherwise remedying the matter concerned; or

(d) disclosed information which, before the time of the disclosure of the information, had become available to the public, whether in the Republic or elsewhere.

(6) Subsection (4) applies whether or not the person disclosing the information concerned has used or exhausted any other applicable external or internal procedure to report or otherwise remedy the matter concerned.

(7) No person may advantage or promise to advantage any person for not exercising his or her right in terms of subsection (4).

(8) No person may threaten to take any action contemplated by subsection (4) against a person because that person has exercised or intends to exercise his or her right in terms of subsection (4).

32. Legal standing to enforce environmental laws.—(1) Any person or group of persons may seek appropriate relief in respect of any breach or threatened breach of any provision of this Act, including a principle contained in Chapter 1, or any other statutory provision concerned with the protection of the environment or the use of natural resources—

(a) in that person's or group of person's own interest;

(b) in the interest of, or on behalf of, a person who is, for practical reasons, unable to institute such proceedings;

(c) in the interest of or on behalf of a group or class of persons whose interests are affected;

(d) in the public interest; and

(e) in the interest of protecting the environment.

(2) A court may decide not to award costs against a person who, or group of persons which, fails to secure the relief sought in respect of any breach or threatened breach of any provision including a principle of this Act or any other statutory provision concerned with the protection of the environment or the use of natural resources if the court is of the opinion that the person or group of persons acted reasonably out of a concern for the public interest or in the interest of protecting the environment and had made due efforts to use other means reasonably available for obtaining the relief sought.

(3) Where a person or group of persons secures the relief sought in respect of any breach or threatened breach of any provision of this Act or any other statutory provision concerned with the protection of the environment, a court may on application—

(a) award costs on an appropriate scale to any person or persons entitled to practice as advocate or attorney in the Republic who provided free legal assistance or representation to such person or group in the preparation for or conduct of the proceedings; and

(b) order that the party against whom the relief is granted pay to the person or group concerned any reasonable costs incurred by such person or group in the investigation of the matter and its preparation for the proceedings.

33. Private prosecution.—(1) Any person may—

(a) in the public interest; or

(b) in the interest of the protection of the environment, institute and conduct a prosecution in respect of any breach or threatened breach of any duty, other than a public duty resting on an organ of state, in any national or provincial legislation or municipal bylaw, or any regulation, licence, permission or authorisation issued in terms of such legislation, where that duty is concerned with the protection of the environment and the breach of that duty is an offence.

(2) The provisions of sections 9 to 17 of the Criminal Procedure Act, 1977 (Act No. 51 of 1977) applicable to a prosecution instituted and conducted under section 8 of that Act must apply to a prosecution instituted and conducted under subsection (1): Provided that if—

(a) the person prosecuting privately does so through a person entitled to practice as an advocate or an attorney in the Republic;

(b) the person prosecuting privately has given written notice to the appropriate public prosecutor that he or she intends to do so; and

(c) the public prosecutor has not, within 28 days of receipt of such notice, stated in writing that he or she intends to prosecute the alleged offence,

(i) the person prosecuting privately shall not be required to produce a certificate issued by the Attorney General stating that he or she has refused to prosecute the accused; and

(ii) the person prosecuting privately shall not be required to provide security for such action.

(3) The court may order a person convicted upon a private prosecution brought under subsection (1) to pay the costs and expenses of the prosecution, including the costs of any appeal against such conviction or any sentence.

(4) The accused may be granted an order for costs against the person prosecuting privately, if the charge against the accused is dismissed or the accused is acquitted or a decision in favour of the accused is given on appeal and the court finds either:

(a) that the person instituting and conducting the private prosecution did not act out of a concern for the public interest or the protection of the environment; or

(b) that such prosecution was unfounded, trivial or vexatious.

(5) When a private prosecution is instituted in accordance with the provisions of this Act, the Attorney General is barred from prosecuting except with the leave of the court concerned.

34. Criminal proceedings.—(1) Whenever any person is convicted of an offence under any provision listed in Schedule 3 and it appears that such person has by that offence caused loss or damage to any organ of state or other person, including the cost incurred or likely to be incurred by an organ of state in rehabilitating the environment or preventing damage to the environment, the court may in the same proceedings at the written request of the Minister or other organ of state or other person concerned, and in the presence of the convicted person, inquire summarily and without pleadings into the amount of the loss or damage so caused.

(2) Upon proof of such amount, the court may give judgment therefor in favour of the organ of state or other person concerned against the convicted person, and such judgment shall be of the same force and effect and be executable in the same manner as if it had been given in a civil action duly instituted before a competent court.

(3) Whenever any person is convicted of an offence under any provision listed in Schedule 3 the court convicting such person may summarily enquire into and assess the monetary value of any advantage gained or likely to be gained by such person in consequence of that offence, and, in addition to any other punishment imposed in

respect of that offence, the court may order the award of damages or compensation or a fine equal to the amount so assessed.

(4) Whenever any person is convicted of an offence under any provision listed in Schedule 3 the court convicting such person may, upon application by the public prosecutor or another organ of state, order such person to pay the reasonable costs incurred by the public prosecutor and the organ of state concerned in the investigation and prosecution of the offence.

(5) Whenever any manager, agent or employee does or omits to do an act which it had been his or her task to do or to refrain from doing on behalf of the employer and which would be an offence under any provision listed in Schedule 3 for the employer to do or omit to do, and the act or omission of the manager, agent or employee occurred because the employer failed to take all reasonable steps to prevent the act or omission in question, then the employer shall be guilty of the said offence and, save that no penalty other than a fine may be imposed if a conviction is based on this subsection, liable on conviction to the penalty specified in the relevant law, including an order under subsections (2), (3) and (4), and proof of such act or omission by a manager, agent or employee shall constitute prima facie evidence that the employer is guilty under this subsection.

(6) Whenever any manager, agent or employee does or omits to do an act which it had been his or her task to do or to refrain from doing on behalf of the employer and which would be an offence under any provision listed in Schedule 3 for the employer to do or omit to do, he or she shall be liable to be convicted and sentenced in respect thereof as if he or she were the employer.

(7) Any person who is or was a director of a firm at the time of the commission by that firm of an offence under any provision listed in Schedule 3 shall himself or herself be guilty of the said offence and liable on conviction to the penalty specified in the relevant law, including an order under subsection (2), (3) and (4), if the offence in question resulted from the failure of the director to take all reasonable steps that were necessary under the circumstances to prevent the commission of the offence: Provided that proof of the said offence by the firm shall constitute prima facie evidence that the director is guilty under this subsection.

(8) Any such manager, agent, employee or director may be so convicted and sentenced in addition to the employer or firm.

(9) In subsection (7) and (8)—

(a) “firm” shall mean a body incorporated by or in terms of any law as well as a partnership; and

(b) “director” shall mean a member of the board, executive committee, or other managing body of a corporate body and, in the case of a close corporation, a member of that close corporation or in the case of a partnership, a member of that partnership.

(10) (a) The Minister may amend Part (a) of Schedule 3 by regulation.

(b) An MEC may amend Part (b) of Schedule 3 in respect of the province of his or her jurisdiction by regulation.

CHAPTER 8

ENVIRONMENTAL MANAGEMENT COOPERATION AGREEMENTS

35. Conclusion of agreements.—(1) The Minister and every MEC and municipality, may enter into environmental management cooperation agreements with any person or community for the purpose of promoting compliance with the principles laid down in this Act.

(2) Environmental management cooperation agreements must—

- (a) only be entered into with the agreement of—
 - (i) every organ of state which has jurisdiction over any activity to which such environmental management cooperation agreement relates;
 - (ii) the Minister and the MEC concerned;
 - (b) only be entered into after compliance with such procedures for public participation as may be prescribed by the Minister; and
 - (c) comply with such regulations as may be prescribed under section 45.
- (3) Environmental management cooperation agreements may contain—
- (a) an undertaking by the person or community concerned to improve on the standards laid down by law for the protection of the environment which are applicable to the subject matter of the agreement;
 - (b) a set of measurable targets for fulfilling the undertaking in (a), including dates for the achievement of such targets; and
 - (c) provision for—
 - (i) periodic monitoring and reporting of performance against targets;
 - (ii) independent verification of reports;
 - (iii) regular independent monitoring and inspections;
 - (iv) verifiable indicators of compliance with any targets, norms and standards laid down in the agreement as well as any obligations laid down by law;
 - (d) the measures to be taken in the event of noncompliance with commitments in the agreement, including where appropriate penalties for noncompliance and the provision of incentives to the person or community.

CHAPTER 9

ADMINISTRATION OF ACT

36. Expropriation.—(1) The Minister may purchase or, subject to compensation, expropriate any property for environmental or any other purpose under this Act, if that purpose is a public purpose or is in the public interest: Provided that the Minister must consult the Minister of Minerals and Energy before any mineral rights are expropriated.

(2) The Expropriation Act, 1975 (Act No. 63 of 1975) applies to all expropriations under this Act and any reference to the Minister of Public Works in that Act must be read as a reference to the Minister for purposes of such expropriation.

(3) Notwithstanding the provisions of subsection (2), the amount of compensation and the time and manner of payment must be determined in accordance with section 25 (3) of the Constitution, and the owner of the property in question must be given a hearing before any property is expropriated.

37. Reservation.—The Minister may reserve State land with the consent of the Minister authorised to dispose of the land, and after consultation with any other Minister concerned, for environmental or other purposes in terms of this Act, if that purpose is a public purpose or is in the public interest.

38. Intervention in litigation.—The Minister may intervene in litigation before a court in any matter under this Act.

39. Agreements.—The DirectorGeneral may enter into agreements with organs of state in order to fulfil his or her responsibilities.

40. Appointment of employees on contract.—(1) The DirectorGeneral may appoint employees on contract outside the provisions of the Public Service Act, 1994 (Proclamation No. 103 of 1994), when this is necessary to carry out the functions of the Department.

(2) The DirectorGeneral must, from time to time, and after consultation with the Department of Public Service and Administration, determine the conditions of employment of such employees.

(3) Such employees must be remunerated from money appropriated for that purpose by Parliament.

41. Assignment of powers.—(1) In this section “assignment” means an assignment as contemplated in section 99 of the Constitution.

(2) The Minister must record all assignments referred to in subsection (1) in a Schedule to this Act and may amend that Schedule.

42. Delegation.—(1) The Minister may delegate a power, function or duty vested in him or her to—

(a) a named officer of the Department; or

(b) the holder of an office in the Department or, after consultation with the relevant Minister or MEC, the holder of an office of any other national department, provincial administration or municipality.

(2) A delegation referred to in subsection (1)—

(a) must be in writing;

(b) may be made subject to conditions;

(c) does not prevent the exercise of the power, function or duty by the Minister himself or herself; and

(d) may be withdrawn by the Minister.

(3) The DirectorGeneral may delegate a power, function or duty vested in him or her by or under this Act to—

(a) a named officer of the Department;

(b) the holder of an office in the Department; or

(c) after consultation with a provincial head of department, an officer in a provincial administration or municipality.

(4) The DirectorGeneral may permit a person to whom a power, function or duty has been delegated by the DirectorGeneral to delegate further that power, function or duty.

(5) A delegation referred to in subsection (3) and the permission referred to in subsection (4)—

(a) must be in writing;

(b) may be made subject to conditions;

(c) does not prevent the exercise of the power, function or duty by the DirectorGeneral himself or herself; and

(d) may be withdrawn by the DirectorGeneral.

43. Appeal to Minister.—(1) Any affected person may appeal to the Minister against a decision taken by any person acting under a power delegated by the Minister under this Act.

(2) An appeal under subsection (1) must be noted and must be dealt with in the manner prescribed.

44. Regulations in general.—(1) The Minister may make regulations—

(a) dealing with any matter which under this Act must be dealt with by regulation; and

(aA) prohibiting, restricting or controlling activities which are likely to have a detrimental effect on the environment; and

[Para. (aA) inserted by s. 2 of Act No. 56 of 2002.]

(b) generally, to carry out the purposes and the provisions of this Act.

(2) The Minister may make different regulations under this Act in respect of different activities, provinces, geographical areas and owners or classes of owners of land.

(3) The Minister may by regulation provide that infringements of certain regulations constitute criminal offences and prescribe penalties for such offences.

45. Regulations for management cooperation agreements.—(1) The Minister may make regulations concerning—

- (a) procedures for the conclusion of environmental management cooperation agreements, which must include procedures for public participation;
- (b) the duration of agreements;
- (c) requirements relating to the furnishing of information;
- (d) general conditions and prohibitions;
- (e) reporting procedures;
- (f) monitoring and inspection.

(2) An MEC or municipal council may substitute his or her or its own regulations or bylaws, as the case may be, for the regulations issued by the Minister under subsection (1) above: Provided that such provincial regulations or municipal bylaws must cover the matters enumerated in subsection (1), and comply with the principles laid down in this Act.

46. Model environmental management bylaws.—(1) The Minister may make model bylaws aimed at establishing measures for the management of environmental impacts of any development within the jurisdiction of a municipality, which may be adopted by a municipality as municipal bylaws.

(2) Any municipality may request the DirectorGeneral to assist it with the preparation of bylaws on matters affecting the environment and the DirectorGeneral may not unreasonably refuse such a request.

(3) The DirectorGeneral may institute programmes to assist municipalities with the preparation of bylaws for the purposes of implementing this Act.

(4) The purpose of the model bylaws referred to in subsection (1) must be to—

- (a) mitigate adverse environmental impacts;
- (b) facilitate the implementation of decisions taken, and conditions imposed as a result of the authorisation of new activities and developments, or through the setting of norms and standards in respect of existing activities and developments; and
- (c) ensure effective environmental management and conservation of resources and impacts within the jurisdiction of a municipality in cooperation with other organs of state.

(5) The model bylaws referred to in subsection (1) must include measures for environmental management, which may include—

- (a) auditing, monitoring and ensuring compliance; and
- (b) reporting requirements and the furnishing of information.

47. Procedure for making regulations.—(1) Before making any regulations under this Act, a Minister or MEC must—

- (a) publish a notice in the relevant Gazette—
 - (i) setting out the draft regulations; and
 - (ii) inviting written comments to be submitted on the proposed regulations within a specified period mentioned in the notice; and
- (b) consider all comments received in accordance with paragraph (a) (ii).

(2) The Minister must, within 30 days after promulgating and publishing any regulations under this Act, table the regulations in the National Assembly and the National Council of Provinces, and an MEC must so table the regulations in the

relevant provincial legislature or, if Parliament or the provincial legislature is then not in session, within 30 days after the beginning of the next ensuing session of Parliament or the provincial legislature.

(3) In considering regulations—

(a) tabled in the National Assembly, a committee of the National Assembly must consider and report to the National Assembly;

(b) tabled in the National Council of Provinces, a committee of the National Council of Provinces must consider and report to the National Council of Provinces; and

(c) tabled in a provincial legislature, a committee of that provincial legislature must consider and report to the provincial legislature, whether the regulations—

(i) are consistent with the purposes of this Act;

(ii) are within the powers conferred by this Act;

(iii) are consistent with the Constitution; and

(iv) create offences and prescribe penalties for such offences that are appropriate and acceptable.

(4) The National Council of Provinces may by resolution reject the regulations within 30 days after they have been tabled in the National Council of Provinces, and such rejection must be referred to the National Assembly for consideration.

(5) (a) The National Assembly, after considering any rejection of a regulation by the National Council of Provinces; and

(b) the relevant provincial legislature, may by resolution within 60 days after they have been tabled disapprove of the regulations, and may suspend its disapproval for any period and on any conditions to allow the Minister or MEC to correct a defect.

(6) If the National Assembly or provincial legislature disapproves of any regulation, the regulation lapses, but without affecting—

(a) the validity of anything done in terms of the regulation before it lapsed; or

(b) a right or privilege acquired or an obligation or liability incurred before it lapsed.

CHAPTER 10

GENERAL AND TRANSITIONAL PROVISIONS

48. State bound.—This Act is binding on the State except in so far as any criminal liability is concerned.

49. Limitation of liability.—Neither the State nor any other person is liable for any damage or loss caused by—

(a) the exercise of any power or the performance of any duty under this Act; or

(b) the failure to exercise any power, or perform any function or duty under this Act,

unless the exercise of or failure to exercise the power, or performance or failure to perform the duty was unlawful, negligent or in bad faith.

50. (1) Repeals sections 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 14A, 14B, 14C, 15, 27A and 38 of the Environment Conservation Act, No. 73 of 1989.

(2) Sections 21, 22 and 26 of the Environment Conservation Act, 1989 (Act No. 73 of 1989) and the notices and regulations issued pursuant to sections 21 and 22 and in force on the commencement date of this Act are repealed with effect from a date to be published by the Minister in the Gazette, which date may not be earlier than the date

on which regulations or notices made or issued under section 24 of this Act are promulgated and the Minister is satisfied that the regulations and notices under sections 21 and 22 have become redundant.

51. Savings.—Anything done or deemed to have been done under a provision repealed by this Act—

(a) remains valid to the extent that it is consistent with this Act until anything done under this Act overrides it; and

(b) subject to paragraph (a) is considered to be an action under the corresponding provision of this Act.

52. Short title.—This Act is called the National Environmental Management Act, 1998.

53. Commencement.—This Act comes into operation on a date fixed by the President in the Gazette.

Schedule 1

Section 11 (1)

National departments exercising functions which may affect the environment

- * Department of Environmental Affairs and Tourism
- * Department of Land Affairs
- * Department of Agriculture
- * Department of Housing
- * Department of Trade and Industry
- * Department of Water Affairs and Forestry
- * Department of Transport
- * Department of Defence

Schedule 2

Section 11 (2)

National departments exercising functions that involve the management of the environment

- * Department of Environmental Affairs and Tourism
- * Department of Water Affairs and Forestry
- * Department of Minerals and Energy
- * Department of Land Affairs
- * Department of Health
- * Department of Labour

Schedule 3

(Section 34)

Part (a): National Legislation

No. and year of law	Short title	Relevant provisions
Act No. 36 of 1947	Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies	Section 18 (1) (l) in so far as it relates to contraventions of sections 7 and 7bis
Act No. 71 of 1962	Animal Protection	Sections 2 (1) and 2A
Act No. 45 of 1965	Atmospheric Pollution Prevention	Section 9
Act No. 15 of 1973	Hazardous Substances	Section 19 (1) (a) and (b) in so far as it relates to contraventions of sections 3 and 3A
Act No. 57 of 1976	National Parks	Section 24 (1) (b)
Act No. 63 of 1976	Mountain Catchment Areas	Section 14 in so far as it relates to contraventions of section 3
Act No. 63 of 1977	Health	Section 27

Act No. 73 of 1980	Dumping at Sea Control	Sections 2 (1) (a) and 2 (1) (b)
Act No. 6 of 1981	Marine Pollution (Control and Civil Liability)	Section 2 (1)
Act No. 43 of 1983	Conservation of Agricultural Resources	Sections 6 and 7
Act No. 2 of 1986	Marine Pollution (Prevention of Pollution from Ships)	Section 3A
Act No. 73 of 1989	Environment Conservation	Section 29 (2) (a) and (4)
Act No. 18 of 1998	Marine Living Resources	Section 58 (1) in so far as it relates to contraventions of sections 43 (2), 45, and 47, and section 58 (2) in so far as it relates to contraventions of international conservation and management measures
Act No. 36 of 1998	National Water	Section 151 (i) and (j)

Part (b): Provincial Legislation

No. and year of law	Short title	Relevant provisions
Ordinance No. 8 of 1969	Orange Free State Conservation	Section 40 (1) (a) in so far as it relates to contraventions of sections 2 (3), 14 (2), 15 (a), 16 (a) and 33
Ordinance No. 9 of 1969	Orange Free State Townships	Section 40 (1) (a) (ii)
Ordinance No. 15 of 1974	Natal Nature Conservation	Section 55 in so far as it relates to section 37 (1), to section 49 in respect of specially protected game and to section 51 in respect of specially protected game, section 109 in so far as it relates to section 101, to section 102 and to section 104, section 154 in so far as it relates to section 152; section 185 in so far as it relates to section 183, and section 208 in so far as it relates to section 194 and to section 200
Ordinance No. 19 of 1974	Cape Nature and Environmental Conservation	Section 86 (1) in so far as it relates to contraventions of sections 26, 41 (1) (b) (ii) and (c)(e), 52 (a), 57 (a), 58 (h) and 62 (1)
Ordinance No. 12 of 1983	Transvaal Nature Conservation	Sections 16A, 42, 84, 96 and 98
Ordinance No. 15 of 1985	Cape Land Use Planning	Section 46 (1) in so far as it relates to sections 23 (1) and 39 (2)
Ordinance No. 15 of 1986	Transvaal Town Planning and Townships	Sections 42, 93 and 115
Act No. 5 of 1998	KwaZulu Natal Planning and Development	Section 48
Act No. 29 of 1992	KwaZulu Nature Conservation	Section 67 in so far as it relates to sections 59 (1), 59 (2), 60 (1) and 62 (1); section 86 in so far as it relates to sections 76, 77 and 82; and section 110 in so far as it relates to section 109

Summary

PHYSICAL PLANNING ACT NO. 125 OF 1991

The purpose of the Act is to promote the orderly physical development of the Republic, and for that purpose to provide for the division of the Republic into regions, for the preparation of national development plans, regional development plans, regional structure plans and urban structure plans by the various authorities responsible for physical planning, and for matters connected therewith.

Functions of the Minister

In order to achieve the objects of this Act, the Minister may by himself or in collaboration with or through any other Minister, any Administrator, any government, any regional or local authority or any other person do research or cause research to be done, institute any inquiry or cause any inquiry to be instituted or collect information or cause information to be collected, whether in the Republic or elsewhere, in connection with any matter which has or is likely to have an effect on the physical development of any area in the Republic, including—

- (a) the physical, social and economic characteristics of that area and, in so far as any neighbouring area has or is likely to have any effect on the physical development of that area, the physical, social and economic characteristics of any such neighbouring area;
- (b) the distribution, increase and movement and the urbanization of the population in that area;
- (c) the natural and other resources and the economic development potential of that area;
- (d) the existing and the planned infrastructure, such as water, electricity, communication networks and transport systems, in that area;
- (e) the general land utilization pattern;
- (f) the sensitivity of the natural environment.

POLICY PLANS

The Minister may cause—

- (a) a policy plan, to be known as a national development plan, to be prepared for the Republic; and
- (b) a policy plan, to be known as a regional development plan, to be prepared for a development region or any portion of such region.

The Administrator concerned may cause a policy plan, to be known as a regional structure plan, to be prepared for a planning region or any portion of such region.

The objects of a policy plan shall be to promote the orderly physical development of the area to which that policy plan relates to the benefit of all its inhabitants.

A policy plan shall consist of broad guide-lines for the future physical development of the area to which that policy plan relates.

A policy plan may provide that land shall be used only for a particular purpose or, with the consent of the Minister, an Administrator or any other authority specified in the policy plan, also for the other purposes for which provision is made in the policy plan.

LEGAL CONSEQUENCES OF PLANS

Any regional development plan, regional structure plan or urban structure plan, any regional structure plan or urban structure plan, and any urban structure plan, shall be valid so long and in so far only as it is not repugnant to or inconsistent with any national development plan, any regional development plan and any regional structure plan, respectively.

The provisions of a plan shall not enable any person to use the land in question in accordance with those provisions unless, if in terms of any other law permission, approval or authorization is required for such use, that permission, approval or authorization has been obtained.

Regulations by Minister

The Minister may make regulations as to any matter which he may consider necessary or expedient to prescribe or regulate in order that the objects of this Act may be achieved, including—

- (a) the making of surveys, the institution of inquiries and the collection of information with a view to the physical planning of any area;
- (b) the evaluation, co-ordination and dissemination of any information collected by or under this Act;
- (c) the powers, duties and functions of any authority which is in terms of this Act responsible for physical planning, including the implementation of a plan by any such authority;
- (d) the convening of and the procedure and quorum at meetings of a planning committee;
- (e) the investigation of a matter by an investigating committee and the procedure at such investigation;
- (f) the powers, duties and functions of a planning or investigating committee and of the chairman or a member of such committee;
- (g) any matter required or permitted to be prescribed in terms of this Act.

PHYSICAL PLANNING ACT

NO. 125 OF 1991

[View Regulation]

[ASSENTED TO 27 JUNE, 1991]

[DATE OF COMMENCEMENT: 30 SEPTEMBER, 1991]

(English text signed by the State President)

as amended by

Regional and Land Affairs General Amendment Act, No. 89 of 1993

ACT

To promote the orderly physical development of the Republic, and for that purpose to provide for the division of the Republic into regions, for the preparation of national development plans, regional development plans, regional structure plans and urban structure plans by the various authorities responsible for physical planning, and for matters connected therewith.

ARRANGEMENT OF SECTIONS

CHAPTER I

APPLICATION OF ACT

1. Definitions
2. General functions of Minister
3. Development and planning regions

CHAPTER II

POLICY PLANS

4. Kinds of policy plans
5. Objects of policy plans
6. Contents of policy plans
7. Establishment of planning committees
8. Constitution of planning committees
9. Proposals for inclusion in draft plans
10. Preparation of draft plans
11. Representations by interested persons
12. Establishment of investigating committees
13. Constitution of investigating committees
14. Notices of inquiries
15. Approval of draft plans
16. Commencement of policy plans
17. Removal of conflicts, ambiguities and administrative difficulties
18. Applications for amendment of policy plans
19. Amendment of policy plans
20. Review of policy plans
21. Withdrawal of policy plans

CHAPTER III

URBAN STRUCTURE PLANS

22. Urban structure plans
23. Responsible authorities

24. Contents of urban structure plans
25. Commencement of urban structure plans
26. Regulations relating to urban structure plans

CHAPTER IV LEGAL CONSEQUENCES OF PLANS

27. Effects of regional and urban structure plans
28. Mutual effect of plans
29. Permission in terms of other laws to use land
30. Offences and penalties

CHAPTER V MISCELLANEOUS

31. Allowances to members of committees
 32. Administrative work of committees
 33. Regulations by Minister
 34. State bound
 35. Exclusion of self-governing territories
 36. Repeal of laws
 37. Transitional provisions
 38. Short title and commencement
- Schedule 1 Provisions of law repealed (section 36 (1) (a))
Schedule 2 Provisions of law repealed (section 36 (1) (b))
Schedule 3 Provisions of law repealed (section 36 (1) (c))
Schedule 4 Laws repealed (section 36 (1) (d))

CHAPTER I APPLICATION OF ACT

1. Definitions.—In this Act, unless the context indicates otherwise—
“Administrator” means the administrator of a province acting in consultation with the other members of the executive committee for that province;
“committee” means any planning committee or any investigating committee;
“Department” means the Department of Regional and Land Affairs;
[Definition of “Department” substituted by s. 20 (a) of Act No. 89 of 1993.]
Wording of Sections
“Departmental Head”, in relation to any provision of this Act which applies to or is connected with—
(a) a national development plan or a regional development plan, means the Director-General;
(b) a regional structure plan, means the director-general of the provincial administration in question;
“development region” means any development region referred to in section 3 (1) (a);
“Director-General” means the Director-General: Regional and Land Affairs;
[Definition of “Director-General” substituted by s. 20 (b) of Act No. 89 of 1993.]
Wording of Sections
“draft plan”, in relation to a policy plan, means a draft of that policy plan as referred to in section 7;

“Gazette”, in relation to any notice required to be published by a Planning Authority in the Gazette—

(a) where the Minister is the Planning Authority, means the Gazette of the Republic;

(b) where any Administrator is the Planning Authority, means the Official Gazette of the province in question;

“investigating committee” means an investigating committee established under section 12;

“local authority” means any institution or body established by or under any law for a particular area with a view to the performing of local government functions in respect of that area;

“Minister” means the Minister of Regional and Land Affairs;

[Definition of “Minister” substituted by s. 20 (c) of Act No. 89 of 1993.]

Wording of Sections

“national development plan” means a national development plan referred to in section 4 (1) (a);

“plan” means a national development plan, a regional development plan, a regional structure plan or an urban structure plan;

“Planning Authority”, in relation to any provision of this Act which applies to or is connected with—

(a) a national development plan or a regional development plan, means the Minister;

(b) a regional structure plan, means the Administrator concerned;

“planning committee” means a planning committee established under section 7;

“planning region” means any planning region referred to in section 3 (1) (b);

“policy plan” means a national development plan, a regional development plan or a regional structure plan;

“prescribed” means prescribed by regulation;

“regional authority” means any regional services council established under section 3 of the Regional Services Councils Act, 1985 (Act No. 109 of 1985), or any joint services board established under section 4 of the KwaZulu and Natal Joint Services Act, 1990 (Act No. 84 of 1990);

“regional development plan” means a regional development plan referred to in section 4 (1) (b);

“regional structure plan” means a regional structure plan referred to in section 4 (2);

“regulation” means a regulation made under section 33 (1);

“responsible authority”, in relation to an urban structure plan, means the responsible authority in respect of that urban structure plan as referred to in section 23;

“this Act” includes a regulation;

“urban structure plan” means an urban structure plan referred to in section 22.

2. General functions of Minister.—(1) In order to achieve the objects of this Act, the Minister may by himself or in collaboration with or through any other Minister, any Administrator, any government, any regional or local authority or any other person do research or cause research to be done, institute any inquiry or cause any inquiry to be instituted or collect information or cause information to be collected, whether in the Republic or elsewhere, in connection with any matter which has or is likely to have an effect on the physical development of any area in the Republic, including—

(a) the physical, social and economic characteristics of that area and, in so far as any neighbouring area has or is likely to have any effect on the physical

development of that area, the physical, social and economic characteristics of any such neighbouring area;

(b) the distribution, increase and movement and the urbanization of the population in that area;

(c) the natural and other resources and the economic development potential of that area;

(d) the existing and the planned infrastructure, such as water, electricity, communication networks and transport systems, in that area;

(e) the general land utilization pattern;

(f) the sensitivity of the natural environment.

(2) The Minister shall ensure that physical planning is promoted and co-ordinated on a national and regional basis.

3. Development and planning regions.—(1) For the purposes of this Act, the Minister may by notice in the Gazette—

(a) divide the Republic into two or more development regions, describe the boundaries of each development region, and give a name to each development region;

(b) divide a development region into two or more planning regions, describe the boundaries of each planning region, and give a name to each planning region.

(2) The Minister may at any time amend or withdraw a notice referred to in subsection (1) by like notice in the Gazette.

CHAPTER II

POLICY PLANS

Introductory

4. Kinds of policy plans.—(1) Subject to the provisions of this Chapter, the Minister may cause—

(a) a policy plan, to be known as a national development plan, to be prepared for the Republic; and

(b) a policy plan, to be known as a regional development plan, to be prepared for a development region or any portion of such region.

(2) Subject to the provisions of this Chapter, the Administrator concerned may cause a policy plan, to be known as a regional structure plan, to be prepared for a planning region or any portion of such region.

5. Objects of policy plans.—The objects of a policy plan shall be to promote the orderly physical development of the area to which that policy plan relates to the benefit of all its inhabitants.

6. Contents of policy plans.—(1) A policy plan shall consist of broad guide-lines for the future physical development of the area to which that policy plan relates.

(2) A policy plan may provide that land shall be used only for a particular purpose or, with the consent of the Minister, an Administrator or any other authority specified in the policy plan, also for the other purposes for which provision is made in the policy plan.

Preparation of policy plans

7. Establishment of planning committees.—In order to cause a policy plan to be prepared, the Planning Authority concerned may by notice in the Gazette establish a planning committee to prepare a draft of that policy plan for such area as that Planning Authority may, having regard to the applicable provisions of section 4, describe in the notice.

8. Constitution of planning committees.—(1) A planning committee shall consist of persons—

(a) representing the following departments, administrations, authorities, organizations or institutions, namely—

(i) the Department and any other department of State which in the opinion of the Planning Authority should be represented on the planning committee;

(ii) in the case of a draft plan in respect of a national development plan, every provincial administration or, in the case of a draft plan in respect of a regional development plan or a regional structure plan, the provincial administration in question;

(iii) in the case of a draft plan in respect of a regional development plan, every regional authority whose region falls wholly or partly within the area in question or, in the case of a draft plan in respect of a regional structure plan, every regional authority and every local authority whose region or area of jurisdiction falls wholly or partly within the area in question;

(iv) any other organization or institution which in the opinion of the Planning Authority should be represented on the planning committee;

(b) who in the opinion of the Planning Authority are capable of rendering assistance in the preparation of the draft plan.

(2) The Planning Authority shall determine the membership of a planning committee, and shall in respect of every department, administration, authority, organization or institution required to be represented on such committee, determine the number of representatives.

(3) The Departmental Head shall appoint the members of a planning committee, and shall designate one of those members as the chairman of the planning committee.

9. Proposals for inclusion in draft plans.—The Planning Authority shall by the same notice whereby a planning committee is established, or by a subsequent notice in the Gazette, invite interested persons to submit to that planning committee within a period specified in the notice, which period shall not be less than 30 days from the date of the notice, proposals in writing for inclusion in the draft plan.

10. Preparation of draft plans.—(1) Before a planning committee prepares a draft plan, it shall consider any proposals submitted to it in accordance with section 9.

(2) A planning committee may make such investigation in connection with a draft plan, including the area to which the draft plan relates, as it may deem necessary, and for the purposes of such investigation it may in its discretion consult any department of State, provincial administration, regional or local authority or any person.

(3) After a planning committee has prepared a draft plan in respect of the area in question, it shall submit such plan to the Departmental Head.

11. Representations by interested persons.—(1) After a draft plan has been submitted to him in terms of section 10 (3), the Departmental Head shall—

(a) make copies of the draft plan available for inspection at the prescribed places; and

(b) publish twice in an Afrikaans and in an English newspaper circulating in the area to which the draft plan relates, a notice stating that such plan is available for inspection at the places specified in the notice and inviting interested persons to submit to him in writing within a period so specified, which period shall not be less than 21 days from the date of the last publication of the notice, any representations that they may wish to make in connection with the said plan.

(2) After having considered any representations submitted to him in accordance with subsection (1), the Departmental Head may make or cause to be made such further investigation in connection with the draft plan, including the area to which that draft plan relates, as he may deem necessary, and for the purposes of such investigation he may—

(a) refer any matter in connection with that draft plan to an investigating committee; or

(b) in his discretion consult any department of State, provincial administration, regional or local authority or any person.

12. Establishment of investigating committees.—A Planning Authority may at the request of the Departmental Head establish an investigating committee to inquire into any matter referred to in section 11 (2) (a), and to make recommendations to the Departmental Head in connection therewith.

13. Constitution of investigating committees.—(1) An investigating committee shall consist of three members appointed by the Planning Authority who in the opinion of the Planning Authority have particular knowledge concerning the matter which is being investigated.

(2) The Planning Authority shall designate one of the members of an investigating committee as the chairman of the investigating committee.

14. Notices of inquiries.—The chairman of an investigating committee shall—

(a) by notice in an Afrikaans and in an English newspaper circulating in the area to which the inquiry relates, make known that the investigating committee will inquire into a matter specified in the notice at a date, time and place so specified, which date shall not be less than 14 days from the date of the notice;

(b) cause to be served in the prescribed manner a copy of the notice to every person who has submitted representations in connection with the said matter in accordance with section 11 (1) (b).

15. Approval of draft plans.—(1) The Departmental Head shall submit a draft plan, any comments or representations received by him in connection therewith, the recommendations of the investigating committee, if he has referred any matter in connection with the draft plan to an investigating committee, and his own comments on such plan to the Planning Authority concerned.

(2) (a) After having considered the draft plan and any comments, representations or recommendations submitted to it, the Planning Authority may, subject to paragraph (b), in its discretion approve such plan, with such amendments as it may deem necessary, as a policy plan.

(b) Where the Planning Authority required to exercise any power under paragraph (a)—

(i) is the Minister, the State President may request him to act with the concurrence of, or after consultation with, such other Ministers as the State President may determine;

(ii) is an Administrator, the Minister may request him to act with the concurrence of, or after consultation with, himself or such other Ministers as the Minister may determine.

(c) For the purposes of paragraph (b), the requirement that the Planning Authority shall act with the concurrence of, or after consultation with, a particular Minister shall, unless the Planning Authority or the Minister concerned has otherwise directed, be deemed to have been complied with if the Departmental Head has obtained the concurrence of, or has consulted with, the director-general concerned, as the case may be.

(3) If the Planning Authority has approved a draft plan as a policy plan under subsection (2), it shall—

(a) cause copies of the policy plan to be made available for inspection at the prescribed places; and

(b) by notice in the Gazette and in an Afrikaans and in an English newspaper circulating in the area to which the policy plan relates, make known that a policy plan has been approved by it in respect of the area described in the notice and that copies thereof are available for inspection at the places so specified.

Commencement and rectification of policy plans

16. Commencement of policy plans.—A policy plan shall come into operation on the date on which the Planning Authority by notice in the Gazette in terms of section 15 (3) (b) makes known that the policy plan has been approved by it or on such later date as the Planning Authority may determine by the notice.

17. Removal of conflicts, ambiguities and administrative difficulties.—If the provisions of a policy plan are found to be in conflict with each other or to be ambiguous or to give rise to administrative difficulty in the application thereof in the area in question, the Planning Authority may by notice in the Gazette determine to what extent the relevant provisions shall apply in order to remove the conflict, ambiguity or administrative difficulty.

Amendment, review and withdrawal of policy plans

18. Applications for amendment of policy plans.—(1) Any person who has an interest in a policy plan, or any department of State, provincial administration or regional or local authority, may apply in writing to the Planning Authority concerned for the amendment of the relevant policy plan.

(2) Such person, department of State, provincial administration or regional or local authority shall furnish such additional particulars in connection with his or its application as the Planning Authority may require.

19. Amendment of policy plans.—(1) If a Planning Authority is of the opinion that it is in the interest of the future physical development of any area or that it is for any other reason desirable to amend a policy plan, it may of its own accord or on application in terms of section 18 direct the Departmental Head to prepare or cause to be prepared an amendment plan after consultation with such departments of State, provincial administrations, regional or local authorities or such persons as the Planning Authority may determine.

(2) The Departmental Head may summarily submit such amendment plan to the Planning Authority or, if he deems it fit under the circumstances, afford interested persons an opportunity to submit representations in connection with that amendment plan to him, in which case the provisions of sections 11 to 15 (1) shall mutatis mutandis apply in respect of that amendment plan.

(3) After having considered the amendment plan and any comments, representations or recommendations submitted to it, the Planning Authority may in its discretion approve such plan, with such further amendments as it may deem necessary.

(4) The provisions of sections 15 (3) and 16 shall mutatis mutandis apply in respect of an amendment plan approved under subsection (3).

20. Review of policy plans.—(1) Policy plans shall be reviewed at such intervals as the Planning Authority may in respect of each policy plan determine.

(2) For the purposes of a review referred to in subsection (1)—

(a) a review plan shall be prepared; and

(b) the provisions of sections 7 to 16 shall mutatis mutandis apply in respect of such plan:

Provided that such plan shall be approved as a new policy plan under section 15 (2) (a) and that the existing policy plan shall be deemed to have been withdrawn with effect from the date on which the new policy plan comes into operation in terms of section 16.

21. Withdrawal of policy plans.—(1) Subject to the provisions of subsection (2), a Planning Authority may at any time by notice in the Gazette withdraw any policy plan.

(2) The provisions of section 15 (2) (b) and (c) shall mutatis mutandis apply in respect of any power exercised by a Planning Authority under subsection (1).

CHAPTER III

URBAN STRUCTURE PLANS

22. Urban structure plans.—Any Administrator may, subject to a regulation made by him under section 26 (1), prepare or cause to be prepared an urban structure plan for the area or areas of jurisdiction of one or more local authorities, or any portion of such area or areas of jurisdiction, or for the region of a regional authority, or any portion of such region, within the province in question.

23. Responsible authorities.—If an urban structure plan is prepared in respect of—

(a) a single local authority, that local authority shall be the responsible authority in respect of that urban structure plan;

(b) two or more local authorities, the regional authority on which those local authorities are represented shall be the responsible authority in respect of that urban structure plan; and

(c) a regional authority, that regional authority shall be the responsible authority in respect of that urban structure plan.

24. Contents of urban structure plans.—(1) An urban structure plan shall consist of guide-lines for the future physical development of the area to which that urban structure plan relates.

(2) An urban structure plan may provide that land shall be used only for a particular purpose or, with the consent of the Minister, an Administrator or any other authority specified in the urban structure plan, also for the other purposes for which provision is made in the urban structure plan.

25. Commencement of urban structure plans.—An urban structure plan, or any amendment or review thereof, shall come into operation on a date determined by or by virtue of the applicable regulation made under section 26 (1) (c).

26. Regulations relating to urban structure plans.—(1) Any Administrator may with the approval of the Minister by notice in the Official Gazette concerned make regulations not inconsistent with a provision of this Act as to—

(a) the manner in which an urban structure plan is required or permitted to be prepared by any local authority, local authorities jointly, joint body or regional authority, or by that Administrator, including the recovery of any expenditure incurred by that Administrator in connection with the preparation of such plan when any such local authority, local authorities jointly, joint body or regional authority has failed to prepare such plan within the period determined by or under the applicable regulation;

(b) the amendment and review of such plan;

(c) the date of commencement of such plan or any amendment or review thereof;

(d) the removal of conflicts, ambiguities and administrative difficulties in the application of the provisions of such plan;

(e) the withdrawal of such plan;
(f) the powers, duties and functions of any local authority, local authorities jointly, joint body, regional authority, responsible authority or Minister responsible for local government; and

(g) in general, any matter which the Administrator may consider necessary or expedient to prescribe or regulate in order that the objects of this Chapter may be achieved.

(2) No approval shall be granted by the Minister in terms of subsection (1) unless he acts after consultation with every Minister responsible for local government and every other Administrator.

(3) For the purposes of subsection (2), the requirement that the Minister shall act after consultation with a particular Minister or Administrator shall, unless the Minister, or the Minister or Administrator concerned, has otherwise directed, be deemed to have been complied with if the Director-General has consulted with the director-general concerned.

CHAPTER IV

LEGAL CONSEQUENCES OF PLANS

27. Effects of regional and urban structure plans.—(1) As from the date of commencement of a regional structure plan in terms of section 16 or an urban structure plan in terms of section 25—

(a) no town planning scheme which is binding on that date may be amended in such a way that, and no new town planning scheme may be introduced in which, provision is made for the zoning of land for a purpose which is not consistent with the regional structure plan or the urban structure plan, as the case may be;

(b) no person shall use any land in the area to which the regional structure plan or the urban structure plan, as the case may be, applies for a purpose other than the purpose for which it—

(i) was being used immediately before that date; or

(ii) is zoned in terms of a town planning scheme which is or may become binding in that area:

Provided that land to which no such scheme applies may with the consent of, in the case of the regional structure plan, the Administrator concerned or, in the case of the urban structure plan, the responsible authority be used for any purpose determined in the relevant plan or for any other purpose which in the opinion of that Administrator or responsible authority is consistent with the relevant plan;

(c) no permission, approval or authorization shall in terms of any law or in terms of any town planning scheme be given for the subdivision or use of land in the area to which the regional structure plan or the urban structure plan, as the case may be, applies for a purpose which is not consistent with the relevant plan;

(d) all land in the area to which the regional structure plan or the urban structure plan, as the case may be, applies, other than land which is agricultural land as defined in section 1 of the Subdivision of Agricultural Land Act, 1970 (Act No. 70 of 1970), and which in terms of the relevant plan may be used for agricultural purposes only, shall be excluded from the provisions of the said Act: Provided that without the prior written approval of the Minister of Agriculture, or an officer designated by him, no permission shall be granted in terms of any law for the subdivision of land which in terms of the relevant plan may be used for agricultural purposes as well as any other purpose.

(2) The provisions of subsection (1) (b) and (c) shall not apply in respect of any right of any person to prospect for or to mine any mineral as defined in section 1 of the

Minerals Act, 1991, or the use of any land for prospecting or mining purposes, or for purposes connected therewith.

(3) For the purposes of subsection (1) “town planning scheme” includes any zoning scheme.

(4) As from the date of commencement of any amendment of a regional structure plan in terms of section 16, as applied by section 19 (4), or any amendment or review of an urban structure plan in terms of section 25, the provisions of this section shall mutatis mutandis apply in respect of such amendment or review.

28. Mutual effect of plans.—Any regional development plan, regional structure plan or urban structure plan, any regional structure plan or urban structure plan, and any urban structure plan, shall be valid so long and in so far only as it is not repugnant to or inconsistent with any national development plan, any regional development plan and any regional structure plan, respectively.

29. Permission in terms of other laws to use land.—The provisions of a plan shall not enable any person to use the land in question in accordance with those provisions unless, if in terms of any other law permission, approval or authorization is required for such use, that permission, approval or authorization has been obtained.

30. Offences and penalties.—(1) Any person who contravenes a provision of section 27 (1) (b), or of that section as applied by section 27 (4), shall be guilty of an offence and liable on conviction to a fine not exceeding R4 000 or to imprisonment for a period not exceeding one year or to both such fine and such imprisonment and, in the case of a continuing contravention, to a fine not exceeding R200 for every day during which the contravention continues.

(2) Whenever any person is convicted of an offence referred to in subsection (1), the court convicting him may summarily enquire into and determine the monetary value of any advantage which he may have gained in consequence of that offence, and, in addition to any other punishment that may be imposed in respect of that offence, impose on him a fine equal to the amount so determined or, in default of payment thereof, imprisonment for a period not exceeding one year.

(3) Notwithstanding anything to the contrary in any other law contained, a magistrate’s court shall have jurisdiction to impose any penalty provided for in this section.

CHAPTER V

MISCELLANEOUS

31. Allowances to members of committees.—A member of a committee who is not in the full-time employment of the State may from money appropriated for that purpose by Parliament be paid such travelling and subsistence and other allowances in respect of the services rendered by him in connection with the affairs of the committee as the Planning Authority may, with the concurrence of the Minister of Finance, determine either in general or in any particular case.

32. Administrative work of committees.—The administrative work incidental to the performance of the functions of a committee shall be performed by officers of the Department or the provincial administration in question, as the case may be, designated for that purpose by the Departmental Head concerned.

33. Regulations by Minister.—(1) The Minister may make regulations as to any matter which he may consider necessary or expedient to prescribe or regulate in order that the objects of this Act may be achieved, including—

(a) the making of surveys, the institution of inquiries and the collection of information with a view to the physical planning of any area;

- (b) the evaluation, co-ordination and dissemination of any information collected by or under this Act;
- (c) the powers, duties and functions of any authority which is in terms of this Act responsible for physical planning, including the implementation of a plan by any such authority;
- (d) the convening of and the procedure and quorum at meetings of a planning committee;
- (e) the investigation of a matter by an investigating committee and the procedure at such investigation;
- (f) the powers, duties and functions of a planning or investigating committee and of the chairman or a member of such committee;
- (g) any matter required or permitted to be prescribed in terms of this Act.

(2) Different regulations may be made under subsection (1) in respect of different plans.

34. State bound.—The provisions of this Act shall bind the State, including any provincial administration, except in so far as criminal liability is concerned.

35. Exclusion of self-governing territories.—(1) Subject to the provisions of subsection (2), the provisions of this Act shall not apply to any area for which a legislative assembly has been established under the Self-governing Territories Constitution Act, 1971 (Act No. 21 of 1971): Provided that any such area may with the prior written approval of the government concerned be included in any national development plan.

(2) If the Government of the Republic and the government of any such area agree thereto, the State President may, notwithstanding anything to the contrary contained in the said Act, by proclamation in the Gazette—

- (a) declare that this Act and any regulation made thereunder shall apply to that area to the extent stated in the declaration;
- (b) amend or adapt this Act or any regulation made thereunder in order to regulate its application in that area;
- (c) repeal or amend any law of the legislative assembly of that area in order to regulate any matter which, in his option, requires to be regulated in consequence of such application.

36. Repeal of laws.—(1) Subject to the provisions of subsection (2)—

- (a) the provisions of the law mentioned in Schedule 1 are hereby repealed to the extent indicated in the third column of that Schedule;
- (b) the provisions of the law mentioned in Schedule 2 are hereby repealed to the extent indicated in the third column of that Schedule;
- (c) the provisions of the law mentioned in Schedule 3 are hereby repealed to the extent indicated in the third column of that Schedule; and
- (d) the laws mentioned in Schedule 4 are hereby repealed to the extent indicated in the third column of that Schedule.

(2) The provisions of—

- (a) paragraph (b) of subsection (1) shall come into operation on the date on which the Minerals Act, 1991, comes into operation;
- (b) paragraph (c) of subsection (1) shall come into operation on a date fixed by the State President by proclamation in the Gazette; and
- (c) paragraph (d) of subsection (1) shall come into operation on the date mentioned in paragraph (a) or on the date mentioned in paragraph (b), whichever is the later date.

37. Transitional provisions.—(1) Notwithstanding the repeal by section 36 (1) (a) of those provisions of the Physical Planning Act, 1967 (Act No. 88 of 1967), which relate to guide plans—

(a) any guide plan committee which was established under any such provisions and has not yet completed the draft guide plan in question at the commencement of this Act, shall continue to exist and shall perform its functions as if the repeal had not been effected;

(b) any draft guide plan compiled by the said committee shall be dealt with as if the repeal had not been effected;

(c) any guide plan, irrespective of whether it was approved under any such provisions before or after the commencement of this Act, shall continue in force and shall apply in the area for which it was compiled as if the repeal had not been effected; and

(d) any such provisions which but for the repeal would have been applicable to the said guide plan, shall continue to be applicable to such guide plan as if the repeal had not been effected.

(2) The Minister may at any time by notice in the Gazette—

(a) declare—

(i) that the provisions of paragraph (c) and (d) of subsection (1) shall with effect from a date specified in the notice cease to apply in respect of a guide plan so specified;

(ii) that such guide plan with effect from that date—

(aa) shall for the purposes of the provisions of this Act be deemed to be a regional structure plan which has in terms of those provisions been prepared for the area described in the notice; or

(bb) shall for the purposes of the provisions of this Act or the applicable regulations referred to in section 26, irrespective of whether those regulations have already been made or not, be deemed to be an urban structure plan which has in terms of those regulations been prepared for the area described in the notice; and

(iii) if such guide plan is deemed under subparagraph (ii) (bb) to be an urban structure plan, that a regional authority or a local authority specified in the notice shall for the purposes of the provisions of this Act be deemed to be the responsible authority in respect of that urban structure plan; or

(b) withdraw a guide plan specified in the notice with effect from a date so specified.

38. Short title and commencement.—This Act shall be called the Physical Planning Act, 1991, and shall come into operation on a date fixed by the State President by proclamation in the Gazette.

Schedule 1

PROVISIONS OF LAW REPEALED (Section 36 (1) (a))

No. and year of law	Short title	Extent of repeal
Act No. 88 of 1967	Physical Planning Act, 1967	1. The whole, except those sections referred to in paragraph 2 and the third column of Schedules 2 and 3.

2. Sections 1, 7, 8, 9 (2) to (4), 9A, 11, 12 (1), 13, 13B and 14 in so far as those sections relate to—

(a) the zoning, subdivision and use of land for industrial purposes;

(b) guide plans; or

(c) any matter incidental to a matter referred to in paragraph (a).

Schedule 2

PROVISIONS OF LAW REPEALED (Section 36 (1) (b))

No. and year of law	Short title	Extent of repeal
Act No. 88 of 1967	Physical Planning Act, 1967	1. Sections 4 and 6B. 2. Sections 1, 7, 8, 9 (2) to (4), 9A, 10, 11, 12 (1), 13, 13B and 14 in so far as those sections relate to— (a) the reservation of land for the utilization of natural resources; (b) the restriction on the use of land for the purposes of any brickmaking, stonecrushing, sand-washing or quarry, or for the processing of any mineral in any other manner; or (c) any matter incidental to a matter referred to in paragraph (a) or (b).

Schedule 3

PROVISIONS OF LAW REPEALED (Section 36 (1) (c))

No. and year of law	Short title	Extent of repeal
Act No. 88 of 1967	Physical Planning Act, 1967	1. Sections 5, 6 and 12 (4). 2. Sections 1, 7, 8, 9 (2) to (4), 9A, 10, 11, 12 (1), 13, 13B and 14 in so far as those sections relate to controlled areas, or to any matter incidental thereto.

Schedule 4

LAWS REPEALED (Section 36 (1) (d))

No. and year of law	Short title	Extent of repeal
Act No. 73 of 1975	Physical Planning and Utilization of Resources Amendment Act, 1975	The whole.
Act No. 104 of 1977	Environment Planning Amendment Act, 1977	The whole.
Act No. 51 of 1981	Environment Planning Amendment Act, 1981	The whole.
Act No. 87 of 1983	Physical Planning Amendment Act, 1983	The whole.
Act No. 104 of 1984	Physical Planning Amendment Act, 1984	The whole.
Act No. 92 of 1985	Physical Planning Amendment Act, 1985	The whole.
Act No. 109 of 1985	Regional Services Councils Act, 1985	So much of Schedule 3 as relates to the Physical Planning Act, 1967.
Act No. 97 of 1986	Transfer of Powers and Duties of the State President Act, 1986	So much of Schedules 1 and 2 as relates to the Physical Planning Act, 1967.

Act No. 84 of 1990 KwaZulu and Natal Joint Services Act, 1990
of Schedule 3 as relates to the Physical Planning Act, 1967.

So much

THE COMPANIES ACT, NO 61 OF 1973
(AS AMENDED)
ARTICLES OF ASSOCIATION
OF
DOME BERGLAND CONSERVANCY
(ASSOCIATION INCORPORATED UNDER SECTION 21)

REGISTRATION NUMBER:

- A. The Articles of Table 'A' contained in Schedule 1 of the Companies Act 1973 shall not apply to the Association.**
- B. The Articles of the Association are as follows:**

DEFINITIONS

- 1. In these Articles, unless the context otherwise requires:**

Expressions defined in the Companies Act, 1973 (as amended) shall have the meaning given to them in that Act;

Words importing the singular shall include the plural and vice versa;

Words importing persons shall include any natural person, partnership, firm, syndicate, society or other voluntary association and any Association or body, whether corporate or not; and

The following words and expressions shall have the following meanings, namely:

"The Act" means the Companies Act, 1973 (as amended);

"In writing" or "Written" includes typewriting, printing and lithography;

"Month" means calender month;

"The Office" means the Registered Office for the time being of the Association;

"Transfer Office" means the place where the Register of Members is kept.

"Conservancy" means the area known as the Vredefort Dome Conservancy and any additional areas incorporated from time to time as decided by the

board of directors.

2. The Association is an Association incorporated not for gain and is accordingly subject to all the provisions of the Companies Act applicable to such Associations.

MEMBERSHIP

3.
 - 3.1. Membership of the Association will be open to owners of immovable property situated within the Conservancy being, Trusts, Companies, Closed Corporations, State Departments and Organisations, who shall appoint their Official Representative in writing, and to individual persons;
 - 3.2. Where any immovable property is owned by more than one person, all the registered owners of that immovable property shall together be deemed to be one member of the association and have the rights and obligations of one member of the association, provided however that all co-owners of any immovable property shall be jointly and severally liable for the due performance of any obligations of the association.
 - 3.3. When any member disposes of his immovable property within the Conservancy, he shall *ipso facto* cease to be a member of the association.
 - 3.4. Membership may be terminated for non-payment of dues, or conduct which in any way tends to injure the Association or to affect adversely its reputation, or which is contrary to or destructive to its objectives;
 - 3.5. In the event of the winding up of a Member the liability of such Member shall be limited to the amount unpaid on subscriptions, membership fees, special fees, annual or otherwise, in respect of the financial year in which the winding up of the Member may commence. The provisions hereof will in no way affect any liability of such Member arising otherwise than by virtue of membership of the Association;
 - 3.6. Any member whose name has been entered in the Register of Members of the Association, shall from such date remain a Member for at least the period ending with the last day of the Association's financial year during which such Member's name was registered;
 - 3.7. In the event of any Member of the Association being wound up and whether it be compulsory or voluntary; or amalgamating with any other person, or being reconstructed, continued membership on the same conditions on which such Member was elected and registered, shall be subject to review and confirmation by the Board of Directors;
 - 3.8. Membership may be terminated on either a Member's or the Association's part by at least one calendar month's written notice being given of the intention so to terminate, such notice to reach the Association's Head Office by not later than the first day of the month prior to the annual renewal date of the Member's subscription. All reciprocal rights and duties shall terminate on expiration of such notice;

- 3.9. Notwithstanding anything herein contained a Member whose membership has terminated shall be liable for and pay all arrear membership or annual subscription or other fees.
- 3.10. Members of the association shall observe all rules made by the association or its directors and abide thereby.

GENERAL MEETINGS

- 4. 4.1. The Annual General Meeting shall be held within a period of 12 (TWELVE) weeks after the financial year end;
- 4.2. The Directors may, whenever they think fit, convene a General Meeting of Members which shall be known as an Extraordinary General Meeting, and may be held at such time and place as the Board of Directors may from time to time decide; provided that the Board of Directors shall, on being requisitioned in writing by not less than 10 (TEN) Members, convene an Extraordinary General Meeting;
- 4.3. An Annual General meeting and a meeting called for the passing of a Special Resolution shall be called by 21 (TWENTY-ONE) days notice in writing at the least, and any other Meeting shall be called by 14 (FOURTEEN) days notice in writing at the least. The notice shall be exclusive of the day on which it is served or deemed to be served and of the day for which it is given, and shall specify the place, the day and the hour of the Meeting and, in the case of special business, the general nature of that business, and shall be given, in a manner hereinafter mentioned or in such other manner, if any, as may be prescribed by the Board of Directors, to such persons as are, under the Articles of the Association, entitled to receive such notices;
- 4.4. All business shall be deemed special that is transacted at an Extraordinary Meeting, and all that is transacted at an Annual General Meeting, with the exception of the consideration of the accounts, balance sheets, and the ordinary reports of Directors and Auditors, the election of Directors in place of those retiring by rotation, and the fixing of the remuneration of the Auditors;
- 4.5. No business shall be transacted at any General Meeting unless a quorum of Members is present at the time when the Meeting proceeds to business; Save as herein otherwise provided, 10 (TEN) or at least 3 (THREE) Members personally present shall be a quorum;
- 4.6. If within half an hour from the time appointed for the Meeting a quorum is not present, the meeting, if convened upon the requisition of Members, shall be dissolved; in any other case it shall stand adjourned to the same day in the next week, at the same time and place, or, if that day be a public holiday, to the next succeeding day other than a public holiday, and if at

such adjourned Meeting a quorum is not present within half an hour from the time appointed for the Meeting, the Members present shall be a quorum;

- 4.7. The Chairman, if any, of the Board of Directors, shall preside as Chairman at every General Meeting of the Association. If there is no such Chairman, or if at any Meeting he is not present within 15 (FIFTEEN) minutes after the time appointed for holding of the Meeting or is unwilling to act as Chairman, the Members present shall choose someone of their number to be Chairman;
- 4.8. The Chairman may, with the consent of any Meeting at which a quorum is present (and shall if so directed by the Meeting), adjourn the Meeting from time to time and from place to place, but no business shall be transacted at any adjourned Meeting other than the business left unfinished at the Meeting from which the adjournment took place;
- 4.9. At any General Meeting a resolution put to the vote of the Meeting, shall be decided on a show of hands, unless a poll (before or on the declaration of the result of the show of hands) is demanded, and, unless a poll is so demanded a declaration by the Chairman, that a resolution has, on a show of hands, been carried, or carried unanimously, or by a particular majority, or lost, and an entry to that effect in the book of the proceedings of the Association shall be conclusive evidence of the fact, without proof of the number or proportion of the votes recorded in favour of, or against such resolution;
- 4.10. If a poll is duly demanded it shall be taken in such manner as the Chairman directs, and the result of the poll shall be deemed to be the resolution of the Meeting at which the poll was demanded. Scrutineers shall be elected to declare the result of the poll, and their decision, which shall be given by the Chairman of the Meeting, shall be deemed to be the resolution of the Meeting at which the poll is demanded;
- 4.11. In the case of an equality of votes, whether on a show of hands or on a poll, the Chairman of the Meeting at which the show of hands takes place or at which the poll is demanded, shall be entitled to a second or casting vote;
- 4.12. A poll demanded on the election of a Chairman, or on a question of adjournment, shall be taken forthwith. A poll demanded on any other question shall be taken at such a time as the Chairman of the Meeting directs. The demand for a poll shall not prevent the continuation of a Meeting for the transaction of any business other than the question upon which the poll has been demanded;
- 4.13. Any resolutions which require ratification at the Annual General Meeting must be submitted and received in writing by the Secretary at least two (2) weeks before the end of the financial year;
- 4.14. The quorum of any General Meeting shall be 10 (TEN) attending Members. Member Companies, State Departments and Organisations and Trusts

shall be represented by one person per such Member.

- 4.15. A copy of the agenda for every Meeting shall be forwarded to each Member and shall accompany the required notice.

VOTES OF MEMBERS

5. 5.1. On a show of hands every Member present in person, or duly represented by a proxy, shall have one vote;
- 5.2. No Member shall be entitled to vote at any General Meeting if subscriptions and/or special fees presently payable by him are more than thirty (30) days past due date for payment;
- 5.3. On a poll votes may be given either personally or by proxy or by the duly appointed representative of a Member;
- 5.4. The instrument appointing a proxy shall be in writing, and, in the case of a corporate body member, under the hand of an Officer or agent authorised by such corporate body Member. The holder of a General or Special Power of Attorney given by a Member shall be entitled to vote, if duly authorised under that power, to attend and take part in the meetings and proceedings of the Association, whether or not he be himself a Member of the Association;
- 5.5. The instrument appointing a proxy and the Power of Attorney or other valid authority, if any, under which it is signed or a notarially certified copy of such power or authority shall be deposited at the Registered Office of the Association not more than 48 (forty eight) hours before the time for holding the Meeting at which the person named in the instrument proposes to vote, and in default the instrument of proxy shall not be treated as valid. No instrument appointing a proxy shall be valid after the expiration of 6 (six) months from the date when it was signed, unless so specifically stated in the proxy itself, and no proxy shall be used at an adjournment Meeting which could not have been used at the original Meeting;
- 5.6. An instrument appointing a proxy may be in the following form, or in any other form which the Board of Directors shall approve:

GENERAL PROXY VOTING FORM

DOME BERGLAND CONSERVANCY (ASSOCIATION INCORPORATED UNDER SECTION 21)

PROXY VOTING FORM

I,
being a Member of the Association hereby appoint
of
or failing him

of
or failing him
of

as my proxy to vote for me and on my behalf at the Annual General (or Extraordinary as the case may be) General Meeting of the Association to be held on the _____ day of 19____ and at any adjournment thereof as follows:

In favour of Against Abstain

Resolution 1 _____

Resolution 2 _____

Resolution 3 _____

(Indicate instruction to proxy by way of a cross in space provided above.)

Except as instructed above, my proxy may vote as he thinks fit.

SIGNED this day of 19

MEMBER'S SIGNATURE

(NOTE - A member entitled to attend and vote is entitled to appoint a proxy to attend, speak and on a poll vote in his stead, and such proxy need not also be a Member of the Association.)

BOARD OF DIRECTORS

- 6. 6.1. The affairs of the Association shall be governed by a Board of Directors, elected from members of the Company, who will, in turn, elect its Chairman from amongst its number;
- 6.2. The first Directors will number seven(7).
- 6.3. The Board shall consist of not less than four (4) nor more than twelve (12) Directors.
- 6.4. The existence of a vacancy in the Board through death, resignation, business move, or other cause, shall be confirmed and filled by the Board. The Board shall take steps to fill such a vacancy for a period not to exceed the unexpired term of the office vacated;
- 6.5. The Board of Directors may designate or appoint one or more committees

which shall have such powers as the Board may confer upon them from time to time;

- 6.6. The Board shall have full control of the direction and activities of the Association, subject to the limitations of the Memorandum and Articles of Association. The Board shall have the power to regulate its own proceedings;
- 6.7. A quorum for any Board meeting for conducting routine Association business shall be a simple majority of the Board;
- 6.8. In conducting the affairs of the Association, the Board may, by resolution adopt Bylaws in harmony with this Memorandum and Articles of Association;
- 6.9. The Board may, by majority vote of the Members present at any Meeting, establish, amend, or revise procedures for the conduct of the business affairs of the Association, for the ordering and conduct of its professional or business meetings, and for the guidance of its committees in their work.
- 6.10. The Board may accept gifts of money or other things of value for and in the name of the Association. The deposit, investment and disbursement of all funds shall be subject to the direction of the Board;
- 6.11. The Board shall have the authority to establish and fix the location of an official headquarters of the Association;
- 6.12. The Board may designate Honorary Membership of, and a Legal Counsel for, the Association;
- 6.13. The Board may appoint a Managing Director of the Association, define his duties and fix his compensation and tenure of office. The Board may also be required to approve the establishment of additional executive post(s) when such action would facilitate the transaction of the Association business;
- 6.14. The Board will meet at least twice per year, or more often, as deemed necessary, to suit the needs for the orderly management of the Association;
- 6.15. The Directors may from time to time entrust to, or confer upon the Managing Director for the time being of the powers and authorities vested in them, as they think fit, and may confer such powers and authorities for such time and to be exercised for such objects and purposes and upon such terms and conditions and with such restrictions as they may think expedient; and they may confer such powers and authorities either collaterally or to the exclusion of, and in substitution for, all or any of the powers and authorities of the Directors and may from time to time revoke or vary all or any of such powers and authorities;
- 6.16. The Directors may meet together for the despatch of business, adjourn and otherwise regulate their Meetings as they think fit. Questions arising at

any Meeting shall be decided by a majority of votes. In case of an equality of votes the Chairman shall have a second or casting vote. A Director may, and the Secretary on the requisition of a Director shall, at any time, summons a Meeting of the Directors;

- 6.17. The Directors may elect a Chairman of their Meetings and determine the period for which he is to hold office; but if no such Chairman is elected, or if at any Meeting the Chairman is not present within 15 (FIFTEEN) minutes after the time appointed for holding the same, the Directors present may choose one of their number to be Chairman of the Meeting;
- 6.18. The Directors may delegate any of their powers to committees consisting of such Member or Members of their body as they think fit; any committee so formed shall, in the exercise of the powers so delegated, conform to any Articles that may be imposed on them by the Directors;
- 6.19 A committee may elect a Chairman of the Meetings, if no such Chairman is elected, or if at any Meeting the Chairman is not present within 15 (FIFTEEN) minutes after the time appointed for holding the same, the Members present may choose one of their number to be Chairman of the Meeting;
- 6.20 A committee may meet and adjourn as it thinks proper. Questions arising at a Meeting shall be determined by a majority of votes of the Members present, and in case of an equality of votes the Chairman shall have a second or casting vote;
- 6.21 All acts done by any Meeting of the Directors or of a committee of Directors or by any person acting as a Director shall, notwithstanding that it be afterwards discovered that there was some defect in the appointment of any such Directors or persons acting as aforesaid, or, that they or any of them were disqualified, be as valid as if every such person had been duly appointed to be a Director.

DISQUALIFICATION OF DIRECTORS

7. 7.1. The office of Director shall be vacated, if the Director:
 - (i) Ceases to be a Director by virtue of Section 68 bis (2) of the Companies Act, 1973, as amended; or
 - (ii) Without the consent of the Board holds any other office of profit under the Association except that of Managing Director; or
 - (iii) Becomes insolvent; or
 - (iv) Is found lunatic or becomes of unsound mind; or
 - (v) Resigns his office by notice in writing to the Association; or

- (vi) Is directly or indirectly interested in any contract with the Association or participates in the profits of any contract with the Association; or
 - (vii) Becomes prohibited from being a Director by reason of any order made under the Companies Act, 1973, as amended.
- 7.2. Provided, however, that a Director shall not vacate his office by reason of his being a Member of any corporation which has entered into contract with or done any work for the Association if he shall have declared the nature of his interest in a manner required by the Companies Act, 1973, as amended, but the Director shall not vote in respect of any such contract or work or any matter arising therefrom, and if he does so vote his vote shall not be counted.

ROTATION OF DIRECTORS

8. 8.1. At the first Annual General Meeting of the Association, 1/3 (ONE-THIRD) of the Directors shall retire from office and at the Annual General Meeting in every subsequent year, 1/3 (ONE-THIRD) of the Directors, or if their number is not a multiple of three, then the number nearest to 1/3 (ONE-THIRD), shall retire from office. This will not apply to the Managing Director if so appointed;
- 8.2. The Directors to retire in every year shall be those who have been longest in office since their last election, but as between persons who became Directors on the same day, those to retire shall, unless they otherwise agree among themselves, be determined by lot;
- 8.3. A retiring Director shall be eligible for re-election;
- 8.4. The Association at the General Meeting at which a Director retires in manner aforesaid may fill up the vacated office by electing a person thereto;
- 8.5. Nominations for the election of new Directors to the Board at General Meetings must, however, be submitted to reach the Secretary of the Association at least 48 (FORTY EIGHT) hours before the time of the meeting;
- 8.6. If at any meeting at which an election of Directors ought to take place, the places of the vacating Directors are not filled up, the Meeting shall stand adjourned till the same day in the next week at the same time and place, or if that day be a public holiday, to the next succeeding day which is not a public holiday and if at such adjourned Meeting the places of the vacating Directors are not filled up, the vacating Directors, or such of them as have not had their places filled up shall be deemed to have been re-elected at such adjourned Meeting;
- 8.7. Unless the Members otherwise determine in a General Meeting any casual vacancy occurring in the Board of Directors may be filled up by the

Directors, but the person so chosen shall be subject to retirement at the same time as if he had become a Director on the day on which the Director in whose place he is appointed was last elected Director;

- 8.8. The Association may by ordinary resolution of which special notice has been given in accordance with the Companies Act, 1973 as amended, remove any Director before the expiration of his period of office, notwithstanding anything in these Articles or in any agreement between the Association and such Director. Such removal shall be without prejudice to any claim such Director may have for damages for breach of contract of service between him and the Association.

BORROWING POWERS

9. 9.1. The Directors may exercise all the powers of the company to borrow money and to mortgage or bind its undertaking and property or any part thereof and may open a banking or similar account at any financial institution as set out in the Memorandum of Association.
- 9.2. The Directors may secure the repayment of such loans in such manner and on such conditions as they may think fit, including the passing of mortgage bonds.

MEMBERSHIP FEES

10. 10.1. The membership fees, if any, pertaining to each classification of membership shall be set by the Board of Directors;
- 10.2. The Board of Directors may revise the fees on an annual basis. Any such revision to the fees will be advised at the Annual General Meeting and also communicated by written notice to each Member. Revised fees will be retroactive to the beginning of the financial year, and operate on a financial year basis.

PAYMENT OF FEES

11. 11.1. Annual membership fees as may be determined are due and payable in advance at the beginning of each financial year, and Members will be invoiced during March at the rates pertaining at the end of the preceding financial year;
- 11.2. Following any revision of fees and advice thereof as per Articles 10.1. and 10.2. such revised amounts will be invoiced by the Association and become due and payable on presentation;
- 11.3. Entrance and annual membership fees as may be determined shall be due

and paid together with application for membership;

- 11.4. Intention to resign must be received in writing at least 30 (THIRTY) days prior to the financial year end, or the Member will be liable for the fees as invoiced in the subsequent March except in so far as may be considered and agreed to otherwise by the Board of Directors.

LIABILITY

12. 12.1. The liability of Members to the Association shall be limited to the amount of their annual membership fee, as per Articles 10.1. and 10.2. or if membership fees are deferred, the amount recorded in Clause 9 of the memorandum of association of the Association
- 12.2. Every Director or Officer of the Association, or any person, whether an Officer of the Association or not, employed by the Association as auditor, shall be indemnified out of the funds of the Association against all liability incurred by him as such Director, Officer or Auditor, in defending any proceedings, whether civil or criminal, or in which Judgment is given in his favour, or in which he is acquitted, or in connection with any application under the Companies Act, 1973 as amended;
- 12.3. No Director, Secretary or other Officer or servant of the Association shall be liable for the acts, receipts, neglects or defaults of any other Director or Officer or servant, or for joining in any receipt or other act for conformity, or for loss or expense happening to the Association through the insufficiency or deficiency of any security in or upon which any of the monies of the Association shall be invested, or for any loss or damage arising from the bankruptcy, insolvency or tortious acts of any person with whom any monies, securities or effects shall be deposited, or for any loss or damage occasioned by any error of Judgment or oversight on his part, or for any other loss, damage or misfortune whatever which shall happen in the execution of the duties of his office, or in relation thereto, unless the same happen through his own negligence or dishonesty.
- 12.4. No liability shall be attached to the Association by, or on behalf of a Member.

MINUTE AND MINUTE BOOKS

13. The Directors shall, in terms of Section 204 of the Act, cause minutes to be kept:-
 - 13.1. Of all appointments of officers;
 - 13.2. Of names of Directors present at every Meeting of the Association and of the Directors; and
 - 13.3. Of all proceedings at all Meetings of the Association and of the Directors.

Such minutes shall be signed by the Chairman of the Meeting at which the proceedings took place or by the Chairman of the next succeeding Meeting.

REGISTERS

14. The Association shall keep at the places prescribed by the Act and maintain in proper form and in the manner prescribed by the Act the undermentioned Registers, namely:-

14.1. Register of Members;

14.2. Register of Pledges and Bonds;

14.3. Register of Directors and Officers;

14.4. Register of Declaration of Interest in Contracts by Directors and Officers;

14.5. Attendance Registers in respect of Association, Directors' and Managers' Meetings;

14.6. Register of Fixed Assets;

ACCOUNTS

15. The Directors shall cause true accounts as required by the Act to be kept of the sums of money received and expended by the Association, and the matter in respect of which such receipts and expenditure take place, and of the assets, credits and liabilities of the Association. The books of accounts shall be kept at the Office of the Association, or at such place or places as the Directors think fit.

16. The Directors shall from time to time determine whether and to what extent and at what times and places, and under what conditions or regulations the accounts and books of the Association, or any of them, shall be open to the inspection of Members, and no Member (not being a Director) shall have any right to inspect any account or book or document of the Association except as conferred by the Act or authorised by the Directors.

17. At each Annual General Meeting the Directors shall lay before the Association Annual Financial Statements containing the Balance Sheet, Statements and Reports referred to in Section 286 of the Act.

18. The Report of the Directors shall comply with Section 299 of the Act and the Report of the Auditor shall comply with Section 301 of the Act. The Income Statement, Reports and Balance Sheets shall be signed on behalf of the Directors by 2 (TWO) Directors.

19. A copy of the Annual Financial Statements shall at least 21 (TWENTY-ONE) days prior to the Annual General Meeting be made available on written request to every Member of the Association.

AUDITORS

20. The duly appointed Auditors of the Association shall, subject to the provisions of the Act, hold office until another appointment or other appointments to the office shall be made at an Annual General Meeting of the Association, and the provisions of Sections 270 and 271 of the Act shall apply to and be complied with in connection with any appointment proposed to be made, made or not made of an Auditor or Auditors of the Association. The remuneration of the Auditor or Auditors shall be fixed by the Association at each Annual General Meeting.
21. An Auditor may or may not be a Member of the Association, but no person shall be qualified for appointment as Auditor of the Association if he is:-
 - 21.1. A Director, Officer or Employee of the Association;
 - 21.2. A Director, Officer or Employee of any Association performing secretarial work for the Association;
 - 21.3. A Partner or Employer or Employee of a Director or an Officer of the Association;
 - 21.4. A person who by himself or his Partner or Employee habitually or regularly performs the duties of Secretary or Bookkeeper of the Association;
 - 21.5. A body corporate;
 - 21.6. A person who at any time during the financial year was a Director or Officer of the Association; or
 - 21.7. Not qualified to act as such under the Public Accountants' and Auditors' Act, 1951 (Act No 51 of 1951).
22. The appointment, powers, rights, remunerations and duties of the Auditors shall be regulated by the provisions of the Act.
23. Any vacancy occurring in the office of an Auditor whether by reason of resignation or otherwise, shall be filled by the Directors in accordance with the provisions of Section 280 or Section 273 as the case may be, and any person so appointed shall, subject to the provisions of Section 270 of the Act, continue in office until the Annual General Meeting next after his appointment, but if there be more than one incumbent, a casual vacancy in the office of Auditor may, subject to the provisions of Section 280 of the Act, be filled by the Director and while any such vacancy continues the surviving and continuing Auditor or Auditors may continue to act.
24. Every account of the Association, when audited and approved by a General Meeting, shall be conclusive, except as regards any error discovered therein

within 3 (THREE) months after the approval thereof.

NOTICES

- 25. All notices intended or required to be given by the Association to any Member of the Association shall be given either personally or by sending the same through the post by a prepaid letter, envelope or wrapper addressed to such Member at his registered address, or to such member by electronic mail addressed to such address as provided by the member.**
- 26. Each Member in the Association shall notify in writing to the Association an address, which address shall be his registered address within the meaning of the last preceding Article and if he has not named such an address he shall be deemed to have waived his right to be served with notices.**
- 27. Any notice sent by post or electronic mail shall be deemed to have been given on the day on which the letter, envelope or wrapper containing the same is posted, or sent by electronic mail, and in proving such service it shall be sufficient to prove that the letter, envelope or wrapper containing the notice was properly addressed and put in the post.**
- 28. Any notice or document delivered or sent by post to or electronic mail or left at the registered address of any Member in pursuance of these presents, shall, notwithstanding that such Member was then deceased, and whether or not the Association has notice of his decease, be deemed to have been duly served in respect of any Unit, whether held solely or jointly with other persons by such Member until some other person be registered in his stead as the sole or joint Holder thereof, and such service shall for all purposes of these presents be deemed a sufficient service of such notice or document on his or her heirs, executors or administrator, and all persons (if any) jointly interested with him or her in any such Unit.**
- 29. Where a given number of days notice, or notice extending over any other period is required to be given, the day of service shall not, except if it be otherwise so provided, be counted in such number of days or other period.**

RULES

- 30. 30.1. Subject to any restriction imposed or direction given at a general meeting of the conservancy, the Directors may from time to time make rules which may include house rules in regard to:**
 - 30.1.1. the standards and guidelines for the architectural design of all buildings and outbuildings, structures of any nature and all additions and alterations to any such building, outbuildings or structures erected or to be erected in the conservancy area, and in particular to control the design of the exterior of such buildings, outbuildings, or structures and the materials and colours used on such exterior to ensure an attractive, aesthetically pleasing**

character to all the buildings in the conservancy area;

30.1.2. the standard and guidelines for the design of all site works, buildings, structures, installations and projections on the properties in the Conservancy.

30.1.3. the preservation of the environment including the rights to control vegetation and the right to control the erection of walls, fences and hedges, upon the boundaries of any property;

30.1.4. the right to prohibit, restrict or control the keeping of any animal which they regard as dangerous or a nuisance;

30.1.5. the access to and egress from any of the properties in the Conservancy area;

30.1.6. the right to determine and control all security measures in the Conservancy;

30.1.7. the conduct of any persons within the Conservancy area for the prevention of nuisance of any nature to any member;

30.1.8. the control and collection of refuse;

30.1.9. the furtherance and promotion of any of the objects of the Conservancy and/or for the better management of the affairs of the Conservancy and/or for the advancement of the interests or members and/or residents in the Conservancy area.

30.2. For the enforcement of any of the rules made by the Directors in terms hereof and for the payment of any debt due to the Conservancy, the Directors may:

- 30.2.1. give notice to the member or resident concerned requiring him to remedy a breach thereof or make payment within such reasonable period as the directors may determine; and/or**
- 30.2.2. take or cause to be taken such steps as they may consider necessary to remedy the breach of the rule of which the member or resident may be guilty or recover the debt, and debit the cost of so doing to the member or resident concerned, which amount be deemed to be a debt owing by the member or resident concerned to the Conservancy; and/or**
- 30.2.3. Impose a system of fines or other penalties. The amounts of such fines shall be reviewed and confirmed at each Annual General Meeting of the Conservancy; and/or**
- 30.2.4. take such other action including proceedings in Court, as they may deem fit.**
- 30.2.5. In the event of any breach of the rules by a member or any member's household or his guests or lessee, such breach shall be deemed to have been committed by the member himself, but without prejudice to the foregoing, the Directors may take or cause to be taken such steps against the person actually committing the breach as they in their discretion may deem fit.**
- 30.2.6. Notwithstanding anything to the contrary herein contained, the directors may in the name of the Conservancy enforce the provisions of any rules by civil application or action in a court of competent jurisdiction and for this purpose may appoint such attorneys and counsel as they may deem fit.**
- 30.2.7. The Conservancy may in a general meeting itself make any rules which the directors may make and may in general meeting vary or modify any rules made by it or by the directors from time to time.**

MISCELLANEOUS

31. If the provisions of these Articles are in any way inconsistent with the provisions of the Companies Act 1973 as amended, or any other law, the provisions of the Act or other law shall prevail, and these Articles shall be read in all respects subject to the Act or that other law.

Memorandum of association

of a company not having a share capital

[Section 54(1); regulation 17(3)]

Registration No. of company

Paste revenue receipt here or affix revenue stamps here or impress revenue franking machine impression here

1. Name

(a) The name of the Company is

DOME BERGLAND CONSERVANCY

(Association incorporated under Section 21)

(b) The name of the Company in the other official language of the Republic is

KOEPPEL BERGLAND BEWAREA

(c) The shortened form of the name of the Company is

N.A

2. Purpose describing main business

- 2.1 "The main business which the Company is to carry on is to convert the area commonly known as the Vredefort Dome Conservancy, also known as the proposed VREDEFORT DOME WORLD HERITAGE SITE, and any area added thereto from time to time, to a fully fledged coöperation nature reserve, subject to normal rights of ownership, to game fence the entire area, to relocate the game and plant species that traditionally occurred within the area and to ensure its conservation including the natural, cultural, historical and geological heritage of the area.
- 2.2 To, over time and as far as reasonably practical, phase out agricultural activities and to replace same with tourism and conservation and nature associated activities.

3. Main object

"The main object of the Company is :

- 3.1. to have the area commonly known as the Vredefort Dome Conservancy and the area identified as the proposed VREDEFORT DOME WORLD HERITAGE site (hereinafter referred to as the CONSERVANCY) declared as a World Heritage Site.
- 3.2. to regulate the activities and facilities within the area of the Conservancy in order to create, manage and conserve a fully fledged coöperation nature reserve.
- 3.3. to formulate a set of rules which eventually will reasonably regulate the activities of all the land owners and occupants within the Conservancy to enable the realization of its main business.
- 3.4. to promote the activities of the company to ensure that all land owners within the Conservancy become members thereof.
- 3.5. to promote the conservation of the nature, (fauna and flora) geology, history and cultural heritage of the area.

4. Ancillary objects excluded

The ancillary objects referred to in Section 33 (1) of the Act are excluded to the extent that they are not necessary for carrying out the main object, and the capacity of the Company is limited to its main object.

5. **Area of business**

The area of business in which the company will carry on its business is the Republic of South Africa.

6. **Powers**

6.1. The specific powers or part of any powers of the Company which are excluded from the plenary powers set out in Schedule 2 to the Act are powers n/a

6.2. The specific powers or part of any powers of the Company set out in Schedule 2 to the Act which are Qualified –

6.2.1. Powers (k) to be modified to read as follows – “To form and to have an interest in any company or companies having the same or similar objects to the Company for the purpose of acquiring the undertaking of all or any of the assets or liabilities of that Company or Companies or for any other purpose which may seem, directly or indirectly, calculated to benefit the Company, and to transfer to any such company or companies the undertaking or all or any assets or liabilities of the Company”.

6.2.2. Power (l) to be modified to read as follows – “To amalgamate with other Companies having the same or similar objects to the Company”.

6.2.3. Power (m) to be modified to read as follows – “To take part in the management, supervision and control of the business or operations of any other Company or business having the same or similar objects as the Company and to enter into partnerships having the same or similar objects as the Company”.

6.2.4. Power (n) to be modified to read as follows – “To remunerate any person or persons in cash for services rendered in its formation or in the development of its business”.

6.2.5. Power (o) be modified to read as follows – “To make donations provided that no donations be made to members or Directors”.

6.2.6. Power (r) to be modified to read as follows – “To pay gratuities and pensions and establish pension schemes, in respect of its officers and employees.”

7. **Conditions**

The special conditions which apply to the Association and the requirements additional to those prescribed in the Act for their alteration are as follows:

7.1 The income and property of the Association wheresoever derived shall be applied solely towards the promotion of its main object and no portion thereof shall be paid or transferred directly or indirectly, by way of dividend, bonus or otherwise howsoever, to the Members of the Association or to its holding company or subsidiary; provided that nothing herein contained shall prevent the payment in good faith of reasonable remuneration to any officer or employee of the Association or to any Member thereof in return for any services actually rendered to the Association

7.2 Upon its winding-up, deregistration, or dissolution, the assets of the Association remaining after the satisfaction of all its liabilities shall be given or transferred to some other Association or institution or Associations or institutions having objects similar to its main object to be determined by the Members of the Association on or before the date of its dissolution, or failing such determination, by the Court.

8. **Financial year-end**

The financial year-end will be at the end of February each year.

9. **Guarantee**

9.1 The liability of the Members is limited to the amount referred to in 9.2 hereunder;

9.2 Each ordinary Member undertakes to contribute to the assets of the Association in the event of its being wound up either while he is a Member or within one year thereafter, for the purpose of payment of the debts and liabilities of the Association contracted before he ceased to be an Member, and of the costs, charges and expenses of the winding-up, and for adjustment of the rights of the contributories amongst themselves, an amount not exceeding R1.00 (ONE RAND).

10. **Association clause**

We the several persons, whose full names, occupations, residential, business and postal addresses are subscribed, are desirous of being formed into a company in pursuance of this memorandum of Association and we respectively agree to become ordinary Members of the Association.

VREDEFORT DOME CONSERVANCY

STRATEGIC DEVELOPMENT AND MANAGEMENT PLAN

25 February 2002



CONTOUR
Project Managers

In association with

Grant Thornton
Kessel Feinstein 

1. PREFACE

The landowners close to the centre of the Vredefort Dome Impact Structure have indicated that they are interested in establishing the proposed Vredefort Dome Conservancy (VDC).

The proposed VDC is located near Parys in the Free State Province of South Africa and straddles both the North West Province and the Free State across the Vaal River. The area has been mainly used for agricultural and mining purposes over the last two centuries. It has however seen some major changes more recently, as the agricultural and mining potentials declined and more and more landowners started tapping into the natural tourism potentials of the majestic Vaal River and the scenic Vredefort Hills.

As most international geologists in the last decade gave recognition to the Vredefort Dome Impact Structure as the largest and oldest meteorite impact site on the globe, an awareness was created that the area represents a unique geological phenomenon of international significance and that it was in desperate need of conservation. This structure has been studied by numerous scientists. More than 700 publications have appeared with some reference to the Vredefort Dome Impact Structure ¹.

The proposed Vredefort Dome Conservancy is located close to the centre of this impact structure with a diameter of approximately 400 km. Although the study area of 30,108 hectare (Vredefort Dome Conservancy) only covers a small part of the Vredefort Dome Impact Structure, it represents the more visible central granite core and other above ground geological formations, as well as certain interesting and aesthetically pleasing landscapes and diverse ecosystems. It is also relatively close to tourism markets and access routes and has more recently been growing its tourism products. Apart from its natural beauty, the area also offers a rich cultural backdrop comprising a number of interesting archaeological and mining sites and historical aspects.

The area is clearly demarcated by a peripheral provincial road network and constitutes an area of relatively low densities of development, marginal agricultural potential and most significantly, where most landowners have already agreed to incorporate their land into a conservancy.

The study area crosses the Vaal River with its significant tourism attractions to incorporate approximately 11,251 ha in the Free State (\pm 70 landowners) and 18,857 ha in the North West Province (\pm 20 landowners).

The current strategic thinking includes the incorporation of all the land within the designated area into a conservancy, the registration of the conservancy as a World Heritage Site with the United Nations and the joint planning, development and management of the area by the stakeholders with the assistance of government and the private sector.

This Strategic Plan (Strategic Development and Management Plan) was prepared by the stakeholders with the intention of guiding the future planning, development and management of the proposed conservancy.

¹ Reimold W.U and Coney L, 2001. The Vredefort Dome Impact Structure and Directly Related Subjects: An Updated Biography. Economic Geology Research Institute, University of Witwatersrand

2. INTRODUCTION

2.1. BACKGROUND TO VREDEFORT DOME CONSERVANCY

2.1.1. Unique Geology

The geology of the Vredefort Dome Impact Structure, situated near Parys and Vredefort in the Free State Province of South Africa and in the centre of the Witwatersrand Basin, is absolutely unique and of great interest to geologists all over the world. Particularly the area in the vicinity of VDC attracts great interest due to the more visible above-ground formations that significantly contribute to the research and interpretation potentials.

In the region of Vredefort a relatively flat area with the presence of granite rock appears, which normally occurs in the deep crust of the earth. Around this granitic region lies a half-concentric ring of hills towards the north-west. The layers within these hills are upside down with an angle of approximately 60 degrees towards the inside of the circle. This first ring of hills is known as the Vredefort Bergland or Vredefort hills. Outside these hills lies a wide arching valley stretching from Vereeniging in the east towards Potchefstroom and then curving south-westerly towards Viljoenskroon. Underground evidence exists that the same ring structure continues underground to complete the circle in the south-east, although not visible. This confirms a ripple-effect similar to that which can be observed when dropping a pebble into a pool of water.

It is believed that a major catastrophic event occurred 2020 million years ago when a huge meteorite of possibly 10 to 15 km diameter slammed into the earth to form a massive impact crater, the eroded remnants of which today is only visible north-west of the impact site. The Vredefort Dome, an uplifted core of basement rocks surrounded by overturned sedimentary rocks, today marks the centre of this the largest and oldest known meteorite impact structure on Earth. It is situated 120 km south-west of Johannesburg and straddles the Vaal river.

Although the origin of the dome was debated with much controversy by scientists, it is today generally accepted that the cause of this interesting structure was that of a gigantic meteorite impact.

The size (250 km in diameter) and age of the structure makes it the largest and oldest on earth.

Image 1: View of the Vredefort Impact Structure from space

Source: Council of Geoscience

It is further believed that the gold-bearing Witwatersrand strata would have disappeared as a result of erosion if it was not for this catastrophic event.

Evidence exist of violent shifts and deformations in the form of melt rocks which is only found here and in the Sudbury Impact Structure in Canada. Another evidence of this major impact are the shatter cones that are found in sharply upturned rocks of the Vredefort hills that surround the central core of uplifted granitic rock. Signs of shock metamorphic effects and unusual melted formations (Vredefort Granopyre) with traces of meteorite origin and zircon crystals are believed to be further evidence of this extraordinary event.

The Vaal river can be seen where it cuts through the Vredefort hills from north-east to west in the above image.

Picture 1: Overtuned Quartzite Hills



Imprecate faulting resulting in repetitions of Hospital Hills Quartzite with ring-shaped hills of Vredefort in the background

An interesting phenomenon that adds to the spectacular scenery of the landscape is the steeply dipping and heavily fractured overturned quartzite hills caused by impact deformation.

2.1.2. Natural Diversity

The climate is highly variable, ranging between cold winter nights of 0°C and hot summer days of 30°C. The temperature can however drop to -10°C. Average rainfall is 625 mm of which approximately 500 mm falls in the summer months between October and March.

The Vaal river is the major surface water body, but water contamination is becoming an increasing concern. Acocks classifies the area as Bankenveld. Due to the diversity of the study area caused by the meteorite impact and the resulting geological formations, the river and its riverine forests and the varying hill slopes and valleys many interesting plant communities occur.

The area has capacity for a large variety of wildlife species. The interesting variety of birds, smaller mammals and insects such as ants and butterflies are further important indicator in terms of the capacity of the area to sustain a rich biodiversity.

With regards the larger mammal species, it is worthwhile to note that a number of farms have been game fenced and the trend continues. These areas are used for personal recreation as well as tourism purposes. The agricultural potential on most of the land is marginal and landowners are already in a process of reclaiming most of the land and converting it to tourism.

There is however concern about the level of alien plant infestation, water contamination and other forms of pollution.

2.1.3. Archaeology, History and Culture

The area is rich in archaeological, historical and cultural assets. Evidence of human activity dates back to the Stone Age and evidence still exists of caves, rock shelters, pottery, rock engravings and rock art. Kraals typical of both the Tswana and Sotho cultures exist and it appears that later kraals represent a transition type which may be a combination of the two different groups. Poorly preserved San rock art with sketches as well as tools and a cave with animal bones and rock engravings also occur. This makes the study area also quite unique from an archaeological point of view and emphasises the need for its proper conservation.

Numerous worked-out mining sites dating back to the late 19th and early 20th century occur throughout the VDC. On Venterskroon itself (farm Rooderand) mining commenced in 1887 and only lasted for a relatively short period.

The hills of the Vredefort Dome, directly north of the Vaal River, also saw the very first Matebele attacks on Voortrekker camps during 21 and 22 August 1836. The Battle of Tygerfontein dates back to the Anglo-Boer war (1899 – 1902) and the heliograph posts on top of the hills of Tygerfontein are still well preserved and accessible.

Another interesting historical fact with potential novelty value is that a few pontoons

operated across the Vaal river in the early days.

2.1.4. Tourism Potential

The topography of the area is scenically attractive, rich in variety, with a unique geology and geomorphology and interesting archaeological historical aspects, which all combine to justify serious conservation interventions and offers an amazing range of tourism options. The most significant potential of VDC lies in its water-based and adventure tourism potential, its educational and scientific value and its proximity to markets.

The attractiveness of the area is however spoilt by numerous old, unattractive and often derelict farm buildings, fences, cattle kraals, outbuildings, car wrecks, scrap metal, stands of alien plants and other unsightly top structures.

In the year 2001, the greater Vredefort Dome / Parys area had sixty-six tourism establishments and sold a total of 104,635 bednights and 15 969 site-nights per annum. 80% of all accommodation sold were beds and 20% camping facilities. In the region of 54% of all bednights sold were related to conference and events and 46% were leisure related. In total, calculations showed that the area attracted in the region of 110,000 visitors, of which 59% stayed overnight and 41% were day visitors. 48% of all day visitors to the area were related to conferences and events.

Thirty-six out of these sixty-six tourism products were within the boundaries of the proposed Conservancy (Refer Regional Tourism Products Map), representing a total of 1,135 beds (53,198 bednights sold) in the North West side and 162 beds (12,958 bednights sold) in the Free State side of the project area in 2001. This means 64% of the regional beds were sold inside the boundaries of the project area. A total of 34,275 conference delegate days (54%) and only 730 camping nights (4,6%) were sold within the project area.

The total number of overnight visitors to the project area per year was estimated at 42,000, with another 27,500 day visitors, totalling 69,500 or 63% of the total number of visitors to the greater Vredefort Dome / Parys area.

The calculated bed density for the Vredefort Dome Conservancy was 38 beds per

1,000 hectare (1,135 beds in 30,128 ha), which rates with the higher density game reserves in South Africa. Therefore, future developments should be well controlled to ensure that over-development does not occur.

The ultimate tourism capacity of VDC will largely depend on the sensible zoning and future management of the area. A large section of the project area can be zoned as a high density recreation area, particularly close to Parys and along the Vaal river. In addition, the peripheral areas along the Vaal river and around Parys can absorb substantial numbers of overnight and adventure visitors that can enter the Vredefort Dome Conservancy on a regulated basis as day visitors, thus reducing the potential negative impact substantially, whilst still benefiting from these visitors.

2.2. STRATEGIC PLAN

2.2.1. Other Management Documents

This document is one in a series of management documents that jointly aim to provide historical and archive material, sketch the current situation, provide policy and strategic direction and give guidelines for the day-to-day management of VDC.

The following reports need to be maintained by management as important management tools:

- **An Archive Registry of the Conservancy**, which should be maintained and updated monthly as a permanent record of all the relevant historical records and technical information on VDC and the region and where it can be accessed.
- **A Situation Analysis Report**, which is a situational review (or scoping) by management, every two to five years, depending on prevailing circumstances and the rate of change.
- **A Strategic Development and Management Plan** (this document), which is updated as a strategic and policy overview with new policy guidelines every two to five years, following the aforementioned review.
- **A Management Plan**, which is updated annually, as a business plan and guideline for managers, aligning human and other resources with strategies and specifying clear management functions, objectives and operational standards.
- **An Operations Manual**, which is updated monthly by the technical and operations staff, as an operational and procedural guideline.

2.2.2. Purpose

The aim of this Strategic Plan is to provide a broad policy framework for the VDC. The Plan sets out the key strategies, policies and objectives of VDC, defines the responsibilities and modus operandi of the role players and provides broad operating guidelines for the management of the area.

2.2.3. Process

The Strategic Plan was developed in full consultation with stakeholders, including management, concessionaires, local authorities, provincial conservation agencies and other interested and affected parties and after review of the current internal and external environmental factors that affect VDC and its future. A Situation Analysis Report was drafted that summarises the results of this consultation process and forms the basis upon which this Plan was developed [*Boonzaaier, WV. & Lourens M. 2001. Vredefort Dome Conservancy Situation Analysis Report, by Contour Project managers CC in association with Grant Thornton Kessel Feinstein*].

2.3. MANAGEMENT COMMITTEE

A Vredefort Dome Forum representative of Free State and North West stakeholders was initiated on 16 July 2001. An elected Management Committee is responsible for the strategic planning aspects of the VDC and for implementation of this Strategic Plan.

2.4. DEFINITIONS

For the purpose of this Strategic Plan, the following definitions apply:

- **Conservancy** refers to the conservation status granted to VDC by the North West and Free State provinces
- **Constitution** refers to the constitution of the Vredefort Dome Conservancy as adopted by its members and as amended by them at appropriately constituted General Meetings
- **Management** refers to the management committee appointed by the members of VDC
- **The Strategic Plan** refers to the Strategic Development and Management Plan as contained in this document

- **VDC** is the acronym for the Vredefort Dome Conservancy
- **Vredefort Dome Forum** refers to a communication forum of all parties interested in and/or affected by the Vredefort Conservancy.

3. MISSION STATEMENT

3.1. VALUES AND OBLIGATIONS

VDC (Vredefort Dome Conservancy) is recognised by scientists as the oldest and largest visible meteorite impact site on the globe. When developing and managing VDC, all the policies, plans and actions must contribute towards;

- conserving and promoting the geological significance and scientific value of the Vredefort Dome Structure and its archaeological, historical and natural assets;
- behaving responsibly and in line with internationally accepted norms and standards in protecting a site of such outstanding global value;
- fully capitalising on the unique geology, international interest and tourism values of the area; and
- complying with a number of important specific values and obligations ensuing from:
 - The intended listing as a World Heritage Site
 - The intended compliance with IUCN criteria for managing a Protected Area
 - Commitments made to landowners, operators and other affected parties during the planning and development of the Conservancy

3.2. KEY OBJECTIVES

The key objective or purpose of the Vredefort Dome Conservancy is;

- To specifically protect in perpetuity a representative sample of the unique geological phenomenon of the Vredefort Dome Impact Structure and to allow opportunities for related research;
- To generally conserve, promote and optimally interpret the area's unique geology, the system's biodiversity and abiotic resources, biophysical processes, unique landscape and cultural heritage;
- While at the same time capitalising on the area's scientific significance, its tourism potential and its renewable natural resources for the enduring socio-economic benefit of the landowners, operators and neighbouring communities primarily, and international, national and provincial stakeholders secondarily.

3.3. CHALLENGE

The challenge is to achieve these objectives without compromising on the set values and obligations.

3.4. VISION

By achieving its objectives, VDC becomes an area with the following characteristics:

- A single, functional, self-sustainable and professionally managed land unit managed along the principles of a Conservancy with co-operation amongst all the different stakeholders
- An internationally recognised site of scientific significance (World Heritage Listing)
- The unique geology, biodiversity, biophysical processes, non-renewable resources and landscapes and the cultural heritage of VDC is well conserved through a consistently applied adaptive management process founded on up-to-date scientific knowledge and state of the art technology and systems
- Internationally recognised as a uniquely interpreted and excitingly informative destination with high enjoyment, educational and scientific value
- Nationally recognised as an adventure destination with diverse products
- Regionally recognised as an important socio-economic contributor
- The unique tourism and educational potential of the VDC is optimally developed and utilised whilst the natural experience is not unduly impaired and the conservation values are not compromised
- The visitor facilities and services meet international standards
- Development and management is undertaken according to mutually beneficial and synergistic relationships between landowners, operators and their employees
- Land ownership and benefits from VDC is shared equitably
- Development and management is facilitated and controlled in accordance with a well-developed Strategic Plan and Constitution
- VDC is established as an internationally renowned field centre for geological research -particularly Impact Structure research
- An extension service and support mechanism is in place to assist landowners and operators within VDC to meet internationally accepted environmental,

conservation and tourism standards of operation

- VDC is financially self-sustaining through a combination of revenue sources such as grants, donor funding, entrance fees, member contributions, levies, concession fees, sale of natural resources and trading.

3.5. STRATEGIES

After consideration of all the strengths, weakness, opportunities and threats and the critical issues identified during consultation with stakeholders, the following key strategies were identified:

3.5.1. Conservation Management

To sustainably manage the natural, cultural, historical and other heritage resources of VDC in accordance with agreed policies, strategies and operational guidelines, so that the unique, vulnerable, valuable and sensitive environmental assets of VDC would be conserved.

3.5.2. Tourism Management

To optimally facilitate and manage tourism developments and operations in accordance with agreed policies, objectives and strategies and within agreed tourism operating guidelines for the enduring benefit of landowners, operators and the region.

3.5.3. Development Plan

To organise and manage developments within VDC in accordance with an accepted zoning plan and development guidelines, cognisant of its conservation value and tourism market potential, to ensure that its unique attributes are protected and the tourism potentials are optimally utilised.

3.5.4. Institutional Framework

To develop an equitable institutional framework and constitution that together with the VDC Strategic Plan will provide the majority of landowners with the necessary mechanisms and security to willingly join the Vredefort Dome Conservancy.

3.5.5. Internal Communications

To implement a communications strategy that will adequately and effectively provide

all landowners and operators inside VDC with relevant information, to the extent that they will appreciate the value of joining VDC and support its policies, objectives, strategies and activities.

3.5.6. Marketing and Interpretation

To market and interpret VDC, its unique attributes and its products to identified target markets, so that VDC could be recognised amongst all the identified markets and could be optimally utilised.

3.5.7. Socio-economic Development

To contribute towards the socio-economic development of the region and its recognised stakeholders, by ensuring that local spin-offs and appropriate economic empowerment is facilitated.

3.5.8. Funding

To procure and manage appropriate financial resources that are necessary to efficiently and effectively implement the strategies of VDC.

4. CONSERVATION

4.1. BACKGROUND

VDC is earmarked for World Heritage Listing and is in the process of applying to UNESCO. A great deal of government support has been shown for the project by the national, provincial and local governments.

A certain level of conservation and tourism culture exists amongst some landowners and operators, specifically those that have been members of the Bergland Conservancy. Unfortunately this is not apparent everywhere, particularly amongst non-product owners. A great amount of ignorance is displayed regarding legislation relating to the environment, change of land use and the development and operation of businesses.

Particularly the river ecology is under severe pressure from upstream contamination and alien plant infestations. Problems specific to VDC include water quality, soil erosion, alien plants, -birds, -fish and -animals, bush encroachment, air-, noise and visual pollution and illegal developments and businesses.

There is a desperate need for environmental and conservation guidelines and regulations for landowners and operators. There is a lack of knowledge regarding the individual vs. the collective roles, responsibilities and rights of landowners and operators.

Owners are of the opinion that there is great synergy in managing and even fencing VDC as a single management unit. This also opens new opportunities such as charging an entrance fee, managing tourism activities and improving security. It is believed that the positive attitude of government could be harnessed to procure funding for a perimeter fence (eg Poverty Alleviation).

There is a high risk of the currently uncoordinated and unacceptable types of developments diluting the area's potential if it is not planned, organised and controlled by a uniform set of environmental management guidelines.

Mining is still a threat to the conservation of the area and its tourism potential.

4.2. VISION

VDC is recognised as a World Heritage Site and the unique geology, biodiversity, biophysical processes, non-renewable resources, cultural heritage and landscape of VDC is well conserved through a consistently applied adaptive management process.

The conservation management of VDC is recognised nationally and internationally as a successful model of efficient and cost effective use of human and financial resources for the achievement of geological, archaeological / historical and natural heritage conservation objectives.

VDC becomes an internationally renowned centre for Impact Structure conservation, interpretation and research .

4.3. OBJECTIVES

4.3.1. Primary Objective - Conservation

The primary objective is to conserve the area's unique geology and to conserve the system's present biodiversity and abiotic resources, the river ecology, biophysical processes and historical / archaeological sites and to minimise the visual impairments on the unique natural landscape. *[Realistically this objective can only be achieved by defining the limits of change that are acceptable in terms of climatic cycle fluctuations and the satisfaction of the secondary and tertiary objectives given below. Limits of acceptable change should be approved and reviewed periodically by the Executive Management on the basis of expert advice, but in the full knowledge that setting such limits involves a great degree of value judgement]*

In attempting to achieve this objective, special consideration should be given to representative geological formations, species, sub species, communities, habitats and archaeological sites that are threatened or endangered outside VDC. This special consideration should be applied in the following descending order of priority; internationally, nationally, provincially and locally.

Because many of the “natural” bio physical processes of the system have been disrupted by historical human interventions and the present interventions such as farming, fencing, barriers to natural fires etc, the maintenance or rehabilitation of “natural” bio physical processes cannot be adopted as a realistic primary objective. Nevertheless, contemporary ethics and laws pertaining to soil and water conservation and state of the art scientific knowledge pertaining to resilience and equilibrium / stability concepts should be adhered to as an ancillary objective.

4.3.2. Secondary Objective - Tourism

The secondary objective is to provide visitors to VDC with a highly marketable educational and nature based recreational experiences provided that this does not compromise the primary objective.

4.3.3. Tertiary Objective – Socio-economic

The tertiary objective is to capitalise on the area’s attractions and renewable natural resources in a sustainable manner for the enduring socio-economic benefit of the landowners, operators and neighbouring communities primarily and international, national and provincial stakeholders secondarily by maximising income from tourism as well as the consumptive utilisation of VDC’s natural resources provided that this does not compromise the primary and secondary objectives.

4.4. POLICY

VDC is aspiring to qualify for World Heritage Listing and will therefore comply with UNESCO management guidelines. Should the World Heritage application not succeed, application should still be made for National Heritage Listing.

VDC should be registered with and comply with the requirements of the IUCN (International Union for Conservation of Nature and Natural Resources) as a Natural Monument (Category III) Protected Area.

VDC will be registered as a Conservancy with both the North West and Free State provinces.

The VDC ecology will be conserved as the primary representative sample of the Vredefort Dome Impact Structure. The integrity of the geological, archaeological /

historical and natural heritage of the VDC area can therefore not be sacrificed for short-term economic gain.

The river ecology is an important feature of VDC and its quality will be a primary consideration in managing the river frontage, water surface and associated activities.

Although VDC may feature all of the so-called Big Five species, they will not be allowed to roam the entire area, as it will exclude certain important activities inside VDC.

As it is unrealistic to assume that the system's biotic and abiotic components can be conserved through "natural" ecological processes the policy is to apply management interventions for the achievement of ecological management objectives. This Policy does not necessarily imply a policy of simulating and or rehabilitating "natural" processes as in many cases this may not be feasible in terms of current knowledge, current technology, time and financial resources. Nevertheless, to encourage systems reliance through original ecological processes, especially natural selection, and to keep management costs to a minimum, management interventions should also be minimised in situations where primary, secondary and/or tertiary objectives are clearly being met in the absence of management interventions.

It shall be policy to restrict plant and animal introductions to those species that were historically indigenous to VDC with the exception of weeping willows [*Salix babylonica*] which have become naturalised in many parts of South Africa.

4.5. STRATEGY

In the light of imperfect knowledge and technology, and a stated policy of management intervention, the overriding strategy is to consistently apply an adaptive management process founded on;

- a comprehensive natural resource data base;
- unambiguous and measurable objectives and goals;
- continuously updated scientific knowledge and state of the art technology;
- modelling of ecological processes;
- efficient, effective and repeatable monitoring systems; and

- regular evaluation and review by experienced ecologists and system modellers.

The secondary strategy is to inform and motivate landowners, operators and their staff to achieve the primary objective, while providing them with the necessary training and extension services.

4.6. OPERATIONAL GUIDELINES

4.6.1. Strategic Environmental Assessment

To achieve the conservation objectives of VDC, it is necessary to have an overall set of environmental and conservation guidelines, such as a Strategic Environmental Assessment. These should be aligned with UNESCO requirements.

4.6.2. Alien Plant Control

It is policy to forbid the introduction of spreading alien plants to VDC including gardens of landowners, staff houses, tourist facilities and lodges. The objective is to remove all existing alien plants that have the potential of spreading in VDC. Plans for eradicating alien plants must include a five year follow up control procedure and be based on the latest alien plant control technology and knowledge. Cost effectiveness must be an important criteria when selecting control methods. Plans that do not have a five-year follow up procedure and guaranteed budget for actioning the procedure must be rejected outright.

4.6.3. Veld Burning Programmes

It is policy to regard veld burning as an important intervention for achieving primary, secondary and tertiary ecological management objectives. The strategy is to apply a patch mosaic burning programme implemented annually in terms of time and space. However, the burning strategy must be compromised to some extent for the achievement of the secondary and tertiary ecological management objectives. The design and application of the burning programme has to be applied in close liaison and co-operation with landowners and operators.

4.6.4. Bush Encroachment Control

At this stage the assumption is that the patch mosaic burning programme will control the eruption of woody plants to the extent that *alpha*, *beta* and *gamma* diversity

objectives are achieved. Consequently it is policy to only initiate large-scale bush control programmes if monitoring results indicate that fire is not suppressing the encroachment of woody plants effectively. Nevertheless, it will be policy to undertake some bush clearing for the enhancement of the tourism experience for visitors. As with alien plants, bush encroachment plans must be cost effective and have a five-year follow up procedure with guaranteed funding.

4.6.5. Water Point Provision

Historical processes of game movement in relation to water availability have been disrupted considerably by having a large number of separately fenced small farms in the VDC system and the drying up of springs due to erosion. Due to the fact that VDC will remain a closed system, it is impracticable to try and simulate and or rehabilitate these historical processes. A policy of providing artificial water points for game is acceptable in the VDC situation. The number and distribution of water points must be designed to achieve the secondary and tertiary ecological management objectives without compromising the primary ecological objective.

4.6.6. Soil Erosion Reclamation

While soil erosion is a “natural” geomorphic process, the acceleration of soil loss due to unsustainable land use practices and developments must be minimised in the VDC system. Logistically, this is best achieved by preventing excessive overgrazing by herbivores and the wise use of fire. The existing sheet and gully erosion should be left to rehabilitate without management interventions as it is firstly extremely difficult to distinguish between what erosion is merely the result of a natural geomorphic process and what is the result of unsustainable land use processes. Further more, it is extremely costly to rehabilitate sheet and gully erosion by means of management interventions. Only in the most severe cases of erosion caused by recent interventions should reclamation be allowed and then only with the approval of the Executive Management and with proper ecological advice and supervision. This does not rule out the obligation on each landowner and operator to take the necessary steps to prevent further erosion where man-made infrastructure such as fences and roads are causing erosion.

4.6.7. Large Herbivore Stocking Rates

In the absence of any data to the contrary it is assumed at this stage that the primary,

secondary and tertiary ecological objectives are best attained by stocking the large wild herbivore populations at a level that lies somewhere between the ecological and economic carrying capacity of the system. Furthermore, it is assumed that these objectives will be attained by adhering to the principle that bulk grazers should be stocked at a high proportion of the total stocking rate, concentrate grazers and mixed feeders at intermediate proportions and browsers at a low proportion of the total stocking rate. It is also important to maintain species that prefer sour grasslands and/or steep slopes at higher proportions of the total stocking rate than species that prefer “sweetveld” and/or flat terrain. The operational manual provides more detailed guidelines on the stocking rates for individual species and feeding classes. It is considered that free-roaming dangerous game such as lion, rhino, crocodile, hippo, elephant, buffalo and spotted hyaena will clearly clash with certain types of tourism activities such as water sport and generally within the High Density Zone. This does however not rule out their presence within special areas of proper containment.

4.6.8. Problem Animal Control

Animals that become a danger or excessive nuisance to persons and property due to either habituation or aberrant behaviour should be destroyed humanely or captured and removed from VDC. This applies also to animals that escape from VDC or encampments or leave and return to VDC or their encampments from time to time. To minimise the need to control problem animals, efforts must be made to take preventative measures such as educating the public and alerting them to various latent dangers. In cases where the solution to the problem lies in destroying or capturing animals the measures and procedures followed must be robust to the ever present threat of criticism from animals rights and other “green” movements.

4.6.9. Consumptive Use of Natural Resources

It is policy to permit the consumptive use of natural resources in VDC, provided that:

- it is necessary for achieving the primary ecological objective; and / or
- it is sustainable and provides meaningful revenue to VDC and/or benefits to the relevant stakeholders; and
- it does not compromise the primary and secondary ecological management objectives; and
- it does not compromise the values and obligations outlined in Section 3.2 above.

4.6.10. Control over Illegal Use of Natural Resources

Illegal utilisation of VDC's natural resources remains a latent threat. Because of the conservation and economic value of particularly its game populations and the growing threat of poaching within the greater southern African region, it is policy to retain an ongoing vigilance through the maintenance of cost-effective surveillance and monitoring programmes and reaction capacities. Due to the law of diminishing returns, these programmes and capacities will be primarily focussed on rare- and endangered as well as economically valuable game species.

Considering the historical access to VDC by previously disadvantaged communities, the main effort towards resolving illegal utilisation of natural resources for purposes of subsistence, will be to create understanding and awareness through a pro-active education campaign amongst these communities. Management will however be ruthless with those that illegally harvest natural resources for commercial purposes.

4.6.11. Waste Disposal

Management, landowners and private operators and developers must adopt a responsible and environmentally friendly waste management plan. Specifically, liquid waste should be handled on-site according to a formal development plan. Solid waste should be separated and sorted on-site and recycled where possible, or disposed of in consultation with Management.

4.6.12. Monitoring

Monitoring must be regarded as the most important step in an adaptive management process. Although the responsibility for monitoring lies with Management as one of the most important tasks, proper monitoring techniques and procedures need to be developed with appropriate ecological assistance and landowners and their staff will have to be trained to apply these and to interpret the data. The suitability and effectiveness of these techniques must be reviewed from time to time. The monitoring techniques and procedures applied must be based on the following:

- Related to adaptive management assumptions
- Based on the latest ecological monitoring theory
- Cost effective and appropriate for application by landowners

The techniques chosen for application must be consistently used over an extended period, including climatic cycle fluctuations, and only amended or disbanded if a panel of experts rules that they are clearly inappropriate or when a vastly superior technique and procedure has been developed.

4.6.13. Management Capacity

A conservation management unit capable of providing appropriate extension services and assistance to landowners, operators and their staff regarding law enforcement, monitoring, resource management and utilisation and cleaning-up operations will be in place.

5. TOURISM MANAGEMENT

5.1. BACKGROUND

VDC has a relatively high density of varied and increasing number of tourism products as land use is constantly changing in a natural progression from agriculture to tourism. Although the Vaal river and the natural beauty of the landscape is a major attraction, visitors are hardly aware of the range of natural, geological, archaeological, historical and other attractions that exist.

Tourism products are unfortunately largely below industry standard, particularly where landowners without appropriate knowledge and experience have converted from agriculture to tourism. A certain amount of concern has also been expressed regarding tourism operating standards and a lack of operating ethics and guidelines and trained operators and personnel.

Although the geology, archaeology and mining history makes for excellent opportunities to interpret these attractions, there is a general lack of information, interpretation and signage available to visitors. There is a lack of day visitor facilities such as information centres, picnic sites and ablutions.

The potential to charge entrance fees as a means of earning an income and controlling access and visitors numbers at entrance gates has been recognised.

The opportunity exists to integrate the wide range of attractions and activities into suitable packages, routes and tours and to market these jointly. Particularly creating special interest sites and tours are an option.

As more products are added and tourism densities grow, the attractiveness of the area will be threatened, unless tourist activities and numbers are managed. Co-ordination of activities can however increase the capacity of the area. The need to align tourism products with market potential to obtain optimum visitor usage and occupancy levels is clearly recognised.

5.2. VISION

Within the constraints of the appropriate zones, VDC will have all its diverse features

fully but aesthetically developed for a wide range of visitors from the identified target markets. The hallmark of management will be the skilful blending of visitor facilities and intensive use, with a high level of preservation of aesthetic landscapes, biodiversity and natural ecological functions.

5.3. OBJECTIVES

To facilitate the optimal management of VDC as a unique tourism destination aimed at the educational, special interest – scientific, leisure, corporate and sports and adventure markets for the maximum gain to landowners and tourism operators specifically and the region generally.

5.4. POLICY

Developments and activities will be regulated in accordance with the criteria for each Zone. VDC will attempt to accommodate the highest possible tourism volumes through clever management before having to become restrictive.

VDC will encourage the private sector to develop and manage appropriate tourism products as determined by the zoning criteria and the general policies and strategies of the Strategic Plan. All developments and activities will be conducted by the landowners and/or their concessionaires.

To ensure that benefits from tourism activities are distributed equitably amongst the different stakeholders, VDC may over time enforce restrictions or negotiate adjustments in respect of the density of tourist accommodation facilities and tourist numbers.

5.5. OPERATIONAL GUIDELINES

5.5.1. Self-drive vs. Guided Activities

VDC will allow self-guided activities in all the zones. It is however possible that in the longer term, all activities in the Low Density Zone will only be conducted under the supervision of qualified guides. All non-vehicular activities in areas where dangerous game are present have to be guided.

5.5.2. Management of Tourism Activities and Visitor Densities

Management will remain flexible regarding visitor carrying capacities, rather than

setting fixed limits on visitor numbers. Management may therefore encourage landowners to implement a variety of visitor management techniques that are aimed at increasing visitor carrying capacities whilst reducing impacts. Possible strategies include;

- the strategic placement of tourist facilities, comfort stations, activities and amenities that will reduce traffic into the centre of VDC;
- the surfacing of certain artery visitor roads;
- constant monitoring of visitor profiles, patterns demands and attitudes;
- limiting vehicle entries to acceptable levels during peak periods;
- the selective provision of visitor information;
- the provision of conducted activities, visitor education and -information programmes; and
- special arrangements such as subsidised conducted drives over peak periods, open days during the off-season, etc.

5.5.3. Peripheral Developments

An immediate strategy will be to limit the number of accommodation facilities and visitor comfort stations from the central areas and to promote the development of tourist facilities closer to the periphery. This will simultaneously reduce the impact on the central area whilst increasing the visitor carrying capacity.

The peripheral development strategy should also include the facilitation of new developments outside VDC that can divert internal pressures, stimulate the creation of new regional products and generate new benefits and opportunities for local communities.

5.5.4. Monitoring of Visitor Densities and Attitudes

Visitor entries, usage patterns and visitor reaction to current densities need to be closely monitored, so that the situation can be managed for as long as possible without having to set rigid limitations on entry levels and without having to apply a fixed policy restricting self-guided activities.

5.5.5. Access Control

A standardised visitor-friendly entry system that will also cater for entry control and market intelligence requirements will be in force. The system has to meet the needs of visitors, concessionaires, landowners and management. If cost-effective, such an entry system may be out sourced.

5.5.6. User Fees

Visitors will pay an entry fee proportionate to their length of stay and/or in accordance with the season of their visit. This may also include a differential rate for “in-season”, “off-season”, “mid-week”, “weekend” or “peak season” visitors as well as affordable rates for certain target markets such as local communities, pensioners, etc.

5.5.7. Visitor Management

Management will ensure that they have appropriate rules and regulations and operating guidelines and standards in place and that Management has appropriate enforcement powers.

5.5.8. Visitor Densities

Once it becomes necessary, Management may place a limit on the number of establishments, beds and/or visitor number sfor each zone, group of properties or individual properties. Where densities are found to be too high, a grandfather clause may be introduced that allows negotiations with a landowner and/or operator to reduce densities over a period of time.

5.5.9. Facilitating Appropriate Development

Management will facilitate the packaging of products, attractions, routes and linkages and the introduction and management of high quality tourism information and interpretative services to landowners, product owners and guests.

6. DEVELOPMENT

6.1. BACKGROUND

VDC is a unique geological phenomenon with a growing number and range of products. A variety of natural, archaeological, historical and other attractions exist with a number of untapped tourism options. The area is in transition from agriculture to tourism and has been earmarked for listing as a World Heritage Site.

Current products are not spatially grouped and organised in zones and are not necessarily aligned to market potential. It is mostly focused on the lower end of the market with many group facilities. There is a lack of day visitor facilities such as picnic sites and ablutions. Signage and interpretation has not yet been developed and occupancy levels are low.

Apart from management infrastructure and cell phone reception, all other bulk infrastructure is good. Support infrastructure to the tourism industry is however lacking.

The land is owned by many small landowners and no development guidelines and regulations exist.

Ruins, rubble and dilapidated cattle fences and kraals abound and in many places developments and land management does not reflect sound planning. A number of illegal practices, such as unauthorised changes in land use, unlicensed business activities and illegal residences exist.

The peripheral tourism potential for land “outside” the project is also recognised.

Mining is still a threat to the landscape, the geology, the natural assets and the tourism potential of the area. Further threats include increased pollution, congestion, uncontrolled developments, visual impacts and more traffic and noise.

It is expected that unchecked growth in tourism developments, combined with current levels of insensitive developments and management practices, may cause a disastrous result to the detriment of all concerned. Different parts of VDC also have

different attributes and potentials. The need therefore exists for proper zoning of VDC so that all the identified markets and products could be accommodated in an orderly manner.

The potential exists to optimise the tourism potential of the area by harnessing international scientific interest and obtaining listing as a World Heritage Site. This would however require a more stringent planning, development and management regime.

A particular challenge is to zone VDC so that its management will comply with IUCN criteria for protected area management and satisfy UNESCO's requirements for a Listed World Heritage Site, whilst simultaneously optimising the market potential.

A further challenge is to ensure that restrictions inside VDC does not put landowners in a disadvantaged position in comparison with peripheral owners that are not bound by similar controls.

6.2. VISION

It is anticipated that VDC will be zoned to facilitate the development and management of the widest possible range of tourism products within the identified market segments and within the constraints of an appropriate conservation management regime. Although infrastructure development will be the responsibility of each individual landowner or operator within the constraints of the zoning guidelines, certain bulk infrastructure may be developed collectively through the proactive intervention of VDC.

6.3. POLICY

World Heritage Listing is a priority and development planning, implementation and management must conform to UNESCO requirements.

Representative examples of the most interesting geological, archaeological/historical and other unique heritage assets both inside and outside VDC have to be conserved and protected from the impacts of inappropriate developments and over-utilisation, through appropriate zoning and other regulatory guidelines. In this regard it is also important that more than 75% of VDC is managed for the primary purpose according

to the IUCN Guidelines for Protected Areas [*IUCN Guidelines for Protected Area Management Categories*].

Management will decide on the most appropriate zoning and their location within VDC and will be responsible for enforcing the development policies and guidelines within VDC.

Landowners inside the VDC area should not be restricted to the extent that they benefit less than those outside the area.

Agriculture will be phased out over time, as benefits from tourism prove to out-weigh that of agriculture.

Once a Strategic Environmental Assessment has been done for VDC, it will be used as a guideline for any future development applications.

6.4. OBJECTIVE

The development objective of VDC is to optimise the use of the area through facilitating appropriate developments and activities in appropriate locations.

6.5. STRATEGIES

6.5.1. Zoning System

The optimisation of and balancing of primary, secondary and tertiary objectives are achieved through a zoning system. Zoning organises developments, visitor access and activities and resource management, thus minimising potential conflict between non-compatible management regimes, activities and user groups.

6.5.2. Zoning Considerations

A Zoning regime is developed by considering the following critical aspects;

- The overall concept and regional context of VDC
- The different objectives and potentially conflicting developments, management requirements and activities of VDC
- Accessibility for identified target markets
- The physical, aesthetic and other potentials, capacities and constraints of the

terrain

- Suitability for specific types of developments and activities
- Access to support infrastructure
- Linkages and relationships with neighbouring zones, developments and activities

6.5.3. Zoning Criteria

Criteria that are applied as a broad guideline to determine spatial boundaries for each of the zones are the following:

- Compliance with IUCN guidelines for a Natural Monument Protected Area
- A range of development and usage densities in rough proportion to available markets is necessary to create diversity, accommodate the identified primary markets and to optimise the use of the area
- Sensitivity of particular tracts of land to development and usage impacts (natural, scenic, physical, etc)
- Conservation value of specific sites
- Type, intensity and impact of current land use, including agricultural and tourism activities
- Size of individually owned properties
- Density of current top structures
- Nature of attractions within an area and the type of likely usage options
- Higher densities should be closest to primary market access points to reduce the impact of high traffic levels
- High density zones and low density zones should ideally be separated by intermediate zones to allow for a gradual transition to reduce conflicts
- Resort type developments with higher densities are likely to be in greater demand along the river frontage and near the periphery than in the more remote areas
- The more undulating areas with steep slopes should not carry high densities and are ideal for nature-based activities
- High density areas and development nodes should be on lower ground levels and not on high ground and steep slopes, to avoid visual impacts

Where desirable and practically feasible, Management in liaison with affected landowners and other stakeholders, may from time to time adjust the boundaries in line with these criteria.

6.6. DEVELOPMENT GUIDELINES

6.6.1. VDC Zoning

The following categories of zones have been identified and are reflected on the Zoning Map:

High Density Zone

The High Density Zone is 4,485 hectare in extent and represents 14% of VDC. This zone is set aside to primarily achieve the secondary and tertiary objectives and will therefore allow the development of intensive water-based and adventure resorts, guest houses and hotels. Restrictions will be minimal and densities will be high.

Typical activities will be water-based adventure, sports and leisure. A lenient upper limit of 2,000 overnight visitors is recommended as an initial guideline until better data is available on visitor satisfaction related to densities.

Moderate Density Zone

The Moderate Density Zone is 17,421 hectare in extent and represents 53% of VDC. It is set aside to serve all three the objectives and therefore will accommodate low- to medium-sized lodge-type developments with a more natural ambience and low impacts. Facilities will range from private lifestyle lodges to nature-based resorts and commercial lodges. Moderate restrictions will be placed on densities, size and impact.

Activities will range from moderate impact water-based adventure activities to low impact nature-based activities. An upper limit of 1,000 overnight visitors is suggested as an interim ceiling until better data is available on visitor satisfaction related to densities.

Low Density Zone

The Low Density Zone is 10,986 hectare in extent and represents 33% of

VDC. This zone is set aside primarily to serve the primary conservation objective and allows for nature-based adventure activities with a very low impact. Clear and severe restrictions will be enforced in terms of the level of infrastructure development, visitor densities and visual-, noise- and other pollution.

All camps to be of a small size accommodating no more than forty people each and to be constructed in an environmentally sensitive manner. Where possible, facilities should be built from local materials and no excavations should be allowed.

Activities should be guided and motorised activities are prohibited, including the use of the Vaal river.

An upper limit of 500 overnight visitors is recommended as an interim ceiling until a trails network has been properly planned and better information is available on appropriate densities.

Development Nodes

These are areas specifically set aside for high density development, such as at visitor centres. The limits on visitor numbers will be set separately for each of these nodes. Only one such node is recommended at the Venterskroon Village, where it is recommended ample provision is made for group accommodation and interpretation of the various attributes of VDC.

River Frontage and Water Surface

The river frontage and water surface will be managed along a strict set of conservation guidelines, irrespective of the zone within which it may fall. The intensity of activities in the various zones will however also be scaled down progressively as one moves downstream from the High Density to the Medium Density and eventually the Low Density Zone.

6.6.2. Infrastructure

Regulatory Control

Management will ensure that infrastructure is developed in accordance with set procedures and guidelines, covering all of the following:

- Alignment with target markets
- Compliance with zoning criteria
- Compliance with environmental and other development related legislation
- Setting minimum environmental impact levels and criteria
- Setting criteria and standards for infrastructure development inside and immediately outside the VDC – especially for future expansion areas
- Ensuring that the development criteria are embodied in the IDPs of the appropriate local authorities

Support Infrastructure

VDC may be responsible for facilitating the development of the following centralised infrastructure in accordance with a priority list that will be determined on a cost/benefit basis:

- Entrance gates
- Educational and scientific information and interpretative facilities (refer **Section 9.5.2**)
- Signage
- Supporting tourism infrastructure where gaps exist, such as general public and day visitor facilities
- Bulk services such as access roads and telecommunication networks
- Management infrastructure (peripheral fencing, offices, workshops, staff housing)

This does not necessarily mean that VDC will do the developments themselves or incur any costs in the process.

6.6.3. Cleaning Up Operations

VDC may assume responsibility for certain beautification and cleaning-up operations without reducing the onus on landowners to comply with legal and regulatory

requirements, such as:

- Demolishing inappropriate infrastructure and rubble removal
- Alien plant removal and control

6.6.4. Law Enforcement

VDC will also have a monitoring function to ensure that all developments and activities conform to the development guidelines and procedures of VDC as well as the general laws of the country, particularly in terms of the following:

- Change of land use permits
- Conservation and environmental legislation
- Liquor and trading licences
- Road reserve regulations

7. INSTITUTIONAL FRAMEWORK

7.1. BACKGROUND

A strong conservation and tourism culture exists amongst a number of landowners and the Bergland Conservancy has been successfully formed on the North West side of VDC. Most of the North West Province landowners and some of the Free State landowners are positive about the proposed VDC, whilst the few remaining landowners are either ignorant, outright negative or just not interested.

A natural transformation moving away from agriculture to tourism has been taking place over the last few years.

A Vredefort Dome Forum representative of the primary stakeholders was initiated on 16 July 2001. A management committee has been elected. Currently no management capacity exists and no conservation or environmental guidelines and regulations are available.

Government has major responsibilities IRO world heritage sites and would have to play an increasingly active supporting role once VDC is Listed as a World Heritage Site.

The potential exists for a major increase in land values once the area is better known as an ecotourism destination and/or heritage site. This is however not well appreciated by some uninformed landowners. Uncertainties exist regarding expected financial contributions and the distribution of potential income, particularly IRO small landowners and poor tenants.

Once World heritage Listing has been achieved, the UNESCO requirements for institutional structuring will have to be met.

7.2. VISION

It is envisaged that the VDC will be established and governed under a constitution as a single co-operative entity through an elected Management, whilst land ownership and usage rights will be retained by individual landowners under certain conditions.

7.3. OBJECTIVES

All landowners within the demarcated VDC join their land under the control of a single VDC to achieve synergistic market penetration and other benefits derived from collective land management.

7.4. POLICY

Land ownership and individual rights will not be unduly or forcefully alienated, participation will be voluntary and no landowner will be forced to incorporate his land.

Transformation from non-compatible to compatible land-use will be through a gradual process. Those that incorporate at a later stage will however be expected to make appropriate contributions in respect of value added to their advantage by former participants.

Co-operation will be through reasonable and just consideration of individual rights and interests and the maximum collective benefit. Generally accepted economic principles will apply.

7.5. OPERATIONAL GUIDELINES

7.5.1. Land Ownership and Rights

Individual land ownership is paramount, although the usage and management of the land will be subjected to certain rules and regulations as contained in the Constitution and the Management Plan of the VDC.

The use and benefits from the land will be for the direct benefit of the landowners, within the constraints of the Constitution and the Strategic Plan .

7.5.2. Conservancy

Willing landowners can join a Conservancy whereby they incorporate their land under a specified management regime.

Landowners have proportionate representation and voting powers, based upon the size of their land.

Owner contributions to VDC are determined by the members at Annual General

Meetings.

7.5.3. Management

An Executive Management will be elected by the members of the VDC.

Certain functions as specified in the Constitution will be managed collectively under the supervision of the Executive Management.

7.5.4. Process of Incorporation

Each landowner that joins the Conservancy needs to submit an incorporation plan, for approval by the Executive Management, which will include a management plan clearly specifying a programme with deadlines for converting the incorporation land and its facilities and activities to comply with the specifications and requirements as determined by the Constitution and the Strategic Plan.

7.5.5. Movement of Game

Free movement of game will be encouraged. Although joint management of natural resources under the overall control of Management is desirable, the responsibility for game introduced by individual owners can not be transferred to VDC. The dropping of internal fences through direct negotiations between individual landowners will however be encouraged. All internal fences should be designed to allow free movement of smaller animal species.

8. INTERNAL COMMUNICATIONS

8.1. BACKGROUND

A number of informative special interest excursions arranged on an ad hoc basis with various specialists have been held with limited participation by the landowners and operators. The Bergland Conservancy has also been circulating an informative newsletter to its members.

A concerted combined effort to inform all stakeholders of the value and potential of VDC has not yet been done and available communication systems and opportunities are not optimally utilised. The community is also not adequately structured to ensure that all stakeholders are identified and allowed the opportunity to have access to information and participate in a formal communication strategy. As a result, conservation and tourism cultures are not yet apparent everywhere - particularly amongst non-product owners.

Those landowners that have been converting from agriculture to tourism have not had access to sound advice and guidance on appropriate markets and standards. As a result, many of the products are not of an acceptable standard for the target tourist markets, resulting in wasted resources. This is also due to the fact that no conservation, environmental and tourism operational guidelines and regulations have been in place.

Once all landowners, occupants, operators and adjacent communities appreciate the value of the interesting geology, archaeology and mining history and understands the advantages and potentials of an integrated tourism destination and World Heritage Listing, attitudes should change significantly and more may be interested in co-operating towards achieving the set goals of VDC.

8.2. VISION

All landowners within the demarcated boundaries of VDC are incorporated under a professionally managed Conservancy and all stakeholders understand, appreciate and supports its values, objectives and strategies.

8.3. OBJECTIVES

To obtain the understanding, appreciation and support of all the landowners and stakeholders relevant to VDC through the most appropriate means of communication so that all the stakeholders could optimally benefit from the co-operative development and management of the land.

8.4. POLICY

Landowners and other stakeholders should be properly and correctly informed of the best available facts and options to allow them the opportunity of making the best possible decisions on issues that will affect their own interests

The most appropriate and preferably existing communication structures and cost-effective communication tools need to be used to allow proper two-way communication between the various stakeholders.

8.5. OPERATIONAL GUIDELINES

8.5.1. Communication Structures

Existing structures such as the Bergland Conservancy, agricultural unions and local authorities will be optimally utilised rather than duplicating.

Management will through the Constitution be delegated the necessary responsibilities and authorities to implement the Strategic Plan of VDC and to act on its behalf.

A Communication Forum representing all interested and affected parties (not only VDC members) will be held regularly to facilitate proper communication and interaction between VDC and stakeholders.

General Meetings will be held in accordance with the prescriptions of the Constitution.

8.5.2. Communication Tools

Management should circulate as much information to its members and other stakeholders as possible to improve the level of awareness. This information should also be available at the information desks of each entrance gate. Specific tools that

should be considered are:

- A regular newsletter amongst all stakeholders with a variety of articles inclusive of the following: potential benefits and workings of the VDC, important events, useful environmental, conservation and tourism management guidelines, market intelligence and operational standards and ethics.
- A popular book on the interesting aspects of VDC and the Vredefort Impact Structure should be available to all landowners, operators and visitors.
- Informative leaflets on topics such as environmental and conservation practices, species checklists, geology, archaeology, history, special trail routes, annual events calendar, special packages, etc should be developed and made available to stakeholders and visitors under a standardised VDC branding.
- Maps and publications on the Vredefort Dome Impact Structure
- Large maps of VDC zoning and visitor routes
- Brochures of products and packages
- VDC Constitution, this Strategic Plan, the Management Plan, the Operations Manual and any Operating Rules and Regulations
- Appropriate legislation, UNESCO guidelines and minutes of VDC meetings

8.5.3. Member Recruitment

During the period of establishing VDC, non-interested and negative landowners should be visited individually by Management in an effort to recruit them as members of the Conservancy.

8.5.4. Awareness Creation

Regular information tours, training courses and lectures on unique attractions and assets of the area and on important management topics such as the environment, river ecology, conservation, geology, archaeology, history and tourism standards and ethics should be arranged for stakeholders.

9. MARKETING AND INTERPRETATION

9.1. BACKGROUND

The unique selling point of VDC is its geology, whilst the combination of river frontage with diverse landscapes and scenery, attractive topography and rich cultural history makes for a unique special interest and adventure destination close and accessible to the major Gauteng markets.

The growing range of tourism products are reasonably well patronised. It is however believed that occupancies could be improved through joint marketing under a single branding, if products were aligned with markets that offered the best potential and if interpretation and signage were improved.

The interesting geology, archaeology and mining history makes for excellent interpretation opportunities. Listing as a World Heritage Site will add significant prominence and has great marketing value.

The wide range of attractions and activities has the potential of adding significant value if it could be integrated into a variety of special interest packages, routes and tours. It is felt that the area is not known in the market and that it will not be understood or valued without proper interpretation and marketing.

A particular challenge is to interpret and market VDC's unique attributes, which has to be its geology and adventure attributes, to appropriate markets.

9.2. VISION

VDC is a unique and well-branded tourism destination that is recognised in the market place, also for its well-designed and established interpretation facilities that specifically suites the identified target markets and best portray the internationally significant geological phenomenon of the Vredefort Dome Impact Structure and the rich cultural heritage of the area.

9.3. OBJECTIVES

The primary objective of Marketing and Interpretation is to establish a product and brand that will appeal to the Educational, Scientific, Leisure, Corporate and Sports

and Adventure markets and thus stimulate growth within the target tourism markets.

9.4. POLICY

As a general principle, those that stand to benefit from the marketing of the particular product must carry the costs associated with such marketing. However, no marketing or the contents thereof is permitted that conflicts with the operations, policy or management guidelines of VDC.

The following principles have to be adhered to:

- One brand and message to be used in all marketing, icons, collateral, communication, websites, product range, etc.
- The brand and message must reflect the area's unique features and should also allow for linkages with diverse current and potential products in the area
- The brand name and logo and the marketing message must be a registered trademark which would enforce joint marketing initiatives between the management body and product owners in the area
- Product owners should be legal and comply with the rules and regulations determined by management (which may include membership fees, product standards, concession rights, etc) before they are allowed to carry the brand name associated with the area

9.5. OPERATIONAL GUIDELINES

9.5.1. Branding

A strong single brand which can easily work with marketing collateral and products should be used by all. In conjunction with branding a product range of curios and souvenirs that could be sold to the market by using local skills should be developed.

9.5.2. Information Centres

Information centres are key to the success of the Vredefort Dome Conservancy. A visitor information and interpretation centre should be developed on the main road in Parys. The Potchefstroom Information and Development Centre should be hosting an entire exhibition and interpretation on the Vredefort Dome Conservancy. A smaller Field Information Centre should be established at Venterskroon for visiting scientists in collaboration with and backing from and participation by the University of Potchefstroom.

9.5.3. Range of Products

A wide range of tourism products which will decrease the negative effect of

seasonality in the area should be available. New focus areas are the education and scientific markets.

9.5.4. Market Focus

Capitalise on the proximity of major markets and as markets grow, extend on existing themes. Make use of existing events in the region such as Aardklop to sell the area. Introduce aerial activities that will enable one to better appreciate the extent of the Vredefort Dome Impact Structure, such as balloon rides or gliding over the “Dome”, as well as guided 4x4 rides, hiking trails and general or specialised tours through the area.

Move away from big five game reserve as the primary idea – use the existing unique geological, river-frontage and adventure potentials as selling features of the area and create new and different products that would attract the identified markets.

9.5.5. Product Focus

Develop local tour operators that can co-ordinate guided visits to the variety of attractions for general and special interest markets. Develop sufficient day visitor facilities.

Sufficient interpretation facilities that will suite the identified markets, stimulate additional interest and meet the existing level of demand is necessary and should be developed. Aspects that need proper interpretation include the area’s unique geology, biodiversity and abiotic resources, biophysical processes, unique landscape, cultural heritage features and history.

9.5.6. Respective Marketing Roles

There are four components of marketing:

- The selling of the unique features of VDC and the concept of management which includes the philosophies and policies of VDC. This is the responsibility of Management
- The marketing of individual products. The will be undertaken by the individual product owners
- The marketing of VDC as a tourism destination. Management will negotiate joint marketing efforts between product owners and ensure that government agencies include VDC in relevant regional, national and international marketing campaigns.

9.5.7. Joint Marketing

There may be opportunities for VDC and the individual product owners to market VDC jointly. Where this is appropriate, the parties should work together. Close liaison between the parties should be encouraged.

9.5.8. Screening of Marketing Material

All marketing material concerning VDC should be screened by Management to ensure that a consistent image of the destination and its unique features and a correct message relating to its management is portrayed.

10. SOCIO-ECONOMIC DEVELOPMENT

10.1. BACKGROUND

Population densities in the region are low with higher levels of employment and literacy than the South African average. Agriculture, tourism and mining are the primary economic contributors in the area.

The area is recognised as a typical developing region. In this regard its main challenge is similar to those faced by many countries in Sub-Sahara Africa, namely to successfully restructure its economy away from the primary sectors towards labour-intensive, value-added manufacturing, services and tourism.

10.2. VISION

Recognising that VDC in its former, current and future land-use forms has had and will continue to have an impact on the regional economy, and that it will have difficulty in achieving its objectives without the understanding and appreciation of the larger community, it is envisaged that VDC's stimulus to the local and regional economy will be recognised and that it will therefore be seen as an important vehicle through which rural development and transformation is achieved.

10.3. OBJECTIVE

The primary objective of Socio-economic Development is to facilitate community and emerging entrepreneur access to tourism activities and opportunities in and around VDC and to stimulate local economic activities and job creation. *[This will result in public understanding, appreciation and support for VDC and its projects and programmes, as a valid and beneficial land use option].*

10.4. POLICY

VDC, in line with national policies, has an important role in community empowerment generally and participation specifically, as acknowledged in the vision above. Capacity building within communities is however a non-core activity of VDC and will therefore be facilitated by optimally utilising the resources and capacities of other support institutions. VDC will therefore;

- establish appropriate fora through which communities can give their inputs to decision making and any significant changes in the policies and management of

VDC;

- involve itself at all levels of community empowerment and participation;
- facilitate the necessary support mechanisms for community empowerment through external agencies (Donor NGO's, Government, Private Sector) before allocating its own resources;
- pro-actively identify and regularly expose all business opportunities to communities through an open-ended invitation and through a transparent and user-friendly process;
- where feasible, create special programmes and criteria that will give local and disadvantaged communities and emerging entrepreneurs preference of access to outsourcing contracts;
- in the case of tourism-based enterprises and other direct operational opportunities within VDC, limit its role in capacity building to that of a pro-active facilitator, by procuring appropriate support mechanisms within the private sector, NGO's, government and other agencies;
- in the case of peripheral enterprises, support services and industries, only be obliged to expose opportunities to all neighbouring communities and emerging entrepreneurs.

10.5. STRATEGIES

Community participation, understanding, appreciation and support will be obtained through pro-actively implementing the following strategies within the constraints of available resources:

- Establishment of effective communication mechanisms
- Running an education and awareness programme that will create the necessary understanding, appreciation and support for VDC, its objectives and its operations
- Engaging in appropriate partnerships that will access training and other empowerment resources and capacities of community empowerment support agencies
- Constantly identifying opportunities and inviting communities and emerging entrepreneurs to participate
- Offering preference to communities and emerging entrepreneurs through special selection procedures and support programmes for identified community-based business opportunities

- Identifying and optimally utilising the opportunity to tap into the resources of external social programmes that are aligned to the objectives and policies of the Community Participation programmes (eg Poverty Relief, Job Creation, etc)

10.6. OPERATIONAL GUIDELINES

10.6.1. Community Institutions

VDC will maintain formal communication links with communities through recognised and representative (preferably existing regional and local) structures. These structures will be allowed representation on the Vredefort Dome Forum and their role is to provide a formal communication link with affected communities and to ensure that benefits are accessible to the entire community.

10.6.2. Communication

VDC will regularly engage in two-way communication with the recognised community institutions, allowing regular;

- dissemination of important information
- exposure to opportunities within VDC
- participation in decision making processes, planning and management issues
- monitoring of community perceptions and attitudes.

Important community related information and programmes will be regularly disseminated through appropriate printed, electronic and other media. Target markets will include appropriate support institutions, government agencies, NGO's and politicians.

All identified opportunities will be regularly exposed to communities and emerging entrepreneurs.

10.6.3. Awareness and Education Programmes

VDC within the limits of its financial resources, will facilitate appropriate education and information programmes that will create awareness, appreciation and support amongst all regional communities, for the VDC policies, objectives and projects.

Such programmes and its successes will constantly be reviewed and improved; will build on previous experiences; and where appropriate, will be integrated with

programmes of other government, NGO and private agencies. Appropriate partners, donor organisations and support institutions will therefore be identified and engaged in a joint venture to limit the drain on VDC resources. Education related operations that are aligned with VDC's policies and strategies might be allowed access to VDC and its infrastructure at special rates.

Special tailor-made programmes may be introduced for identified target markets, such as children, community leaders and -structures, the business community, politicians, the media and the general public.

A regular independent and professional assessment will be done of trends in community perceptions and attitudes towards VDC, to enable management to improve relations with target communities.

10.6.4. Community Empowerment Partnerships

Where appropriate, VDC may contractually engage Government, NGO, private and other agencies to establish the necessary support mechanisms and institutional capacities that will facilitate entrepreneurial and skills development and access to resources for local communities and entrepreneurs. VDC may also assist communities in establishing direct relationships with such agencies. All relationships will be established along predetermined guidelines and in accordance with approved programmes that will be monitored at predetermined stages and at regular intervals.

A database of support mechanisms and institutions in the field of capacity building, community empowerment, skills training and funding will be maintained and formal relationships will be established with appropriate role players.

10.6.5. Access to Commercial Opportunities within VDC

Participation in commercial (business) opportunities within VDC, by communities and emerging entrepreneurs, will be pro-actively pursued. Therefore, a permanent inventory will be kept of commercial opportunities available to communities and SMME's inside VDC and of emerging entrepreneurs within the community. The co-operation of landowners and operators in identifying outsourcing opportunities within their own establishments is required.

The development approvals, licensing of enterprises and the use of VDC branding may be conditional on preference being given to local economic empowerment and job creation.

10.6.6. Communication Forum

Every landowner that joins the VDC and every operator inside VDC will automatically be a member of the VDC Forum.

10.6.7. Employment and Small Business Development

Operators inside VDC are obliged to optimise community participation through the application of supportive employment and business contract policies.

10.6.8. Peripheral Commercial Opportunities

Commercial opportunities outside VDC will be pro-actively identified on a regular basis and the potential for entrepreneurial participation and other linkage opportunities will be communicated to identified stakeholders.

10.6.9. Utilising Social Programmes

Social programmes initiated by external organisations (e.g. Job creation, Poverty relief, training initiatives and NGO support programmes) will be identified and tapped into where it has the potential to support VDC objectives, strategies and projects.

10.6.10. Socio-economic Survey

Management will annually obtain available information and where necessary conduct a survey amongst its members in order to identify the needs, skills and economic status of the community as well as the population demographics. This will provide baseline data on which fundamental planning can be based and will also provide a benchmark against which changes can be measured from time to time. It will also provide indications as to what expectations there are concerning VDC and what issues will need to be addressed to deal with these needs or expectations. This will involve ongoing monitoring as well as less frequent but more intensive follow-up studies. These will be co-ordinated by Management.

11. FUNDING

11.1. BACKGROUND

It is recognised that VDC has tremendous tourism potential and already hosts a large number of tourist products and activities. Landowners and tourism operators will most definitely benefit from improved branding, destination management and marketing and should therefore be able to afford making contributions towards VDC. Potential benefits include increased property values, growth in tourism developments and visitor numbers, increased concession fees and tourism income.

Although the potential exists for charging visitor entrance fees, membership fees and operator levies, no permanent sources of funding currently exist.

Considering the importance of VDC as a Protected Area and the expected World Heritage Site Listing, it can be expected that government will continue to support VDC in implementing this Strategic Plan and the envisaged Management Plan. Various types of government assistance could be available, varying from planning and marketing to poverty alleviation, extension services, training and SME development.

It can also be expected that sponsorships and other private sector contributions will become a possibility as VDC's value is appreciated and it gains prominence in the scientific, conservation and tourism arenas.

The challenge is to convince landowners and operators (particularly those that are uninformed and/or negative) of the potential benefits of VDC and that it would be in their interest to join as members and make financial contributions.

VDC and its management currently have no financial resources.

11.2. VISION

Recognising the longterm objectives of VDC and the constant need for appropriate funding and financial management, VDC becomes financially sustainable and is recognised for its professional financial management.

11.3. OBJECTIVES

To achieve financial self-sufficiency through exploiting all possible financial sources, the wise utilisation of all its collective resources and the sound management of financial and other resources.

11.4. POLICY

Financial self-sufficiency will be sought through balancing the known income streams with annual budgets approved at the AGM.

No debts or deficits may be incurred nor will any loan financing be utilised.

Financial contributions from landowners should be proportionate to land size.

Levies could be raised from tourism operators and entrance fees can be charged to visitors.

11.5. STRATEGY

Funding could be achieved through the implementation of the following strategies:

- Identify and implement developments that have the greatest impact potential in relation to their cost (eg beautification, information service to stakeholders, fencing, entrance gates and interpretation centre/s)
- Identify and procure external sources of funding from government and non-government conservation and tourism agencies for once-off planning and the priority developments identified above
- Develop a realistic budget that will cover the essential and most beneficial management costs
- Develop and implement an equitable fee structure for visitors, landowners and tourism operators that will cover annual management costs
- Manage funds and other resources cost-effectively and cost-efficiently

11.6. OPERATIONAL GUIDELINES

11.6.1. Sourcing of Funds

VDC will act as a procurement agent on behalf of members and tap into all possible

sources of non-loan funding:

- Government grants (National, provincial, local, job creation, work for water, poverty relief, SME development and other schemes)
- Donor agencies (corporate sector, conservation agencies, research and technology agencies such as NASA for capital requirements, technical assistance, research, etc)
- Sponsorships
- Concessions
- Member levies
- Resource utilisation
- Trading
- Entrance fees

11.6.2. Management of Funds

Funds will be managed professionally in a cost-effective and cost-efficient manner.

11.6.3. Control over Funds

Management will submit an annual budget and have ultimate control over funds and its application and will report to its members at each AGM.

12. AUTHOR AND ACKNOWLEDGEMENTS

12.1. AUTHOR DETAILS

The authors are:

Willie Boonzaaier

Contour Project Managers CC

PO Box 4906

Rustenburg 0300

Tel +27- (14) - 537 2226

Fax +27 - (14) - 537 2118

E-mail contour@mweb.co.za

Website www.linx.co.za/contour/

Marlien Lourens

Grant Thornton Kessel Feinstein

Postal address: Private Bag X28 Benmore 2010, South Africa

Tel +27 - (11) - 322 4500

Fax +27 - (11) - 322 4545

Email mbosman@gt.co.za

Website www.gt.co.za

12.2. MANAGEMENT TEAM

The Executive Management Committee and various academics and stakeholders are thanked for their enthusiastic co-operative in making contributions, providing important background information, responding to the many requests for further literature or answering questions, setting up and hosting various meetings and workshops and supporting the professional team in general.

13. REFERENCES

13.1. BIBLIOGRAPHY

Reference Documents:

Advertising Research Foundation, 1997, All Media Purpose Survey (AMPS)

Brink M.C. 1999, Die Oorsprong van die Geologiese Ringstruktuur by Vredefort

Brink M.C. Waanders F.B. & Bischoff A.A. The Katdoornbosch-Witpoortjie Fault: a ring thrust of Vredefort Event age, School of Chemical and Mineral Engineering, Potchefstroom University

Burger A. Dome Highlands Nature Park: Motivation for Funding, Steering Committee Working Document

Conroy D.J. 1983, Inligting oor 'n voorgestelde bewaringsgebied, SA National Parks

De La Harpe H. Vredefort Dome in Line-up for World Heritage Nomination, Vredefort Dome World Heritage Initiative

Dinokeng Consortium, 2001, Research conducted for DACEL Dinokeng project, Gauteng Day & Weekend Visitor Trends

Du Preez P.J. 1987, Ekologie van die Boomgemeenskappe van Vredefortdistrik, Oranje Vrystaat, Masters thesis (University of Orange Freestate)

De Swart & Dyus 2001, Vredefort Dome Initiative Status Quo Report Northern Freestate District Council

Erasmus C. 2001, General Information regarding Vredefort Dome as a possible World Heritage Site, Freestate Province Department of Environment Affairs and Tourism

Erasmus C & Cronje E. 2001, Vredefort Dome World Heritage Site (Draft Proposal), Freestate Province Department of Environment Affairs and Tourism

Gibson R.L. & Reimold W.U. 1999, The Vredefort Impact Structure, South Africa (The Scientific Evidence and a Two-day Excursion Guide), Department of Geology, University of the Witwatersrand

Human Science Research Council, 1998, Educational Requirements in Gauteng

International Union for Conservation of Nature and Natural Resources. 1994. Guidelines for Protected Area Management Categories, IUCN Commission on National Parks and Protected Areas with the assistance of the World Conservation Monitoring Centre. IUCN, Gland, Switzerland and Cambridge, UK.

Jansen J. Map of the Vredefort Dome Proposed World Heritage Site. DEAT

Labuschagne P. 2001, Vredefort Dome Initiative, Minutes of Meetings, Potchefstroom Local Municipality

Lourens M. 2001, Tourism Survey of the Vredefort Dome Region, Grant Thornton Kessel Feinstein

Muller T. 2001, Proposed Dome Nature Park, Free State and North West Provinces

Pelser Anton. 2000, A report on the first phase of a cultural resource survey on the Vredefort Dome, National Cultural History Museum Archaeology Department

Reimold W.U. 2001, The Vredefort Saga, a Controversy Around the World's Largest Gold Source, Geotimes, Magazine of the Earth Sciences

Reimold W.U. The Geological Significance of the Vredefort Dome: Motivation for World Heritage Status, Department of Geology, University of the Witwatersrand

Reimold W.U. & Coney L. 2001, The Vredefort Dome Impact Structure and Directly Related Subjects: an Updated Biography Economic Geology Research Institute, University of Witwatersrand

Reimold W.U. & Gibson R.L. Geology and the Evolution of the Vredefort Impact Structure, South Africa, Department of Geology, University of the Witwatersrand

South African Tourism, 1999 to 2000, International Tourism Surveys

South African Tourism, 1996 –2001, Domestic Tourism Surveys

Van Der Merwe J. 2000 Vredefort Dome, Potchefstroom in 2000

Viljoen M.J. & Reimold W.U. An Introduction to South Africa's Geological and Mining Heritage, Mintek in association with the Geological Society of South Africa

Environmental Problems Related to Mining the Kimberley Reefs Horizon in the Vredefort Mountain Land Area

Konsepgrondwet vir die Koepelbewaria, Dome Bergland Conservancy

1997, Operational Guidelines for the Implementation of the World Heritage Convention, UNESCO

Websites:

<http://protea.worldonline.co.za>, 2001, Vredefort Dome 17 - 18 February 2001

www.geosites.co.za/vredefort, 2001, Geological Heritage Tours: Vredefort Dome

www.gwu.edu/~spctour/market, 1996, Space tourism surveys

www.hartrao.ac.za/other/vredefort/, 2001, Deep Impact - The Vredefort Dome

www.linx.co.za/trails/backtrack/rooihaas, 2001, The Rooihaas Hiking Trail: Vredefort Dome

www.mintek.co.za/pubs/geobook/vredefortdome, Landsat Images of the Vredefort Dome

www.space.com, 2001 Reinstating citizens in space

www.space.com, 2001 Tourism as a catalyst
www.spacefuture.com, 1997 Introduction: What is Space Tourism?
www.spacefuture.com, 1997 Space Tourism: How soon will it happen?
www.sciencenorth.on.ca, 2001 Science North Foundation

13.2. STAKEHOLDER WORKSHOPS AND ORIENTATION VISITS

A number of field trips were made by the professional team, during which visits the study area was covered extensively to obtain an understanding of the landscape, the rich geological, archaeological, historical and natural attractions, the tourism potential and other relevant features of the study area.

In this regard, Adv. Steven de la Harpe, Mr Johannes van der Merwe and Dr Maartin Brink were particularly helpful in orientating and hosting the team and introducing them to landowners and operators on the ground.

Stakeholder workshops were held at Dimalachite and Kiepersol on the 23rd and 24th November 2001 respectively.

VREDEFORT DOME CONSERVANCY

SITUATION ANALYSIS REPORT

25 February 2002



CONTOUR
Project Managers

In association with
Grant Thornton
Kessel Feinstein 

LIST OF FIGURES

- Figure 1: Documentation Structure**
Figure 2: Percentage Share of Domestic Tourist Trips (2001)
Figure 3: Percentage Breakdown of Trips by Region and Purpose
Figure 4: Percentage Breakdown of Trips by Region and Purpose

LIST OF IMAGES

- Images 1 and 2: Views of the Vredefort Dome hills from space**

LIST OF PICTURES

- Pictures 1 and 2: Overturned Quartzite Hills**
Pictures 3,4 and 5: Interesting Valley Landforms
Pictures 6,7 and 8: Disturbed Vegetation in the Vredefort Dome
Pictures 9,10 and 11: Mining, Archaeological and Historical Sites
Pictures 12, 13 and 14: Historical Venterskroon Mining Village
Pictures 15, 16 and 17: Topographical Features of the Vredefort Dome
Pictures 18 and 19: Unsightly Developments
Pictures 20 & 21: Rustic Accommodation Facilities in the Vredefort Dome
Pictures 22 and 23: Tourism Products within the Vredefort Dome area
Picture 24: A 5 storey IMAX theatre at Sudbury, used for product launches, group presentations and private screenings
Picture 25: A 5 storey IMAX theatre at Sudbury, used for product launches, group presentations and private screenings
Picture 26: Science North Foundation, Sudbury, Canada

LIST OF TABLES

- Table 1: Summary of Tourism Numbers to the Vredefort Dome Area**
Table 2: Comparative Game Reserve Densities
Table 3: Percentage & Number of Foreign Tourists that Visit North West Province
Table 4: Foreign Visitors to North West and Other Provinces
Table 5: Tourist attractions in the North West visited by Foreign Arrivals to South Africa
Table 6: Activities Experienced by Foreign Visitors to South Africa

- Table 7: Percentage & Estimated Number of Foreign Tourists that Visit the Free State**
- Table 8: Number and percentage of people per LSM category residing In Gauteng and North West Provinces**
- Table 9: Number of people per LSM category residing in Gauteng**
- Table 10: LSM race distribution in Gauteng**
- Table 11: LSM race distribution in North West**
- Table 12: Percentage education level per LSM group - RSA**
- Table 13: Breakdown of Market by LSM & Population Groups**
- Table 14: Estimated Day and Weekend market from Gauteng**
- Table 15: Day Visitor Markets to Vredefort Area**
- Table 16: Total Estimated Number of Overnight Visitors & Roomnight Demand by Source Market (2002)**
- Table 17: Projected Roomnight Demand: Scenario 1 & 2**
- Table 18: Game Reserve Densities**

LIST OF MAPS

- Map 1: Base Map**
- Map 2: Geology of the Vredefort Dome**
- Map 3: Regional Tourism Products**
- Map 4: Proposed Vredefort Dome Zoning**

ANNEXURES

- A: Tourism Products in the Vredefort Dome Region**
- B: Tourism Demand Analysis**
- C: Literature Database**
- D: Strategic Exercise Matrix**

1. INTRODUCTION

1.1. AIM AND CONTEXT OF THIS DOCUMENT

1.1.1. Purpose of Study

The aim of this document is to provide a concise “snap-shot” situation analysis of the current position at the proposed (VDC) Vredefort Dome Conservancy, thus assisting the Executive in developing policies and strategies for VDC; by

- analysing the latest strategic thinking and opinions of stakeholders;
- evaluating the external and internal environments; and
- determining and discussing Specific Issues that may affect the future of VDC with stakeholders.

This document therefore lays the foundation for new strategic thinking and long-term as well as short-term planning.

1.1.2. Context of the Situation Report

This document is one in a series of management documents that jointly aim to provide historical and archive material, sketch the current situation, provide policy and strategic direction and give guidelines for the day-to-day management of the Vredefort Dome Conservancy.

The following reports need to be maintained by management as important management tools:

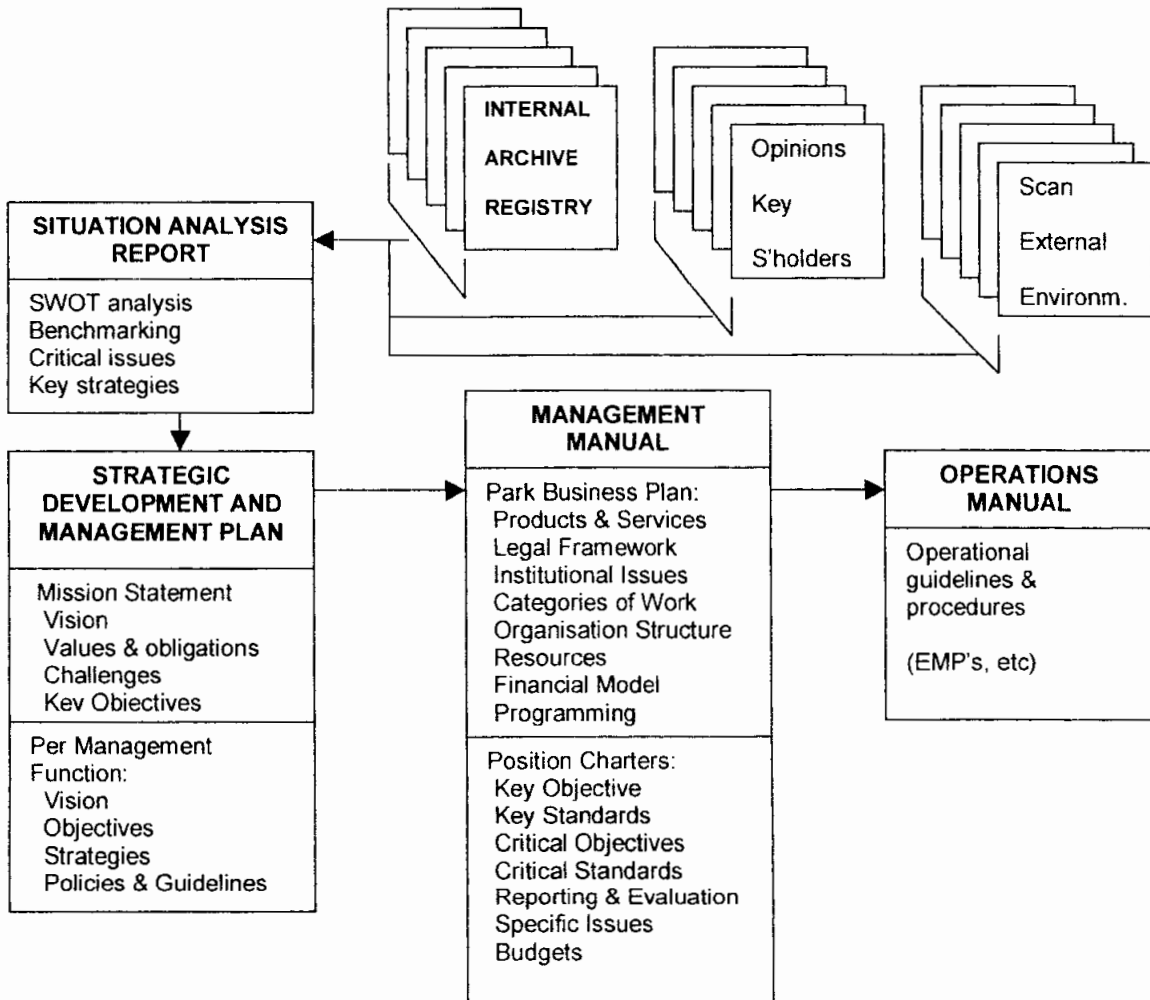
- **An Archive Registry of the Conservancy**, which should be maintained and updated monthly as a permanent record of all the relevant historical records and technical information on the Park and where it can be accessed. Refer Annexure C for an interim record.
- **A Conservancy Situation Analysis Report**, which is a situational review (or scoping) by management, every two to five years, depending on prevailing circumstances and the rate of change.
- **A Conservancy Strategic Development and Management Plan**, which is updated as a strategic and policy overview with new policy guidelines every two to five years, following the aforementioned review.
- **A Conservancy Management Manual**, which is updated annually, as a business plan and guideline for managers, aligning human and other resources with strategies and specifying clear management functions, objectives and standards.

- **Conservancy Operations Manual**, which is updated monthly by the technical and operations staff, as an operational and procedural guideline and training tool.

1.1.3. Documentation Structure

The overall structure for the documents is illustrated as follows:

Figure 1: Documentation Structure



1.1.4. Process

The Situation Analysis Report was developed through a series of meetings and contacts with the following stakeholder representatives:

- the Vredefort Dome Forum management committee
- scientists (specifically in relation to the geology and the ecology of the area)
- government agencies in the Free State and North West provinces
- landowners and tourism operators

This was done through a verbal request for information at a public meeting held at Potchefstroom on 18 October 2001, an electronic call for information to all stakeholders on the database of the forum and through direct contacts with those that responded to our requests.

Further consultation will continue to take place during the process of finalising the Situation Report and the Strategic Development and Management Plans.

In addition, a database of literature was compiled and used as references in a desktop study conducted to understand the study area, to identify strengths and weaknesses within the internal environment, to identify opportunities and threats in the external environment and to identify critical issues and potential strategies.

Apart from available tourism demand studies that were used, additional primary research was done to clearly understand the tourism demand and supply aspects to the extent that informed recommendations could be made on tourism potential.

1.2. OVERVIEW OF THE CONSERVANCY

The Vredefort Dome Impact Structure is a unique geological phenomenon of international significance believed to have been created by an extreme meteorite impact. This structure has been studied by numerous scientists. More than 700

publications have appeared with some reference to the Vredefort Dome Impact Structure ¹.

The Vredefort Dome Conservancy is located close to the centre of this impact structure with a diameter of approximately 400 km. Although the study area of some 30 108 hectare (Vredefort Dome Conservancy) only covers a small part of the Vredefort Dome Impact Structure, it represents the more visible central granite core and other above ground geological formations, as well as certain interesting and aesthetically pleasing landscapes and diverse ecosystems. It is also relatively close to tourism markets and access routes and has more recently been growing its tourism products. Apart from its natural beauty, the area also offers a rich cultural backdrop comprising a number of interesting archaeological and mining sites and other historical aspects.

The area is clearly demarcated by a provincial road network and constitutes an area of relatively low densities of development, marginal agricultural potential and most significantly, where most landowners have already agreed to incorporate their land into a conservancy.

The study area crosses the Vaal River with its significant tourism attractions to incorporate approximately 11 251 ha in the Free State (\pm 70 landowners) and 18 857 ha in the North West Province (\pm 20 landowners).

1.3. CURRENT STRATEGIC DIRECTION

The current strategic thinking includes the incorporation of all the land within the designated area into the conservancy, the registration of the conservancy as a world heritage site with the united nations and the joint planning, development and management of the area by the stakeholders with the assistance of government and the private sector.

¹ Reimold W.U and Coney L, 2001. The Vredefort Dome Impact Structure and Directly Related Subjects: An Updated Biography. Economic Geology Research Institute, University of Witwatersrand

To this end, an application is being prepared for submission to UNESCO (United Nations Educational, Scientific and Cultural Organisation) for recognition as a World Heritage Site.

Secondly, a Strategic Development and Management Plan is being prepared as a direct outcome of this document, after having consulted with all interested and affected parties.

1.4. APPROACH TO THE STUDY

1.4.1. Use of Available Data

A number of studies have been done for the Vredefort Dome. These include a number of geological, conservation, tourism and planning studies. The Situation Report is predominantly based upon the work done in these studies and purposefully avoided duplication to save time and costs. Refer to the literature database attached as Annexure C.

Limited primary research was however necessary to determine the most recent status of current tourism products in the study area.

1.4.2. Regional Context and Integrated Approach

The project team wants to ensure that the project plan is fully integrated with other regional planning initiatives. The Vredefort Dome project will therefore not be planned in isolation, as it has the potential to become an anchor project that can act as a catalyst for stimulating significant peripheral as well as regional tourism products and linkages. Particularly in view of the complex and diverse development dynamics in the region, it is essential that the project planning has to be fully consultative with other planning authorities and is integrated with regional dynamics.

The potential of the Vredefort Dome is therefore interpreted from a physical, spatial, land tenure and socio-economic point of view to broadly determine the best development potential for the study area.

An integrated approach is followed to involve all dimensions relevant to conservation and tourism development, including the economy, the spatial locational patterns, population dynamics and the enabling environment.

In this regard the Integrated Development Plans of the appropriate local authorities will be used.

1.4.3. Consultative Approach

Although the team has optimally utilised all former studies to save time and money, it will be necessary to involve all key stakeholders in the process of discussing the project development and management plan before any further steps can be taken.

The consultative process aims at obtaining consensus and commitment to the project, but will also be educational in the sense that it will ensure that unrealistic expectations and incorrect perceptions are addressed and that stakeholders understand the different options and the potential impact of their decisions.

1.4.4. Project Focus

Many integrated projects fail due to the lack or limited capacities of a primary project champion. In this case, this should not be a problem.

The project team understands that although FSDEAT (Free State Department of Environmental Affairs and Tourism) does not plan to expand its own protected areas, it does accept the responsibility of acting in a leading and facilitation role in partnership with NWPTB (North West Parks and Tourism Board), relevant state agencies and landowners to establish the Vredefort Dome as a fully integrated protected area and World Heritage Site.

It is also understood that most of the technical skills required for further studies and management of the project already exist amongst the members of the Management Committee and other stakeholders. These include geological research, ecological management, EIAs, environmental management and monitoring and tourism research. Particularly the Potchefstroom University can play a major role in future studies and consulting on a wide range of planning, research and management topics.

The project is therefore built around the fact that the need is rather for finalising future direction for the project and identifying and addressing critical practical and implementation issues than focusing on further theoretical studies.

1.4.5. Realistic Assessment of Potential

The project team has extensive practical experience in the full process of conceptualising, negotiating, planning, implementing and managing prominent nature-based projects in Southern Africa within complex environments.

The study is therefore evaluated and tested for real potential and will not be lead by pre-conceived ideas. Stakeholders will therefore be confronted with real facts, issues and options, based on experience elsewhere, when having to make choices and decisions.

1.4.6. Approach to Sustainable Development

Unless the overall sustainability of the project can be assured, it would be unwise to start implementation. Apart from the internal biophysical, institutional, financial and other factors over which a project may have direct control, every project is also exposed to external factors. The project has to be evaluated within the broader context of its physical, social and economic environment.

The project is therefore tested for sustainability not only in terms of its internal capacities and its own financial potential, but also in terms of the sustainability of other supporting factors. These include amongst others regional demographics, community perceptions, competing land-uses, institutional arrangements, land tenure, socio-economic spin-offs to the region, political commitment, social stability, infrastructure support, future markets, support service industries, natural resources, etc.

Critical external factors that are likely to influence the project will also be broadly identified and may require external interventions to ensure sustainability of the project.

2. INTERNAL ENVIRONMENT

2.1 PHYSICAL ENVIRONMENT

2.1.1 Geology

The geology of the Vredefort Dome Impact Structure, situated near Parys and Vredefort in the Free State Province of South Africa and in the centre of the Witwatersrand Basin, is absolutely unique and of great interest to geologists all over the world. Particularly the area in the vicinity of the Vredefort Dome Conservancy attracts great interest due to the above-ground formations that make research and interpretation a lot easier.

In the region of Vredefort a relatively flat area with the presence of granite rock appears, which normally occurs in the deep crust of the earth. Around this granitic region lies a half-concentric ring of hills towards the north-west. The layers within these hills are upside down with an angle of approximately 60 degrees towards the inside of the circle. This first ring of hills is known as the Vredefort Bergland or Vredefort hills. Outside these hills lies a wide arching valley stretching from Vereeniging in the east towards Potchefstroom and then curving south-westerly towards Viljoenskroon. Underground evidence exists that the same ring structure continues underground to complete the circle in the south-east, although not visible. This confirms a ripple-effect similar to that which can be observed when dropping a pebble into a pool of water.

It is believed that a major catastrophic event occurred 2020 million years ago when a huge meteorite of possibly 10 to 15 km diameter slammed into the earth to form a massive impact crater, the eroded remnants of which today is only visible north-west of the impact site. The Vredefort Dome, an uplifted core of basement rocks surrounded by overturned sedimentary rocks, today marks the centre of this the largest and oldest known meteorite impact structure on Earth. It is situated 120 km south-west of Johannesburg and straddles the Vaal river.

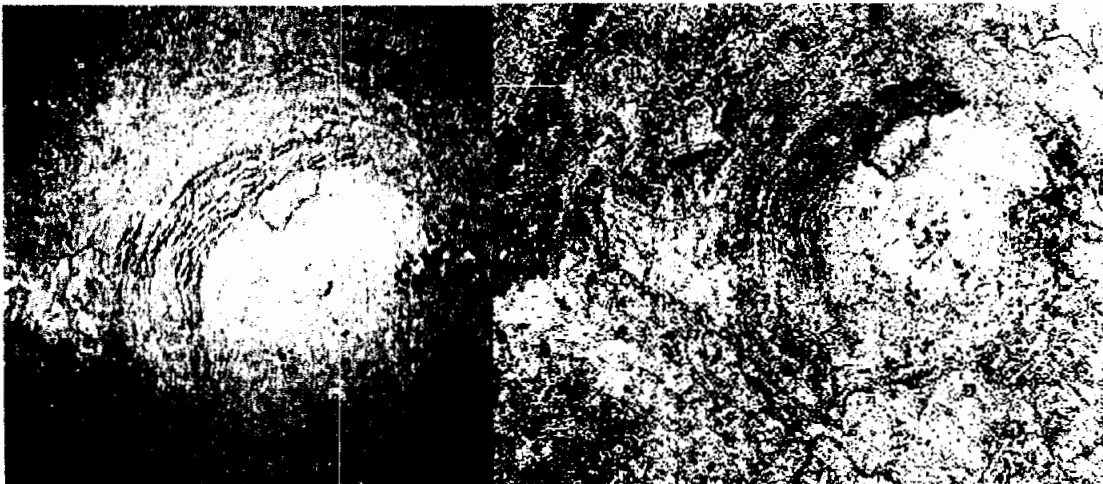
Although the origin of the dome was debated with much controversy by scientists, it is today generally accepted that the cause of this interesting structure was that of a gigantic meteorite impact.

The size (250 km in diameter) and age of the structure makes it the largest and oldest on earth.

Evidence exist of violent shifts and deformations in the form of melt rocks which is only found here and in the Sudbury Impact Structure in Canada. Another evidence of this major impact are the shatter cones that are found in sharply upturned rocks of the Vredefort hills that surround the central core of uplifted granitic rock. Signs of shock metamorphic effects and unusual melted formations (Vredefort Granopyre) with traces of meteorite origin and zircon crystals are believed to be further evidence of this extraordinary event.

It is further believed that the gold-bearing Witwatersrand strata would have disappeared as a result of erosion if it was not for this catastrophic event.

Images 1 and 2: Views of the Vredefort Dome hills from space

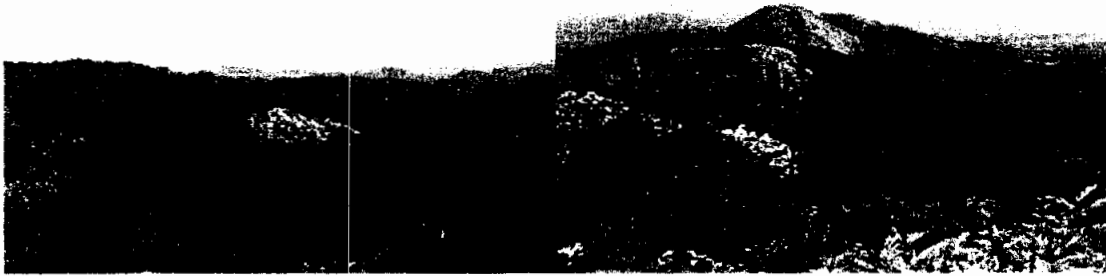


*Earth Sciences and Image Analysis
Laboratory, NASA Space Centre*

*Landsat False-colour Image of the
Vredefort Dome*

The Vaal river can clearly be seen where it cuts through the Vredefort hills from north-east to west in the above images.

Pictures 1 and 2: Overturned Quartzite Hills



Quartzite hills in Koedoesfontein (left) and imprecate faulting (right) resulting in repetitions of Hospital Hills Quartzite with ring-shaped hills of Vredefort in the background

An interesting phenomenon that adds to the spectacular scenery of the landscape is the steeply dipping and heavily fractured overturned quartzite hills caused by impact deformation.

2.1.2 Climate

The average rainfall is 625 mm of which approximately 500mm is in the summer months. Between 50 and 60 days are rain days with more than 7mm rain per day. Rain often comes in heavy thunderstorms and on average six hail storms can be expected each year. The rainfall patterns are however erratic and drought is not an uncommon occurrence. On average, rain-days of four days or more can be expected three times per year.

Average day temperatures in summer vary from a hot 30°C maximum to a cool 15°C minimum. On average only one night in each year one will experience a "tropical night" with a temperature of 20°C or higher. In winter the maximum is a pleasant 18°C dropping to cold nights of around freezing point. The winter nights can however drop to -10°C.

Northern slopes are always warmer than on the southern slopes and the valleys are always cooler at night than the hill tops and slopes.

In general, each day (winter and summer) has more than eight hours of sunshine.

The predominant wind direction is north, varying between north-easterly and north-westerly. Winds from the south occasionally occurs after storms and winds from the west and the east are at very low frequencies.

From a tourism perspective, it is important to note that based on world norms, only the average June and July winter nights can be classified as cold. The summer days from November to March are classified as warm. Due to the great variances in temperature, the only pleasant days are the spring days of August, September and October and the autumn days of April and May.

2.1.3 Hydrology and Geomorphology

The Vaal River is by far the major surface water body and drainage system within the study area. Water quality in the Vaal river has however been a concern for some time and tests are being done on a regular basis. The water of the Vaal river is mainly contaminated by mineralisation from the significant Gauteng urban metropolis with its human and industrial effluent and other upstream Agricultural activities. Both the algae and water hyacinths build-ups are signs of such contamination. Other signs are the disappearance of certain smaller animals in the river ecosystem.

Due to the repetition of the quartzite hills in particularly the north-western portion of the study area, numerous drainage lines and valleys with sediments. The different types of drainage patterns formed by the unique geology are also rather unique.

A large variety of valley forms are also encountered. Between the steep quartzite hills, sharp V-shaped valleys are formed. These hills are also dissected with cross-valleys, similar to plates standing row upon row in a drying rack. A number of U-shaped valleys and flat valleys caused by erosion. The varied rock formations had a strong influence on the variety of valleys formed through erosion. The diversity of valley forms in a relatively small area is quite unique and emphasises the need for conserving the area.

Pictures 3,4 and 5: Interesting Valley Landforms



Views of different valley forms on the farms Steenkampsberg, Koedoesfontein and river view Koedoeslaagte.

2.1.4 Soils and Agricultural Potential

Predominantly soils are of the Hutton form with an effective depth of approximately 75cm. Along the river, limited portions of Dundee form silt soils occur. Most of the study area has no or very limited arable land potential, except on along the Vaal river and on the flat areas in the Free State. Limited irrigation still occurs although many farmers have allowed old lands to reclaim themselves. It does however appear that a few larger irrigation farms along the river have good agricultural potential. Certain areas need to be withdrawn due to the danger of erosion. In many instances farmers have re-sown their lands with indigenous grasses in an effort to expedite the reclamation process. Grazing areas comprise the larger hilly areas which cannot be properly utilised by cattle due to the steep slopes and inaccessibility of much of the terrain. The carrying capacity in many cases is quite low at approximately seven hectare required for a Large Animal Unit. Accessibility also restricts the ability to apply sound farming practices. It is expected that normal pastures and livestock farming potential is marginal, particularly on the many smaller land parcels.

2.2 BIOLOGICAL ENVIRONMENT

2.2.1 Vegetation

Acocks classifies the area as Bankenveld. Due to the diversity of the study area caused by the meteorite impact and the resulting geological formations, the river and its riverine forests, the varying hill slopes and valleys and the different grass veld vegetation in the south and the higher lying plateau in the extreme north, many interesting plant communities occur. The broader distribution of plants are partly determined by the different physical and chemical aspects of the soils in the study

area. Other aspects such as different geological formations, height above sea level, slope, aspect, depth of soil and drainage also play a substantial role in the distribution patterns of plant species.

The following main tree- and shrub communities have been classified by PJ du Preez [*Ekologie van die boomgemeenskappe van Vredefortdistrik, Oranje Vrystaat, 1987*]:

- The *Protea caffra* community
- The *Acacia hereroensis* community
- The *Olea europaea* subsp. *Africana* – *Pavetta zeyheri* community
- The *Comretum molle* community
- The *Buddleja saligna* – *Rhoicissus tridentata* community
- The *Salix capensis* community
- The *Diospyros lycioidis* – *Rhus pyroides* community
- The *Acacia karroo* – *Protasparagus suaveolens* community

The presence of Red Ivory (*Berchemia zeyheri*) is believed by some to be the most southerly inland distribution. The substantial stand of Wild Olive (*Olea Europaea*) on the farm Koppieskraal is unique and has been proclaimed a National Heritage Site.

There is however concern about a number of alien species that have become a problem. These include amongst others large stands of gum trees which are particularly threatening along the banks of the Vaal river where they are encroaching on the natural vegetation and where they have already destroyed large stands of indigenous riverine forest. Smaller stands of poplar and weeping willow also occur in places. Many stands of different types of prickly pear are spread throughout the study area. All along the river, the present mosaic of cultivated lands are also in need of reclamation if the area is to become a conservation area. It is expected that a number of domesticated plant types may have to be controlled. The river is also heavily infested with water hyacinths which is almost impossible to control due to the upstream infestations.

Pictures 6,7 and 8: Disturbed Vegetation in the Vredefort Dome



Wild Olive stand on Koppieskraal - a National Heritage Site - with lands in foreground and stands of blue gum on the Vaal river and lands under irrigation.

2.2.2 Wildlife Populations

The area has capacity for a large variety of wildlife species. The interesting variety of birds, smaller mammals and insects such as ants and butterflies are important indicators in terms of the capacity of the area to sustain a rich biodiversity.

With regards the larger mammal species, it is worthwhile to note that a number of farms have been game fenced and the trend continues. These areas are used for personal recreation as well as tourism purposes.

2.3 ARCHAEOLOGY, HISTORY AND CULTURE

The area is rich in archaeological, historical and cultural assets. This has been highlighted by archaeological excavations carried out at the Late Iron Age site called Askoppies on the farm Tygerfontein. Evidence of human activity dates right back to the Stone Age and evidence still exists of caves, rock shelters, pottery, rock engravings and rock art. Iron Age sites occur on the Buffelshoek and Askoppies sites. Research on the latter site dates the extensive settlement back to the period between the late 17th and early 19th century. Other late Iron Age sites occur on a number of properties, including the farms Tygerfontein and Rondekoppie. Kraals typical of both the Tswana and Sotho cultures exist in the area and it appears that later kraals represent a transition type which may be a combination of the two different groups. This makes the study area also quite unique from an archaeological point of view in terms of research opportunities.

Pictures 9, 10 and 11: Mining, Archaeological and Historical Sites



Mineshaft on Mizpah and the Askoppies kraal sites and the heliograph post, both on Tygerfontein

Poorly preserved San rock art with sketches as well as tools and a cave with animal bones occurs on the farm Feestdrift. Further rock engravings occur on the farms Diepfontein and Deelfontein, possible from the Late Stone Age to Iron Age. Numerous animals and other figures are portrayed. All these sites need proper research and conservation.

Numerous worked-out mining sites occur at Venterskroon as well as many other areas throughout the proposed conservancy. Most of these mines date back to the late 19th and early 20th century. On Venterskroon itself (farm Rooderand) mining commenced in 1887 and only lasted for a relatively short period. The Mining Commissioners house is dated 1889. The Old Imperial Inn and the "Meesters" House, the stables and the prison have all been renovated.

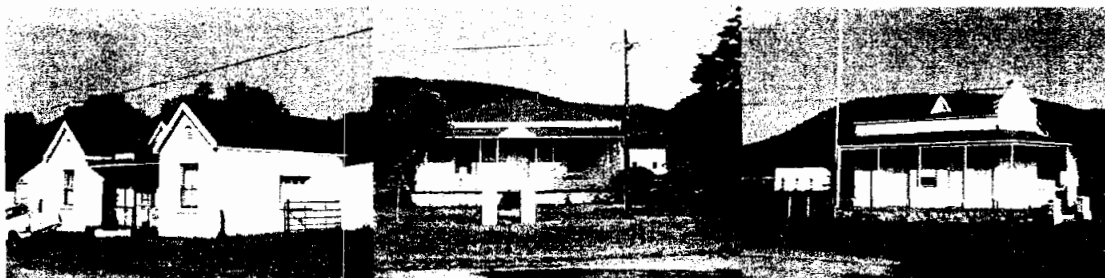
The hills of the Vredefort Dome, directly north of the Vaal River, also saw the very first Matebele attacks on Voortrekker camps during 21 and 22 August 1836. The well-known Trekleader Hendrik Potgieter was in search of another Trekleader Louis Trichardt. Against his will, the small search party comprising Trekker families and servants that trekked with him split into three small groups after crossing the Vaal River. The Stephanus Erasmus party and the Bérend Liebenberg group were massacred by the Matebele during the afternoon of the 21st and the early hours of the 22nd respectively, before the few survivors could retreat to the Potgieter camp downstream on the banks of the Vaal river, where a proper laager was prepared and a

Matebele impi of 1000 strong were defeated during a daylong battle on the 22nd [*Van den Bergh G.N., 24 Battles and Battle Fields of the North-West Province*].

The Battle of Tygerfontein dates back to the Anglo-Boer war (1899 – 1902) and the heliograph sites on top of the hills on Tygerfontein are still well preserved and accessible. Although the Acting-Chief-Commandant of the Orange Free State, General Christiaan Rudolf De Wet had resisted crossing the difficult Vaal River, thus separating him and his Free State troops from their own country, the 11000 strong army of General Kitchener were massing to enclose him against the Vaal River. After having occupied the line of hills on the Free State side of the Vaal River, De Wet started crossing the Vaal River at Schoemansdrift on 6 August 1900. With only part of De Wet's force having crossed the Vaal River by the 7th, and with his forces stretched out both sides of the river, Lord Paul Methuen's force started the attack on De Wet. After Methuen withdrawing his troops to rest, De Wet managed to get all his forces to cross the river and to withdraw to the more favourable Gatsrand area. Only three on British side and four on Boer side were killed in this skirmish [*Van den Bergh G.N., 24 Battles and Battle Fields of the North-West Province*].

Another interesting historical fact with potential novelty value is that a few pontoons operated across the Vaal river in the early days.

Pictures 12, 13 and 14: Historical Venterskroon Mining Village



Restored Venterskroon Mining Village: Old Imperial Inn, Mine Commissioner's Residence and Magistrates Office

2.4 TOPOGRAPHY AND LANDSCAPE

The topography of the area is scenically attractive, rich in variety, with a unique geology and geomorphology and interesting archaeological historical aspects, which all

combine to justify serious conservation interventions and offers an amazing range of tourism options.

Pictures 15, 16 and 17: Topographical Features of the Vredefort Dome



Sunset view down the river at Thabela Thabeng, view down Koedoesfontein valley and view towards Vaal river from Steenkampsberg.

The attractiveness of the area is however spoilt by numerous old, unattractive and often derelict farm buildings, fences, cattle kraals, outbuildings, car wrecks, scrap metal, stands of alien plants and other unsightly top structures.

Pictures 18 and 19: Unsightly Developments



Old farmyards on the Venterskroon and Rietkuil roads.

2.5 TOURISM INFRASTRUCTURE IN THE VREDEFORT DOME REGION

2.5.1 Northern Free State side (Including Parys & Surroundings)

2.5.1.1 Relevance as a Tourist Destination

The Northern Free State is not perceived to be an international tourist region. Domestic tourists also do not perceive this area as a major tourism destination, but it has appeal as a weekend leisure destination and to some extent an overnight destination for businessmen.

This region's tourism potential is currently being investigated by the Northern Free State District Council. The Council is identifying unique selling features in order to formulate a theme and marketing strategy for the area. Their goal is to develop the area as a domestic tourist destination. Their main aim in fostering successful tourism development is the provision of work opportunities in the area.

Unfortunately no tourism figures are available for this area specifically, but according to our research and tourism officials interviewed, approximately 50 000 tourist visit the region every year. The area experiences reasonable flows of tourists over peak weekends, annual events and school holidays. According to locals, the area received approximately 6 000 tourists during Easter and 8 000 tourists during Christmas last year.

Gauteng is the main source market for leisure tourists to this area. The Free State itself generates very few domestic tourists to the Northern Free State. The Tourist Information Department indicated that they have conducted numerous sales campaigns for this area in the Free State, but not a single response emanated over the selling period in contrast to many enquiries made from Gauteng. The Department also indicated that they are trying to work towards establishing one controlling body over the area, since marketing and sales are very difficult in an area covering three Provinces.

There is a definable high and low season for tourism to this area. September to February is high season for most establishments when domestic tourism flows to the area are relatively high, contrasting with exceptionally low accommodation occupancies in winter periods. This is mainly because the area is less appealing scenically due to the low rainfall and also because the leisure activities offered, such as river rafting, horse riding, hiking trails, etc. are more suitable during the summer.

In the past 3 to 4 years Parys has become an artist hub with more than 100 artists living in the area at the moments. Arts and crafts are promoted by hosting art rambles every first weekend of the month. The organisers estimate that these events draw between 1 000 and 2 000 visitors per weekend.

2.5.1.2 Retail & Tourism Support services:

There are about 15 restaurants in Parys supported both by local residents and tourists visiting the area. No car rental services are provided, but some guesthouses offer shuttle services to clients from Johannesburg International Airport to the guesthouse if required. Antiques and curio shops are a big attraction for tourists to Parys. Information on tourist accommodation and attractions is provided by the info centre, which is operated by the Parys Tourism Forum.

2.5.1.3 Tourist Accommodation Establishments & Leisure Facilities in Parys

Annexure A provides a list of the hotels and guesthouses in Parys and the number of beds, size of conference facilities (where applicable), estimated average bed occupancies, estimated number of conferences hosted, etc. Outdoor leisure is the biggest attraction to this area. The accommodation establishments have been categorised as resorts, game & nature parks, conferencing & team building, hotels & guesthouses.

There are 12 guesthouses and 1 hotel in town. Further there are 7 resorts, 2 game reserves and 2 adventure/teambuilding establishments in the surrounding area (Free State side).

In total these establishments represent around 650 beds and achieve bed occupancies of between 5% and 30%. In the region of 40 000 bednights and 10 000 camping site-nights are sold in the area, representing around 26 000 visitors per annum. In addition to these visitors, there are around 10 000 day conference (or event) as well as an estimated 15 000 leisure day visitors to this area per annum.

In total, there are 11 conference establishments (which are part of establishments mentioned above) south of the Vaal River that can accommodate up to 800 delegates. These establishments host around 245 events per annum. The average number of delegates per event is 50 and the average length of overnight conferences is 2 nights. Establishments in the area therefore sell around 21 000 delegate days per annum of which 11 000 are day conferences or events.

Guesthouses

Generally the guesthouses are individually owned and operated and appeal to the budget and mid-market tourists. The most popular guesthouses in Parys are Green Gables, Riverbush Lodge and Desmar which are fully booked every weekend during summer months. The Palm Court is a national museum and is operating as an hotel. It's conference facilities can accommodate up to 40 delegates, whilst larger groups can be accommodated in venues nearby. The primary markets for guesthouses and hotels are overnight accommodation for businessmen working in the area and holiday tourists. The tariffs vary from R100 to R300 per person per night.

Resorts

The majority of resorts listed in the Parys area provide limited services and facilities and are generally of a very low standard. They mostly cater for school or church groups and during school holidays, low to middle income families, caravaners and fishermen. Summer school holidays and weekends are their busiest times, resulting in an average annual occupancy of only 25% for the area. Tariffs at these resorts vary between R40 and R100 per person per night for chalets or rondawels. Caravan stands cost between R20 and R55 per night.

Teambuilding & Adventure

The majority of teambuilding establishments are located north of the Vaal River. Only two establishments namely Hadedda Creek and Hakuna Matata are located on the Free State side. They are professionally operated and offer a wide variety of activities. Outdoor activities offered include river rafting, abseiling, hiking trails, mountain biking, horse trails, clay pigeon shooting, paint-ball war games, teambuilding, etc. They provide

more rustic accommodation than their North West counterparts, i.e. fixed tents sleeping up to 40 people each. These establishments are particularly popular for day corporate events and short teambuilding getaways of 2 to 3 nights. These establishments achieve an occupancy of between 25% to 30%; selling on average about 50 events per annum of which most are scheduled for the summer months. Day conference packages are R110 to R150 per person and overnight conference packages are between R350 and R400 per person (fully inclusive).

Game Reserves

Chazen and Tshwane are the only two game reserve products south of the River, located close to each other in the core "impact area". Tshwane has been established very recently and is considered a 3-star lodge accommodating 20 people. Chazen is considered to be an upmarket facility, and is known for its ability to attract international visitors to the area. Both products do not offer big five game, but have at least 23 animal species including lions, leopards and buffalo. Chazen can accommodate 25 people in unit type accommodation and offers game drives at times suitable to guests.

The establishments are popular with business groups from Gauteng for conferences during the week or teambuilding weekends. These farms are small and are booked out to one group at a time, since owners prefer to give personal attention to visitors.

Rates normally include all facilities and vary between R200 and R350 per person per night. These establishments achieve an average occupancy of 20% per annum.

Pictures 20 & 21: Rustic Accommodation Facilities in the Vredefort Dome



2.5.2 North West side (Including Surroundings)

2.5.2.1 Relevance as a Tourist Destination

The North West side of the Dome, in the eyes of a tourist, is very much considered part of Parys and the surrounding areas, however land owners in the area see themselves separately from products in Parys and have established the "Dome Bergland Conservancy" which incorporates 17 tourism products north of the River. The conservancy covers an area of about 18 000 ha, and the management believes in small tourism developments that are in harmony with its environment. The area contains a substantial portion of the Dome "impact area" and particularly contains areas of high scenic value, i.e. mountains which formed as a result of the meteor impact.

This part of North West has only recently been recognised as an area with potential for tourism and particularly special interest local leisure visitors from Gauteng, North West and Free State. Although the area attracts a small number of special interest international visitors it is not perceived to be an international tourist region. The area is particularly popular for adventure and nature-based tourism.

Unfortunately no tourism figures are available for this area specifically, but according to our research and calculations the area attracts in the region of 30 000 overnight visitors and another 10 000 day visitors. Locals are actively marketing the area and regularly organise festivals and sports events such as the Dome mountain bike challenge, sky diving weekends, hiking challenges, etc. which could attract between 1 000 and 2 000 visitors at a time.

As a result of the nature of tourism products offered in the area, tourism has a definable high and low season. September to February is high season for most establishments when domestic tourism flows to the area are relatively high, contrasting with exceptionally low accommodation occupancies in winter periods.

2.5.2.2 Retail & Tourism Support services

The area is very rural and all tourism products are operated from farms resulting in weak tourism support services. The area is reliant on Parys for all its support services such as restaurants, information centres, distribution, curio shops, etc. Proposals for these support services closer to products are being discussed. There is one restaurant on a farm, part of the Bergland conservancy.

2.5.2.3 Tourist Accommodation Establishments & Leisure Facilities in North West

Annexure A list all the establishments on the North West side of the Vredefort Dome, their sizes, type, estimated average occupancies and ancillary facilities and activities offered.

There are 22 accommodation establishments in the area representing approximately 1 400 beds. Dormitories in the area, i.e. 6 establishments with around 680 beds in total, contribute 50% of all beds. The other major contributors are Smilin'Thru, Sunwa and Stonehenge conference centre. Establishments in the area also have around 260 campsites for tents and caravans.

Bednights are mostly sold over weekends resulting in an average annual occupancy of around 15% for the area as a whole. This is equal to around 64 000 bednights and 6 000 sitenights sold per annum. With the average length of stay in the area being 2 nights, the number of overnight guests visiting the area calculates to about 33 000 people. In addition, an estimated 10 000 day conference (or event) visitors visit the area on an annual basis.

In total, there are 10 conference establishments (which are either part of or separate from establishments mentioned above) on the North West side of the Dome that can accommodate up to 850 delegates. These establishments host around 360 events per annum. The average number of delegates per event is 50 and the average length of overnight conferences is 2 nights. Establishments in the area therefore sell around 42 000 delegate days per annum of which 10 000 are day conferences or events.

Nature reserves & related tourism activities

There are 7 nature reserves offering accommodation and related nature based activities such as canoeing, hiking, mountain bike riding, horse riding, bird watching, etc. These reserves are either small establishments offering rustic accommodation in chalets or huts and campsites or youth camps with dormitories. These establishments represent 538 beds, running at occupancies between 15% and 20%. Main markets for these establishments are school and church groups and to a lesser extent, local hikers. Establishments such as Takwasa and Donkervliet are quite popular for summer camps. Rates vary between R40 and R90 per person per night.

Conference, Teambuilding & Adventure

There are 9 conference and teambuilding establishments in the area representing 695 beds and one lone-standing conference centre. The most popular establishments include Stonehenge, Smilin' Thru, Thabela Thabeng and Sunwa. They are professionally operated and offer a wide variety of facilities. Their success lies in the provision of adequate conference facilities, good quality accommodation and interactive outdoor activities like river rafting, abseiling, hiking trails, mountain biking, horse trails, paint-ball war games, archery, teambuilding, etc. All these establishments cater for corporate groups, mostly from Gauteng, focused on teambuilding and adventure. They have trained guides and equipment that meets the South African standards for river rafters. They operate at an average occupancy of between 30% and 40% and are usually fully booked in high season. Their tariffs are R350 to R550 per person (fully inclusive). Day conference packages are R110 to R150 per person and overnight conference packages are between R350 and R400 per person (fully inclusive).

Resorts & Guest houses

There are 3 resorts and 2 guesthouses in the area representing 167 beds. Resorts such as Benjon, Kwaggapark and Uitkyk are mainly used by local fisherman and achieve very low occupancies and rates, i.e. around 15% occupancy and R50 per person per night.

The guesthouses mostly cater tourists that visit the area to hike, canoe and for other nature related activities. These visitors are also very seasonal resulting in low annual

occupancies for these establishments. The guesthouses have 27 rooms in total achieving an average occupancy of 10%.

Trails

According to the information provided by locals, there are 3 hiking trails in the area, one 4x4 route and several canoe/rafting routes. **Annexure A** provides a list of existing trails, distances and the number of people they can accommodate. Most of the routes are concentrated around the Vredefort Dome and are designed for weekend getaways. Hiking trails in total attract, on average, 100 visitors per weekend in summer months.

Pictures 22 and 23: Tourism Products within the Vredefort Dome area



2.5.3 Conclusion

Table 1 provides a summary of the current performance of establishments in the area as a whole as well as a breakdown of the various markets attracted. Both areas sell a total of 104 635 bednights and 15 969 sitenights per annum. 80% Of all accommodation sold are beds and 20% are camping facilities. In the region of 54% of all bednights sold are related to conference and events and 46% are leisure related. In total, our calculations show that the area attract in the region of 110 000 visitors, of which 59% stay overnight and 41% are day visitors. 48% Of all day visitors to the area are related to conferences and events.

Table 1: Summary of Tourism Numbers to the Vredefort Dome Area

Category	Number
Total bednights sold	104 635
Total camping nights sold	15 969
Total nights sold	120 603
Total conference delegate days	62 988
Total conference delegates	36 725

Total conference day delegates	21 214
Total conference overnight	15 511

Total visitors **81 515**

Additional to the above there are around 30 000 day visitors per annum to the greater Dome area

Total visitors: **110 000**

Overnight	59%
Day	41%
Day conference as % of day visitors	48%

Breakdown of Bednights Sold per annum:

Type of accommodation:

Beds	80%
Camping	20%
	100%

Type of market:

Conference	54%
General leisure	46%
	100%

2.6 BULK INFRASTRUCTURE

2.6.1 Roads

The Vredefort Dome external boundary follows national and district roads. The eastern boundary follows a tarred road whilst all the other roads are well-maintained gravel roads. Therefore access is good. Almost every valley that can conceivably carry a road (and some others as well) has a road or track through it.

2.6.2 Telecommunication

The complex is well served with telephone lines along all the main roads and at all the farms and tourism destinations. Cellular telecommunication is poor in most valleys due to the undulating topography.

2.6.3 Electricity

All the farms and main access roads have power lines.

2.7 TOURISM POTENTIAL

2.7.1 Current Tourism Infrastructure inside the Vredefort Dome Conservancy

Of the tourism products listed in section 2.5 above, only 36 of the 66 regional tourism products are within the boundaries of the proposed project area (Refer Regional Tourism Products Map). These represent a total of 1 135 beds (53 198 bednights sold) in the North West side and 162 beds (12 958 bednights sold) in the Free State side of the project area per year. This means 64% of the regional beds are sold inside the boundaries of the project area. 34 275 conference delegate days (54%) and only 730 camping nights (4,6%) are sold within the project area.

The total number of overnight visitors to the project area per year is estimated at 42 000, with another 27 500 day visitors, totalling 69 500 or 63% of the total number of visitors to the greater Vredefort Dome area.

The calculated bed density for the Vredefort Dome Conservancy is 38 beds per 1 000 26 hectare (1 135 beds in 30 128 ha).

2.7.2 Topography and Landscape

The topography and landscape of the study area is extremely suitable for eco-tourism development, as it is scenically attractive, has a rich topographical variety and offers a rich variety of options. The few spoiling aspects such as unattractive infrastructure and alien plant invasions can be dealt with quite easily.

2.7.3 Reserve Densities

Table 2 reflects the comparative densities of the larger reserves in South Africa, in an attempt to establish a base from where to evaluate the potential of the Vredefort Dome Conservancy:

Table 2: Comparative Game Reserve Densities

Reserve Name	Density (beds/1 000 ha)
<u>High Density Reserves</u>	
Mabula Game Reserve	91
Pilanesberg National Park	38
Vredefort Dome Conservancy	38

<u>Medium Density Reserves (6 – 20 beds per 1 000 ha)</u>	
Ulusaba Game Reserve	16
Phinda Game Reserve	7
Itala Game Reserve	6
<u>Low Density Game Reserves (0 – 5 beds per 1 000 ha)</u>	
Hluhluwe-Umfolozi Game Reserve	4
Madikwe Game Reserve	2
Kruger National Park	2

From the above table it is clear that Vredefort Dome already ranks with the higher density game reserves. Therefore, future developments should be well controlled to ensure that over-development does not occur.

2.7.4 Tourism Capacities

The tourism capacities of the Vredefort Dome Conservancy will largely depend on the sensible zoning and future management of the area. A large section of the project area can be zoned as a high density recreation area, particularly close to Parys and along the Vaal river. In addition, the peripheral areas along the Vaal river and around Parys can absorb substantial numbers of overnight and adventure visitors that can enter the Vredefort Dome Conservancy on a regulated basis as day visitors, thus reducing the potential negative impact substantially, whilst still benefiting from these visitors.

When the zoning exercise is done, particular emphasis will be placed on the determination of separate carrying capacities for each zone.

2.7.5 Competitor Analysis

The Vredefort Dome Conservancy is compared with other destinations. It has a unique selling feature equal to that of the Cradle of Humankind and better than Hartbeespoort Dam and the proposed Dinokeng destinations. It is however not on par with these areas in terms of popularity and proximity to tourist markets. As far as variety of nature-based experiences are concerned, it is rated better than Dinokeng and equal to both Hartbeespoort Dam and Cradle of Humankind. In total, this places VDC on par with Dinokeng, slightly below Hartbeespoort Dam and well below Cradle of Humankind.

2.8 LAND TENURE RIGHTS AND USES

With the exception of relatively small portions of the farms Rooderand 510 IQ and Kopjeskraal 517 IQ which belong to the state and are managed by the departments of Works and Education respectively, all the land belongs to the private sector. The state land represents less than 4% of the study area.

Mineral rights on most of the land are owned by mining companies. Although the area has been mined on and off in small pockets over more than a century, no large-scale mining activities have been undertaken and more recent attempts to mine have been successfully countered by conservation-conscience landowners.

As far as can be determined, no land claims have been registered over any of the properties in the study area.

2.9 INSTITUTIONAL FRAMEWORK AND CAPACITY

2.9.1 Institutional Structures in the North West Province

The North West landowners have established a conservancy called the “Dome Conservancy”. The members of the conservancy represent more than 80% of the land coverage within the North West Province side of the study area. Only three land owners representing approximately 10% of the land have expressed that they are not interested, whilst the balance are potential members not yet recruited. The objective is to transform the area to a fully fledged nature reserve in the following phases:

- Establish the Dome Conservancy
- To Undertake a proper feasibility study for the transformation of the area to a nature reserve
- To fence the area and to develop appropriate infrastructure
- To re-introduce historically indigenous game species
- Phase out general commercial farming
- Final transformation to a proper nature reserve

The following general principles are embodied in the constitution of the Dome Nature Reserve:

- To establish a feasible and co-operative nature reserve with a representative natural area with associated wildlife
- Retention of individual land ownership
- Utilisation of natural resources in a manner which is economically-, ecologically-, morally- and scientifically justifiable
- Transformation must take place through a gradual process in accordance with the identified phases, although the phases may overlap or change in sequence or otherwise
- Co-operation by all affected parties with a reasonable and just consideration of interests and the maximum benefit to all
- The generally accepted economic principles as accepted in the private sector applies
- The maximum decision making powers and jurisdiction over own resources by members
- Only those members that agree to progressing towards a next phase by signing that section of the constitution will be bound thereby.

The North West Parks and Tourism Board plays an active role and has an established track record in the development of conservation areas in collaboration with the private and corporate sectors as well as affected communities.

2.9.2 Institutional Structures in the Free State

The Free State landowners have not yet established any formal institutional arrangement and are reasonably apathetic towards the idea of a conservancy.

The Free State Province Department of Environmental Affairs and Tourism are rather positive and are playing the leading role in applying for World Heritage Site status.

2.9.3 Regional and Local Authorities

The regional and local authorities are actively involved in the process of planning the study area and are represented on the management committee.

2.9.4 Vredefort Dome Forum

A Vredefort Dome Forum representative of Free State and North West stakeholders was initiated on 16 July 2001 after a visit to the Vredefort Dome by the Executive Mayor on 9 June 2001. A follow-up workshop was held on 14 August where a draft mission, a vision and objectives were formulated and it was also recommended that a management committee should be elected. These proposals were adopted at a forum meeting held on 27 August 2001.

A total number of seventy-seven representatives of various interested and affected groupings have attended the various workshops and meetings of the forum.

The following organisations are currently represented on the management committee of the Vredefort Dome Conservancy:

- North West Parks and Tourism Board
- Free State Department of Environmental Affairs and Tourism
- Potchefstroom Local Municipality
- Landowners and Dome Conservancy
- North West Province Department of Agriculture, Conservation and Environment
- Invest North West
- Northern Free State District Municipality

Other interested and affected parties that are already participating in the forum are:

- Academics and scientists (PUCHO, WITS, UOFS)
- Special interest groups (Geological Society of SA, Wildlife and Environmental Society, Lepidopterist Society of SA, Birdlife,
- Operators (Fly Fishing, Mountain Climbing, SARA)
- Commerce and Agriculture (Sakekamer, North West and Free State Agricultural Societies)

- Agriculture
- Conservation organisations (Foundation Simon van der Stel, National Cultural-Historical Museum, National Heritage, Honorary Rangers)

2.9.5 World Heritage Site Status

The application for World Heritage Site status for the Dome was already initiated by the Free State Province during 1997 after nominating the the area as a World Heritage Site. During the year 2000 Mr Coen Erasmus submitted the formal application to the National Department of Environmental Affairs. The application is currently under evaluation with the purpose of submitting it to UNESCO (United Nations Educational, Scientific and Cultural Organisation). The World Heritage Committee has four essential functions:

- To identify cultural and natural properties of outstanding universal value nominated by States Parties
- Monitor state of conservation of listed properties in liaison with States Parties
- Decide which properties are to be inscribed on the “List of World Heritage in Danger”
- To determine the use of World Heritage Fund resources to assist States Parties in the Protection of listed properties

The following general principles (abbreviated) guide the establishment of the World Heritage List:

- Protection of those cultural and natural properties with most outstanding universal value from an international viewpoint
- The set criteria is used to evaluate the intrinsic merit of nominated properties without regard to any other consideration
- Efforts will be made to maintain a reasonable balance between the numbers of cultural and natural heritage properties entered on the List
- No formal limit is imposed on the total number of properties included in the List or submitted by any individual State
- Inscriptions of sites shall be deferred until evidence of the full commitment of the nominating government is demonstrated

- When a property deteriorates it may be placed on the World Heritage in Danger List or may be deleted from the List
- States Parties are requested to be cautious with the number of nominations but also to ensure that their cultural heritage is adequately represented in the List.

[Operational Guidelines for the Implementation of the World Heritage Convention, 1997]

2.10 MISSION, VISION AND OBJECTIVE

During the workshops and meetings of the Vredefort Dome Forum referred to in section 2.9.4, the following Mission, Vision and Objectives were agreed to by the participating stakeholders:

2.10.1 Mission

A world class heritage destination wherein biodiversity conservation and tourism sustainably co-exist.

2.10.2 Vision

To promote and manage the biodiversity conservation and tourism in a sustainable manner so as to maximise economic benefits for present and future generations.

2.10.3 Objectives

Arising from the above-mentioned, the following Goals and Objectives are defined:

- Set up a management structure
- Develop a Strategic Management and Development Plan
- Develop a database of all stakeholders (Free State and North West)
- Launch the Development Forum
- Obtain World Heritage Site Listing
- Obtain National Heritage Site Listing
- Develop Business Plan
- Do a Feasibility Study
- Do a Tourism Master Plan

- Obtain Funding
- Develop a Land Use Plan
- Develop a Community Empowerment Strategy
- Develop an Integrated Marketing Plan
- Capacity Building
- Identify Strategic Alliances
- Reporting to Stakeholders
- Evaluate and monitor progress
- Set up a negotiation process
- Do an Environmental Impact Assessment
- Develop a Website and hotlinking
- Facilitate site visits
- Develop communication strategy

2.11 FINANCIAL RESOURCES

Apart from the limited income received from the Dome Nature Reserve Conservancy membership, no funds have been generated to date and no entrance fee is charged for visitors to the study area. The North West Parks and Tourism Board provided the funding for this study.

Once World Heritage Listing has been achieved, the potential exists for receiving substantial funding from UNESCO as well as the national government. Until then, the most likely financial and other contributions, although limited, will be from the Vredefort Dome Conservancy and its individual members, local and provincial governments, academic and scientific institutions and corporate business.

3. EXTERNAL ENVIRONMENT

3.1 REGIONAL SOCIO-ECONOMIC ENVIRONMENT

3.1.1 North West Province

Representing 9,5% of the total surface area of South Africa, the population density in North West is 29 people per km², slightly less than the 34 per km² for the whole country. Setswana is the home language for 59% of the North West population, followed by Afrikaans and isiXhosa. The North West Province has the lowest life expectancy in the country (59,7 years) and the lowest literacy rate – 69,5% of persons 15 years and older, compared with the national figure of 82,2%. Unemployment levels were at 36,6% during 1995. The Southern region within which the study area falls is however better off than the provincial average, with an illiteracy level of 20% and an unemployment level of 30%. Three major challenges identified by the province are poverty, inequality and unemployment.

In 1995, the most important contributions to the North West Province economy were from Mining (42%), Agriculture (13%), Finance (13%), Manufacturing (12%) and Trade (12%). However, of these, only Agriculture, Finance and Trade showed an average net growth in output for the period 1985 – 1995.

The Potchefstroom Local Municipality recognises that the region together with its dependence on mining and agriculture, is a typically developing region. In this regard its main challenge is similar to those faced by many countries in Sub-Sahara Africa, namely to successfully restructure its economy away from the primary sectors towards labour-intensive, value-added manufacturing, services and tourism.

[Potchefstroom IDP: Status Quo Report, 2001]

3.1.2 Free State

No information was available from the Free State Province side at the time of doing the Situation Analysis. Future studies will have to consider the socio-economic profile of the region on the Free State side.

3.2 FOREIGN TOURIST MARKETS

3.2.1 North West Province

South African Tourism surveys of South Africa's international tourism market show that the percentage of tourists visiting the North West Province decreased from 7,5% in 1997 to 5,5% in 2000. If we extrapolate these percentages to the actual numbers of foreign tourists arriving in South Africa by air¹, the province received in the order of 87 867 overseas tourists in 2000. Foreign arrivals by air have, year-to-date (latest figures available are July 2001), increased by 0,86% over 2000. If we assume that this percentage is representative of the whole year and the North West kept their share of the market in 2000, it calculates to 88 464 foreign tourists to the province. This is lower than the estimated 100 000 overseas tourists that visited this province in 1997 (see Table 3).

Table 3: Percentage & Number of Foreign Tourists that Visit North West Province

Year	Average % Of Foreign Tourists for the year	Extrapolated Number of Foreign Tourists
2001	5,5%*	88 464
2000	5,5%	87 867
1999	5,5%	83 750
1998	5,5%	80 456
1997	7,5%	99 650

Source: *South African Tourism Foreign Tourism Surveys – Summer & Winter 1997 - 1999*

* Assumption: Grant Thornton Kessel Feinstein

The percentage of foreign air arrivals that visit each province in South Africa is shown in Table 4. The North West Province, in seventh position, is one of the least popular regions in South Africa for foreign tourists. Trends since 1996 show that North West is actually losing market share in terms of foreign visitor numbers. The foreign visitors to North West in 2000 were mainly tourists visiting Sun City and the Pilanesberg area. The travel patterns of foreign visitors to the area do not appear to be seasonal, with an even flow between 4% and 5% achieved for the winter and summer months.

¹ In extrapolating these numbers we have used only visitors arriving in South Africa by air as the South African Tourism research is conducted amongst air departures. This is a slightly more conservative approach. Our base includes both overseas and African air arrivals ("foreign air arrivals"). South Africa attracts over 4 million arrivals from Africa, however the majority of these arrivals are cross border traffic. Many of these visitors only cross the border for a day or less for shopping purposes and do not spend on actual tourist facilities. We believe, therefore, that it is more realistic to exclude these visitors from the base.

Table 4: Foreign Visitors to North West and Other Provinces

<u>PROVINCE VISITED</u>	<u>% Of Foreign Air Arrivals</u>			
	<u>Jan-99</u>	<u>Aug-99</u>	<u>Jan-00</u>	<u>Aug-00</u>
Gauteng	53%	59%	55%	63%
Western Cape	58%	48%	58%	43%
KwaZulu-Natal	25%	27%	22%	27%
Mpumalanga	19%	22%	14%	21%
Eastern Cape	14%	13%	14%	12%
Northern Province	6%	7%	5%	7%
North West	5%	6%	5%	6%
Free State	4%	4%	3%	3%
Northern Cape	3%	5%	3%	4%

Source: *South African Tourism Foreign Tourism Surveys – Summer & Winter 1999 & 2000*

The length of stay of foreign tourists in the North West Province has decreased by an average of half a day between 1999 and 2000; i.e. from 5,3 days in 1998 to 4,8 days in 1999.

Of the 84 000 overseas visitors who visited North West Province in 1999, almost 65% originated from Europe, with Germany and the UK providing 9% and 24% of foreign tourists to the Province respectively. The percentage of tourists from African countries decreased from an estimated 9 900 (12%) in 1998 to 4 400 (5%) in 1999. Small pockets of demand emanate from other regions. Tourism markets from the Far East and Australasia seem to be increasing slowly. The Far East increased from around 7 000 tourists in 1998 to 8 000 in 1999, while Australasia increased from 3 500 to 4 700 in the same period.

The major attractions visited in North West Province by foreign tourists are listed in **Table 5**. Sun City and Pilanesberg National Park are the two main attractions in North West Province, visited by 75% and 52% of foreign air arrivals to this province, respectively. The surveys also indicate that a small amount (2 800) of overseas tourists visited Madikwe Game Reserve in 1999. Although other attractions like craft markets and curio shops are visited by tour busses on their way to the Pilanesberg/Sun City complex, the latter are the main destinations where foreign tourists spend their nights in the North West. The survey does not mention Vrededorp or areas near the study area as a destination and we can therefore not comment on the estimated number of foreign tourists attracted to this area.

Table 5: Tourist attractions in the North West visited by Foreign Arrivals to South Africa

<u>Attraction</u>	<u>1999</u>	<u>Projected Total</u>
Sun City	75%	62 561
Pilanesberg National Park	52%	43 089
Madikwe Game Reserve	3%	2 848

Source: "South African Tourism: The South African Tourism Market" 1999

Table 6 indicates the most popular activities experienced by foreign tourists to South Africa. The most important attraction experienced is game/nature reserves (still increasing) followed by historical sites. We believe that the North West Province has a tremendous historical as well as pre-historical resource base, which could be capitalised on to attract foreign visitors to the province.

Table 6: Activities Experienced by Foreign Visitors to South Africa

Activities Experienced in South Africa	1998	1999	2000
Game/Nature reserve	59%	63%	46%
Historical Site	38%	38%	28%
Museum/Art Gallery	35%	33%	26%
Cultural village	16%	18%	13%
Theatre/Concert/Live Show	15%	14%	13%
Visit a casino	13%	12%	11%
Adventure activity (scuba diving, mountain and hiking)	15%	16%	13%
Conference/Convention	10%	11%	12%
Sports spectator	6%	6%	6%
Backpack	8%	9%	7%
Sports participant	4%	4%	5%
Blue Train travel	2%	2%	2%

Source: "South African Tourism: The South African Tourism Market" 1998 & 1999.

The average spend by foreign tourists to South Africa is not available by Province. Overall the average foreign tourist spent R1 058 per day in 2000 (winter survey). The highest spenders are from the Far East (R2 098 per day), followed by Australasia (R1 498 per day). Tourists from Africa, UK and South America are fairly low spenders at R720, R807 and R899 per day, respectively. These spends exclude airfare, but include pre-paid amounts.

3.2.2 Free State

The average of the Summer and Winter 2000 SA *Tourism* survey of South Africa's international tourism market (departing travellers) indicates that around 3% of foreigners visited the Free State during their trip to South Africa in 2000. This percentage is slightly lower than that achieved in 1999 (4%).

The estimated number of foreign tourist visits to the Province has decreased from around 79 720 in 1997 to 47 927 in 2000 (see **Table 7**).

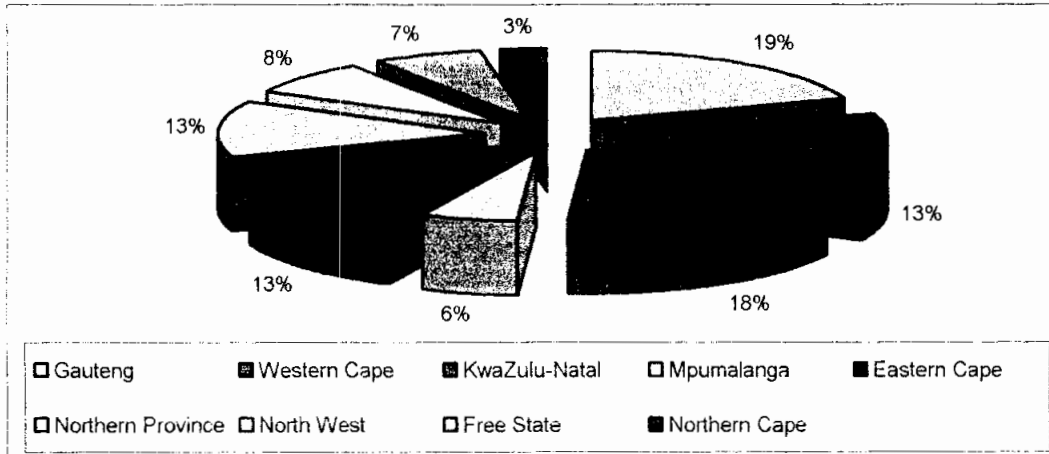
19% Of South African adults, representing 4,3 million people, took one or more holiday or leisure related trip in the past 12 months. 12% Of the population only took one trip in the past 12 months, followed by 3,4% taking 2 trips and 3% taking 3 or more trips.

3.3.2 North West Province

Compared to the 1996 SA Tourism survey, the North West Province moved from the 5th most popular province to one of the least popular domestic tourist destinations in 2001. 7,9% of all trips nationwide were made to North West, equal to around 2,6 million trips.

According to the latest survey Gauteng and KwaZulu-Natal receive the highest number of domestic tourists in the country. They are followed by the Northern Province, Western Cape and Eastern Cape each attracting, 13% of all domestic trips. **Figure 2** shows the percentage share of domestic tourist trips by province.

Figure 2: Percentage Share of Domestic Tourist Trips (2001)



Source: "South African Tourism: The South African Domestic Tourism Market" 2001

Domestic holiday tourists to North West Province mainly originate from within the province (46,9%) and Gauteng (24,3%).

66% Of all trips to the North West were made to visit friends and family. Only 11% (288 000 trips) of trips in the past year were for holiday purposes and 3% (80 000 trips) were for business purposes.

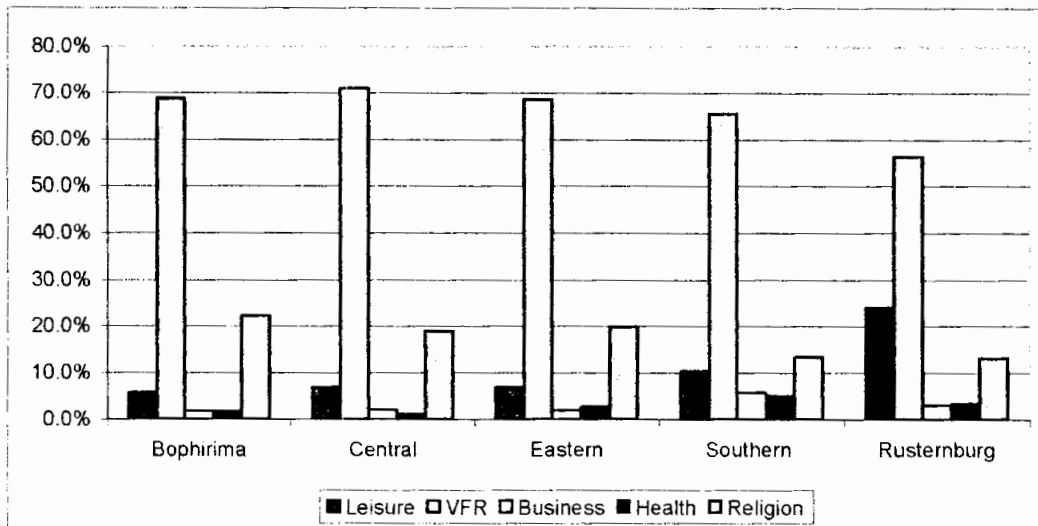
The majority (45,2%) of holiday and leisure trips originate from Gauteng, while 26,1% originates from North West and 8,7% originates from the Free State. Small pockets originate from other provinces in South Africa.

North West residents dominate business trips to this province (36,2%), followed by residents from KwaZulu-Natal (31,2%) and Gauteng (20,6%).

Regions visited in the North West

Overall, the Central and Southern regions receive the majority of travellers to the North West, i.e. 24,4% and 21,9% respectively. **Figure 3** shows the percentage breakdown of trips to the North West by region and purpose. The Rustenburg region received the highest percentage of leisure trips in the province, i.e.24% of all trips to this region.

Figure 3: Percentage Breakdown of Trips by Region and Purpose



Source

e: "South African Tourism: The South African Domestic Tourism Market" 2001

Expenditure

Leisure trips represent the largest expenditure per capita, i.e. R1 073, followed by business visitors spending R685 per capita. In respect of holiday and business visitors, transportation represents the highest portion of expenditure. i.e. between 42% and 66%. Expenditure on accommodation represents between 18% and 42%, while expenditure on food, entertainment and gifts represent 10%, 4% and 2% respectively.

Activity Preference

On selection of activities enjoyed during visits to North West, going to the "beach"² received the highest vote at 63,8%, followed by shopping (61,3%) and visiting nature reserves (56,3%). Respondents showed a low interest in eco-tourism and adventure tourism activities such as back packing, hiking, canoeing, etc.

Length of Stay

The number of nights spent in North West Province was not addressed in the latest domestic survey. The average length of stay in North West Province was 3,5 nights in 1996. This province achieved the shortest length of stay of all provinces in 1996.

² The survey indicates visiting the "beach" with no definition. We can only assume it relates to the Valley of Waves at Sun City. Alternatively the tabulations are poor and people who went to North West Province enjoyed beaches at other destinations during the year.

3.3.3 The Free State

The Free State received 6,7% of all domestic trips taken between 2000 and 2001. As in 1996, the Free State remains the 7th most popular domestic tourist destination in South Africa. According to the latest domestic survey the Free State received 2,2 million trips.

Domestic holiday tourists to the Free State mainly originate from within the province (50,1%), and from Gauteng (19,6%).

66% of all trips to the Free State were made to visit friends and family. 15% Or 340 000 trips to the Free State were for holiday purposes and 4,7% or 100 000 trips were for business purposes.

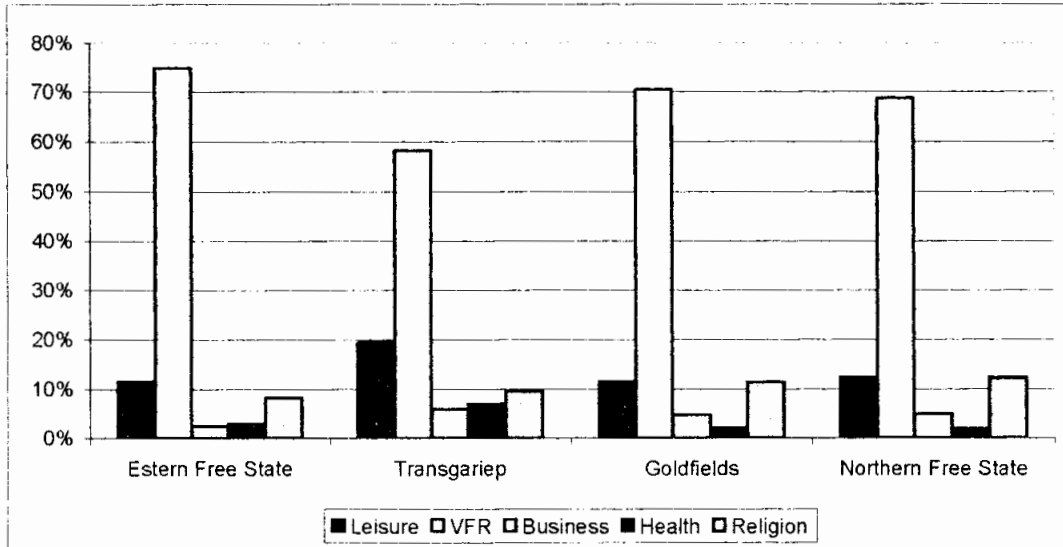
The majority (37,3%) of holiday and leisure trips originate from Gauteng, while 27% originate from within the Free State and 12,5% originate from the Eastern Cape.

As with the leisure related trips, the majority of business trips originate from Gauteng (29,6%), while 22% originate from within the Free State and 18% originate from KwaZulu-Natal.

Regions visited in the Free State

The Transgariep region in the Free State received the majority of trips to the province (42,9%). This region includes Bloemfontein and its surrounding area. Eastern Free State follows with 23,5% of all trips including areas such as Golden Gate, Ficksburg and Bethlehem. **Figure 4** shows the percentage breakdown of trips to the Free State by region and purpose. The Transgariep region also received the highest percentage of leisure trips in the province, i.e.19,5% of all trips to this region.

Figure 4: Percentage Breakdown of Trips by Region and Purpose



Source: "South African Tourism: The South African Domestic Tourism Market" 2001

Expenditure

Figure 5 shows the expenditure of travellers to the Free State by type and by purpose of visit. Business visitors make the highest per capita expenditure, i.e. R1 004 per person per trip, followed by visitors making leisure and health related trips spending R461 and R451 per person respectively.

Activity Preference

On selection of activities enjoyed during visits to Free State, shopping was the highest on the list with 67% of visitors interested in this activity. This is followed by religious gatherings (63,3%) and visiting African cultural villages (61,2%). Respondents showed a low interest in eco-tourism and adventure tourism activities such as back packing, hiking, canoeing, etc.

Length of Stay

The number of nights spent in the Free State was not addressed in the latest domestic survey. The average length of stay in the Free State was 5,8 nights in 1996.

3.4 THE GAUTENG & NORTH WEST DAY-TRIP MARKET

3.4.1 Background

This section discusses the various survey results and information available on the Gauteng and North West leisure markets. This information could be used to better understand the day and weekend markets that could be attracted to Vredefort and to use the correct tools to market the area more effectively.

3.4.2 South African Tourism Domestic Survey

The latest domestic survey (2001) includes an investigation into day trips on a national and provincial level. The survey indicated that 12 million adults had undertaken 20,9 million one-day trips during the previous 12 months. Day-trippers mainly originated from the Eastern Cape (22%) and Gauteng (20%).

North West Province

One-day trips to the North West destinations accounted for 38% of all trips to the province. 79% Of all one-day trips originate from within the North West, while 12% originate from Gauteng. According to the domestic survey, the three most popular one-day destinations in North West are Mafikeng, Rustenburg and Vryburg.

Free State

One-day trips to the Free State accounted for 36% of all trips to the province. 87% Of all one-day trips originate from within the Free State, while 5% originate from Gauteng. According to the domestic survey, the three most popular one-day destinations in Free State are Phuthaditjhaba, Welkom and Bloemfontein.

We believe that most day trips in South Africa are related to visiting family and friends. High percentage of day-trips originating from within the destination province proves this statement. We believe most leisure related day-trips to the North West and Free State emanate from Gauteng. Therefore we discuss the profile of the Gauteng Leisure Market in further detail.

3.4.3 AMPS household survey – Gauteng and North West Province

As indicated above we believe the majority of the market for the Vredefort Dome would originate from Gauteng and to a lesser extent the North West Province. We've analysed the results of the AMPS (All Media Purpose Survey) household survey to obtain a better understanding of Gauteng and North West population income groups, location, education, transportation, marketing material used, etc.

Key information emanating from the AMPS July – December 1997 survey is detailed hereunder.

11,7 Million South Africans fall within LSM's 1 to 4; 3,9 million in LSM 5; 3,4 million in both LSM 6 and LSM 7 and 3,35 million in LSM 8.

Table 8 gives a breakdown of the number and percentage of people in the 5 LSM groupings living in Gauteng and North West.

Table 8: Number and percentage of people per LSM category residing in Gauteng and North West Provinces

	Gauteng		North West	
	# of People 000's	% of RSA	# of People 000's	% of RSA
LSM 1 to 4	738	6%	1 211	10%
LSM 5	1 184	30%	285	7%
LSM 6	1 168	34%	202	6%
LSM 7	1 097	32%	146	4%
LSM 8	1 278	38%	148	4%
Total	5 465	21%	1 992	8%

Source: SAARF, July – December 1997 Amps Survey

The distribution of the Gauteng LSM groups according to area of residence is detailed in Table 9:

Table 9: Number of people per LSM category residing in Gauteng

	Gauteng				
	Greater Soweto 000's	JHB & Reef 000's	Soweto 000's	Pretoria 000's	Vaal 000's
LSM 1 to 4	236	240	165	57	94
LSM 5	322	564	233	145	104
LSM 6	433	423	277	218	100
LSM 7	360	436	128	211	102
LSM 8	355	488	8	303	105
Total	1 706	2 151	811	934	505

Source: SAARF, July – December 1997 Amps Survey

SAARF research indicates that approximately 260 000 South Africans read "Getaway", a monthly magazine aimed at upmarket South Africans, detailing adventure holidays and day-trips in Southern Africa. Of these readers, 215 000 fall within LSM 8 and a further 38 000 within LSM 7. We estimate that 104 000 of these LSM 7 and 8 Getaway readers reside in Gauteng and a further 8 000 in the North West province.

99% Of LSM 8 and 87% of LSM 7 Getaway readers are white.

South Africa's population distribution, by LSM group and education, is depicted in **Table 12**.

Table 12: Percentage education level per LSM group - RSA

Education	RSA				
	LSM 1 to 4 000's	LSM 5 000's	LSM 6 000's	LSM 7 000's	LSM 8 000's
None	22%	6%	3%	1%	0%
Some Primary	30%	19%	11%	3%	0%
Primary	9%	11%	8%	4%	1%
Some High School	33%	45%	50%	44%	22%
Matric	5%	15%	23%	30%	36%
Technikon	1%	1%	3%	8%	15%
University	0%	0%	0%	3%	12%
Other	0%	1%	3%	8%	13%

Source: SAARF, July – December 1997 Amps Survey

LSM 8 has the highest percentage of matric, technikon and university educated South Africans.

80% Of LSM 8 Gauteng and North West residents have a personal car of which 15% are 4 wheel drive vehicles. Only 35% of LSM 7 Gauteng and North West residents have a car for personal use (of which 17% are 4 wheel drive vehicles).

64% Of South Africans in LSM 8 regularly eat out at a restaurant and purchase take-away food. In the LSM 7 category the percentage of people that regularly eat out at restaurants decreases to 38% and the purchase of take-away food decreases to 55%. In LSM's 1 to 4, 5% of the population eat out at restaurants regularly and 10% are regular purchasers of take-away food.

3.4.4 Independent Surveys of the Gauteng Market

The Dinokeng project consultants conducted independent surveys of the Gauteng market during the course of this year. The surveys were specifically focused on day and weekend leisure patterns of the Gauteng market. The interviewing process required that respondents had to be found who had been on a day trip or a weekend excursion in the past 6 months.

LSM 6: R97
 LSM 7: R108
 LSM 8: R148

Average expenditure of the LSM groups: R118 per person per day

Source: Dinokeng Market Assessment

Type of Activities Utilised during Day Trips

Results from previous day trips taken in the last 12 months (average)

ACTIVITY	Total Day Trip Market	Day Trip Tourist Flows (Per person, per weekend day)
WILDLIFE/GAME RESERVES Main user Segments – General - all demographics	7.2% = 66,636	Total number of people = 641 per weekend day Expenditure: 641 x R118 = R 75,638
WATER/NATURE BASED Activities / Surroundings Main user Segments – General - all demographics	32.3% = 298,937	Total number of people = 2874 per weekend day Expenditure: 2874 x R118 = R 339,178
CASINOS/THEMED ENTERTAINMENT Main user Segments – Younger, lower income, Asian	47.8% = 442,390	Total number of people = 4254 per weekend day Expenditure: 4254 x R118 = R501,942
RESORTS/ SHOWS/ EVENTS/ FESTIVALS Main user segments Families, middle income	9.5% = 87,923	Total number of people = 845 per weekend day Expenditure: 845 x R118 = R 99,759

Source: Dinokeng Market Assessment

Importance of Ancillary Activities & Facilities Provided / Facilities mentioned in a day trip

ACTIVITY	Total Day Trip Market	Day Trip Tourist Flows (Per person, per weekend day) Divide by 104
PICNICS / BRAAI SPOTS All sectors; particularly by lower income sectors	89% = 823,697	7 920 people taking day trips
SIGHT SEEING All sectors particularly by lower income sectors	76% = 703,382	6763 people taking day trips
NATURE TRAILS Family orientated 25-49, middle income level	72% = 666,361	6407 people taking day trips
OUTDOOR PURSUITS (Incl. Horse Riding, Fishing, Mountain Biking, Biking) Younger, singles/groups	27% = 249,886	2403 people taking day trips
HIKING / WALKING Upper income levels. Couples, 25+ age group	60% = 555,301	5339 people taking day trips

Source: Dinokeng Market Assessment

A Profile of Visitors to South African Day-Visitor Attractions

As part of a recent survey conducted by Grant Thornton Kessel Feinstein to determine a possible profile of visitors to day-visitor attractions in South Africa showed to the following:

Most visitors...

- Come in a group with family and or friends, many are couples between the ages of 24 and 40 years with small children;
- Stay at the attraction for one to four hours;
- Are prepared to travel long distances (up to 3 hours drive) to an attraction if they perceive the experience is worthwhile; otherwise they prefer not to spend more than 45 minutes driving to attractions;
- Local visitors tend to have visited the attraction before but seldom on a regular basis, while foreign tourists mostly visit an attraction once in a lifetime;

- Most visitors only spend money on entrance fees, parking and light snacks and/or refreshments;
- The most common way through which potential visitors come to know of an attraction is via word of mouth. Limited advertising or publicity is seen regarding South African attractions; and
- The most common reason for visiting South African attractions tend to be for educational purposes, to relax and because of a general interest in the subject matter.

Weekend Trip Market: Domestic Gauteng

Total Weekend Market: 16,7% of Total Market = 566,219.

Weekend Visitor profile:

Aged 35+	59%
Aged 25-34	26%
White	63%
Black	18%
Coloured	7%
Asian	12%
R10,000 +	54%
4+ household	55%

Average of 2,4 trips per annum.

Expenditure: LSM / Income Level (per weekend trip per person)

LSM 6	R360
LSM 7	R415
LSM 8	R549

Average expenditure of the LSM groups: R455 per person per weekend

Type of Activities Utilised during Day Trips

Results from previous weekend trips taken in the last 12 months (Average)

ACTIVITY	Total Weekend Trip Market	Weekend Trip Tourist Flows (Per person, per weekend) (Divide by 52)
WILDLIFE / GAME RESERVES Main user Segments: White, Pretoria, top level income	16% = 88,995	Total number of people = 1711 per weekend Expenditure: R455 x 1711 = R 778,707
WATER/NATURE BASED Activities / Surroundings Main user segments: All Sectors	11.7% = 66,248	Total number of people = 1274 per weekend Expenditure: R455 x 1274 = R 579,670
CASINOS / THEMED ENTERTAINMENT Main user Segments: Younger, Asian	10.9% = 61,718	Total number of people = 1187 per weekend Expenditure: R455 x 1187 = R 540,032
RESORTS Main user segments: Families	17.5% = 99,088	Total number of people = 1905 per weekend Expenditure: R455 x 1905 = R 967,020

Source: Dinokeng Market Assessment

Importance of Ancillary Activities & Facilities Provided / Facilities mentioned in a day trip

ACTIVITY	Total Weekend Trip Market	Weekend Trip Tourist Flows Per person per weekend (Divide by 52)
PICNICS / BRAAI SPOTS	91% = 515,259	9909 taking weekend trips
SIGHT SEEING	82% = 464,299	8929 people taking weekend trips
NATURE TRAILS	82% = 464,299	8929 people taking weekend trips
OUTDOOR PURSUITS (Incl Horse Riding, Fishing, Mountain Biking)	30% = 169,866	3267 people taking weekend trips
HIKING / WALKING	66% = 373,704	7187 people taking weekend trips
CULTURAL / HISTORICAL	48.7% = 275,749	5303 people taking weekend trips
BIRD WATCHING	37% = 209,501	4029 people taking weekend trips

Source: Dinokeng Market Assessment

Type of Accommodation Preferred for a week-end trip

ACCOMMODATION	Total Weekend Trip Market	Divide by 52
SELF CATERING (Incl. Resorts) Market Segmentation: White, Afrikaans, all incomes	45% = 254,799	4900
LUXURY HOTELS Market Segmentation: Pretoria, Asian	9% = 50,960	980
MEDIUM HOTELS Market Segmentation: Top Incomes	9% = 50,960	980
BUDGET HOTELS Market Segmentation: 50+, lower income	3% = 16,987	327
CAMPING / CARAVANNING Market Segmentation: Whites, Afrikaans, average sized household	10% = 56,622	1089
B & B / Guesthouses Market Segmentation: Blacks, 50+	9% = 50,960	980

Source: Dinokeng Market Assessment

3.4.5 Conclusion

In terms of the Vredefort area, potential local visitors would largely be sourced from Gauteng and a lesser extent from the North West province. These two provinces represent almost 40% of all South Africans in LSM categories 7 and 8; those people are more likely to travel and undertake day-trips. 43% Of all South Africans who read Getaway magazine, have a strong likelihood for having an interest in nature and adventure based tourism.

Our conclusion from the various surveys discussed is that the day visitor market in South Africa is largely untapped. This market offers great potential as a source for the Vredefort Dome area. The area should therefore focus on providing facilities for the whole family that is as accessible as possible, offers a wide range of reasonable priced attractions and/or facilities, make use of appropriate advertising and offer and interesting enjoyable, educational experience in order to attract the day-visitor market.

3.5 PROJECTED TOURISM DEMAND

3.5.1 Background

In order to project the potential demand for the proposed Vredefort Dome, we have examined the main sources of overnight and day visitor demand to the area in both the North West and Free State. We have considered the following:

International

Overnight – leisure:

General interest holiday overnight
Special interest holiday overnight

Domestic

Day visitors – leisure:

Day visitors from Gauteng, North West and Free State (including general and special interest visitors)

Day visits from School & University groups (including general and special interest visitors)

Day visitors – Business:

Day conferences & teambuilding (including general and special interest visitors)

Overnight –Leisure:

Overnight School & University (including general and special interest visitors)

Overnight Leisure getaways (including general and special interest visitors)

Overnight – Business:

Overnight Conferences & Teambuilding (including general and special interest visitors)

Overnight general business

In developing demand calculations, we have used data collected from SA Tourism, STATSSA, DBSA, HSRC as well as assumptions developed from our market research surveys. The calculations are not scientifically proven, however, by applying objective logic to the given data, we believe it offers a realistic indication of the likely future demand for the project under study. From the demand analysis we have calculated and recommended types and sizes of facilities that could be sustained.

We have attempted to provide a preliminary estimate of the potential demand in visitor and roomnight numbers that the proposed Vredefort Dome could attract. Our demand analysis is, however based on the following assumptions:

- Dynamic marketing of the project;
- High growth assumptions for the local economy and tourism industry;
- Strong support of the project by the North West Province & Free State Province;
- Provision of interpretive/orientation centres to promote the cultural and natural aspects of the region;
- Upgrading of main access routes to and within the proposed park;
- The provision of international standard facilities and services;
- The provision of sufficient recreation facilities for the local day visitor market;
- Proper management of the dome area and its facilities as a whole.

All demand calculations are set out and detailed in **Annexure B** and the methodology followed for each market sector is discussed briefly below. **All the assumptions on the percentages that the proposed reserve could attract are based on our knowledge and expertise in the tourism and game reserve industry.**

3.5.2 Projected Day Visitor Demand For The Vredefort Dome

As indicated in **Section 3.5.1**, main sources of day visitor demand for the Vredefort Dome area are from two categories, i.e. leisure tourists and business tourists:

Day visitors – leisure:

Day visitors from Gauteng, North West and Free State (including general and special interest visitors)

Day visits from School & University groups (including general and special interest visitors)

Day visitors – Business:

Day conferences & teambuilding (including general and special interest visitors)

Detailed calculations of the day visitor demand are shown in **Annexure B, page 1 & 2.**

A summary of the various market sources and assumptions in respect of numbers that could be attracted to Vredefort is provided in **Table 15** below.

Table 15: Day Visitor Markets to Vredefort Area

Day visitor market	Total Population	% Earning income	% on Day excursions	% To Vredefort	Frequency	Estimated number of visitors per annum
Day Visitor Demand from North West	3 500 000	45%	15%	7%	0.3	4 607
Day visitor demand from Gauteng	7 600 000	45%	30%	15%	0.1	15 390
Day visitor demand from the Free State	2 900 000	20%	15%	10%	0.1	870
Day visitor demand from Schools Groups	3 110 992	n/a	40%	1%	0.5	6 222
			% Day events in the North West	% To Vredefort		Estimated number of visitors per annum
	Conference Delegates in SA	% Day	North West & Free State	% To Vredefort		
Day visitor demand from day Conferences & Teambuilding	11 046 496	80%	4%	5%	n/a	16 702

The biggest proportion of day visitors to Vredefort Dome, is from the day conferences and events, representing 38% of the total day visitor demand, followed by the Gauteng leisure market representing 35% of total day visitor demand. The North West and Free

State contribute smaller amounts of visitors. The reason for this is because of relatively low population densities in the Free State and North West surrounding the Vredefort Dome.

We believe that group visits such as for teambuilding, conferences, family events, school excursions, etc. represents the major portion of visitors to the Vredefort Dome. Day visitors from business events represents in the region of 16 000 tourists per annum, which is equal to around 400 events per annum, if we assume the average group size of events are 40. Events in the Vredefort area have smaller group sizes than normal conferences, because of the nature of events and teambuilding excursions offered.

The total day visitor market is estimated at 46 000 visitors per annum, representing over 40% of the total demand to the Vredefort area.

3.5.3 Projected Overnight Visitor & Roomnight Demand For The Proposed Vredefort Dome

Background

In order to project the potential overnight visitor demand for the proposed park, we have examined the current main sources of accommodation demand in the Vredefort Dome area, i.e.:

- Foreign overnight leisure
- Domestic overnight leisure
- Overnight educational market
- Domestic general overnight business
- Domestic Overnight Conference market

Foreign Leisure

According to the STATSSA 2000 airport arrival statistics available, South Africa received 1,5 million airport arrivals in 2000. The latest International surveys available from South African Tourism (summer and winter 2000) show that the North West received 5,5% and the Free State 3% of all foreign arrivals. Together these provinces

attract around 135 000 foreign tourists per annum. If we assume that there is a 15% overlap of tourists who visit both provinces, it calculates to a potential market of 115 000 foreign tourists.

According to the summer and winter SAT surveys, the Free State and North West attracted in the region of 48% holiday tourists of which around 55% of tourists visited historic sites and reserves. Of these tourists, we've assumed 10% would potentially visit the Vredefort Dome area. These percentages calculates to 3 047 foreign tourists per annum.

Taking into consideration that the average length of stay for overseas tourists in the area is 1.5 nights and the average double occupancy is 75%, then the annual demand from the overseas holiday tourist market calculates to 4 571 bednights or 2 612 roomnights.

Annexure B page 3 provides detailed calculations for this market.

Domestic Leisure

We used the latest SA Tourism domestic survey (2001) to provide an estimated demand that could derive from the domestic leisure market.

The domestic tourism survey by SA Tourism indicates that there were 33,5 million domestic trips in 2000/2001. 7,9% of these tourists visited the North West Province and 6,7% visited the Free State. This calculates to 2,6 million domestic trips to the North West and 2,2 million trips to the Free State. 10,9% Of all trips to the North West and 15% of all trips to the Free State were for holiday purposes. These percentages calculates to 288 000 holiday trips to the North West and 338 000 trips to the Free State. The potential domestic market to both provinces consists of 627 000 trips of which we assume 5% overlaps, calculating to 596 000 trips to both areas. If we assume that 25% of all tourists to the North West and Free State visit reserves and historic places and that 6% of this market would potentially visit the Vredefort Dome area. These calculate to 8 941 domestic leisure visitors per annum.

Taking into consideration the average length of stay for domestic tourists in the area at 1.5 nights and the estimated average double occupancy at 80%(our assumption), then the annual demand from the domestic holiday tourist market calculates to 13 411 bednights or 7 451 roomnights.

Annexure B page 2 provides detailed calculations for this market.

Overnight Demand from Schools, Universities and Others

According to HSRC data there are 3,1 million school children in Gauteng, North West and Free State. We estimate that only 15% of these children go on overnight excursions of which 5% might visit the Vredefort Dome area. Our research shows that the same groups visit the area on a regular basis and we therefore assume that the frequency would on average be 0,6 visitors. These assumptions calculate to 13 999 visitors from this market per annum.

If we take into consideration that the average length of stay for school groups at establishments in the area is 2 nights and the average double occupancy is 80% then the annual demand from this market calculates to 27 999 bednights or 13 999 roomnights.

Overnight Business and Conference

As discussed earlier South Africans took around 33 million trips in 2001 of which 7,9% were to the North West. This calculates to 2,6 million domestic trips to the North West, of which 3% were business trips, i.e. 80 000 trips.

The Free State received 6,7% or 2,2 million trips of which 4,7% were business trips, i.e. 105 000. If we assume that there is an overlap of 5% of business trips to these provinces the area attract around 175 000 business trips per annum.

If we assume that the Dome area could attract 20% of these business trips, it would result in 35 100 business trips per annum. With an average length of stay of 2 nights this market is able to generate 70 260 bednights and 63 872 roomnights per annum.

We estimate that 90% of this market attracted to this area would be as a result of conferences, teambuilding and other related events. Small numbers (10% or less) would visit the area for general business purposes.

The detailed calculations for overnight demand from this market are attached as **Annexure B** (Page 5).

Summary of Overnight Visitor and Roomnight Demand

A summary of the total estimated number of overnight visitors and roomnight demand for the Vredefort Dome area is given in **Table 16**. Where necessary, the numbers in this table have been grown to reflect figures for the year 2002. Growth predictions will be discussed in more detail in **Section 3.5.4**.

**Table 16: Total Estimated Number of Overnight Visitors & Roomnight Demand
by Source Market (2 002)**

Source Markets	Estimated Number of Visitors	Number of Bednights sold
Foreign overnight leisure	3 233	4 849
Domestic overnight leisure	9 119	13 679
Overnight educational market	16 934	33 868
Domestic general overnight business	3 618	7 237
Domestic Overnight Conference market	33 198	66 395
Total	66 102	126 028

3.5.4 Growth In Projected Demand

Growth projections for the period 2002 to 2020 for each market are detailed in **Annexure B** (page 6 & 7). The projected demand is based on estimated growth rates in the various markets for each year between 2000 and 2020. To develop long term projections such as these are risky, as economic and demographic situations can change substantially over such a long term. Long-term projections have mainly been conducted for concept planning purposes. The average annual growth rates for the various markets over this period are as follows:

- Foreign overnight leisure 2,8%
- Domestic overnight leisure 1,0%

- Overnight educational market 3,3%
- Domestic general overnight business 1,0%
- Domestic Overnight Conference market 3,6%
- Day leisure market 0,8%
- Day educational market 2,0%
- Day conference market 3,6%

Growth in Day Visitor Demand

Based on our growth projections the area will be able to attract 113 500 visitors in 2002 of which 47 400 (40%) are expected to be day visitors. If day visitor demand grows by 2% per annum (accumulative growth forecasted for all the various day visitor markets) the area could expect to attract 58 900 day visitors in 2010 and 69 200 day visitors in 2020.

Growth in Bednight Demand

Table 17 gives a breakdown of the projected bednight market mix for the Vredefort Dome area in 2002, 2010 & 2020. 96% Of roomnights are from the domestic market, while 4% are from the overseas market. The domestic conference teambuilding market shared 53% of total bednights in 2002.

Table 17: Projected Roomnight Demand: Scenario 1 & 2

Source of Demand	Projected Roomnights p.a.		
	2002	2010	2020
Foreign overnight leisure	4 849	6 259	7 630
Domestic overnight leisure	13 679	15 408	15 718
Overnight educational market	33 868	46 783	57 028
Domestic general overnight business	7 237	8 191	8 356
Domestic Overnight Conference market	66 395	95 303	121 969
Total Projected Demand	126 028	171 944	210 701

Source: Grant Thornton Kessel Feinstein

3.5.5 Summary

Based on the assumptions for demand to the proposed Vredefort Dome it will be able to attract 113 000 visitors in the 2002. With an average compound growth of 2,5% per annum, the area will be able to attract of the order of 148 000 visitors in the medium and 178 000 visitors in the long term. 60% Of total visitors are overnight visitors and 40% are day visitors.

The area should be able to sell in the region of 126 000 bednights in 2002 growing to 172 000 in 2010 and 210 000 in 2020. 96% Of all bednights will derive from the local market and 4% from the international market. Of the local market, 55% of the bednights will derive from overnight conference visitors, 28% from the educational market, 12% from general leisure and 6% from general business travellers.

Most attractions in and around Gauteng focus on the Gauteng leisure and corporate market. As a result of increasing competition in the region such as the Heritage Park (Pilanesberg & Madikwe), Dinokeng, Hartbeespoort Dam, etc. it will be difficult for the Vredefort Dome to attract large numbers (over 300 000 visitors per annum).

The Vredefort Dome has unique features which would appeal to special interest markets locally and internationally. Although the area does not attract large numbers of special interest markets at the moment we believe that these features should be developed into an acceptable product and marketed effectively. Existing general interest markets could also be turned into special interest markets in the future. Therefore it is important to plan the marketing strategy for the area in such a way that current visitors would return for different products. Diversification of products in the longer term will also assist in keeping the market interested. Establishing and upgrading tourist attractions, upgrading of roads, signage and other infrastructure will assist a great deal in establishing the area as a tourist destination.

3.6 TOURISM MARKET POTENTIAL

Future markets that were identified for the Vredefort Dome include the following:

3.6.1 Educational Tourism

Main focus on:

- Science & technology;
- Geology;
- Archaeology;
- Biodiversity, e.g. plants, animals, etc.;
- History; and
- links with space tourism *activities*.

Space Tourism

A unique option for Vredefort Dome is the establishment of a centre for Space Tourism.

Tourism at meteor sites in the Americas seems to be linked with space, dinosaurs (i.e. palaeontology, archaeology & geology), science, technology, astronomy, UFO's, etc. The earth's oldest impact craters are the Sudbury structure in Canada and Vredefort Dome in South Africa, both just under two billion years old. While this is old for features on Earth, these craters are very young compared to most found elsewhere in the solar system. Possibly the most important crater yet identified is the 65 million year old Chicxulub Crater of Mexico. This crater, 180 to 300 km in diameter, is believed to be the site of the meteorite that ended the dinosaur's 160 million year reign of Earth.

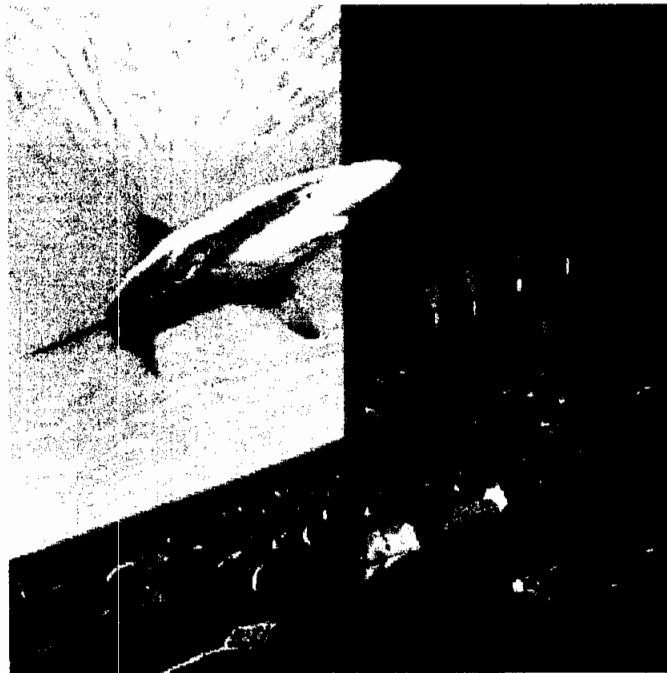
Space related tourism attractions at Chicxulub and Sudbury include:

- Science camps (with themes such as "rocks to rockets", "discover space", "Making space movies, etc.)
- Robotics learning centre
- Flight simulators
- Space galleries & exhibitions which is located "inside a meteor" (artificial)
- Space training camps
- Space rides
- Imax theatres
- Planetariums/ Observatories

Picture 24: Exhibition centre at Sudbury, the towering walls of rock, located beneath the surface of the earth



Picture 25: A 5 storey IMAX theatre at Sudbury, used for product launches, group presentations and private screenings



Space tourism is a term that's come to mean ordinary members of the public buying tickets to travel to space and back. Many people find this idea is futuristic. But over the past few years a growing volume of professional work has been done on the subject, and it's now clear that setting up commercial space tourism services is a realistic target for business.

Space tourism does not only include the vehicles that take public passengers to space, but also from the perspective of the "destination" paradigm. As such the industry can be envisioned to include not only earth-based attractions that simulate the space experience such as theme parks, space training camps, virtual reality facilities, multi-media interactive games and tele-robotic moon rovers, but also parabolic flights, sub-ordinal flights, orbital flights lasting up to 3 days or week long stays at a floating space hotel including participatory educational research and entertainment experiences as well as space sports competitions.

Seeds for the space tourism market, which is the strongest in America and the Far East, have been sowed a couple of decades ago with earth bound attractions such as Nasa's visitor centre, movies such as "Star Trek", "Star Wars", "Armageddon", "Total Recall", etc. and several space related theme park attractions all over the United States. The main obstacles are simply the conservatism of the industry and to some extent from the market

As space tourism has not been introduced in South Africa, we believe Vredefort Dome should capitalise on this opportunity to create unique selling features to attract visitors to its area.

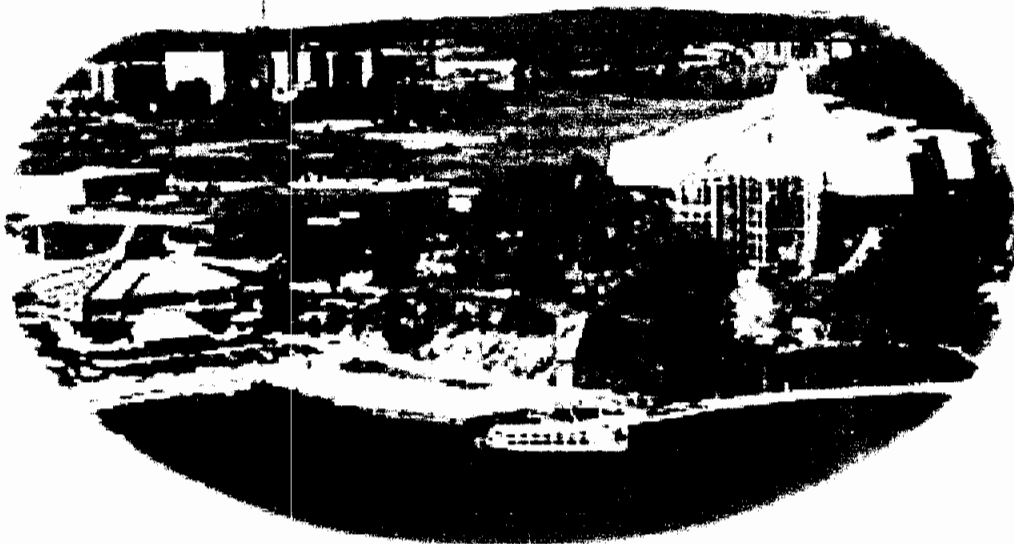
Educational Tourism linked with Science and Technology Tourism

Education, especially those initiatives linked to science and technology enjoy a great deal of attention in South Africa. A large proportion of tourism facilities in the area are suited for education related tourism and we believe it should be used innovatively.

Our research indicates that practical science combined with camps proves to be very successful in the United States. The Science North foundation in Sudbury, Canada (located close to the meteor impact site) is considered leaders in science communication. They exploit the world of scientific learning opportunities by hosting extensive exhibition programmes, science camps, day and overnight science workshops, inviting world-renowned guest speakers, etc. The foundation fosters high quality science education and entertainment experiences for its visitors. Experiences involve people and the relationships between science and technology and everyday

life. Examples of these are learning to collate a variety of rock formations, make plaster casts, rocket launching, making a telephone, making motion pictures, etc. Visitors are encouraged to use various tools and experience the joy of independent learning.

Picture 26: Science North Foundation, Sudbury, Canada



The centre has become famous for its visitor-friendly approach which creates an environment that highlights learning and teaching. Over the course of a school year around 30 000 school children will visit the science centre in organised groups. Such visits provide unique learning opportunities for the young and encourage the student to pursue careers in science.

We recommend that educational tourism in the area should be developed in conjunction with the Department of Arts, Culture, Science and Technology, Universities such as Wits and Potchefstroom, national and provincial Departments of Education and local schools.

3.6.2 General Leisure

The following general leisure markets were identified:

- Day (picnicking, arts, crafts, themed days, competitions, etc);
- Weekend; and
- Events, i.e. weddings, family gatherings, birthdays, etc.

3.6.3 Corporate

The following corporate markets were identified:

- Conference;
- Teambuilding; and
- Functions, events, launches, etc.

3.6.4 Special Interest - Scientific:

The following special interest - scientific markets were identified:

- Geology;
- Archaeology;
- Biodiversity, (special plant and animal life);
- Anthropology/culture & local architecture; and
- links with space tourism *activities*.

Scientific special interest groups include members of the heritage society, palaeontological society, geologists, wildlife/ nature societies, science enthusiasts, etc. The area has a wide range of special interest attractions to offer such as geology, history, biodiversity, archaeology and even architecture.

Special interest groups are very important due to the fact that they are most likely to spend more time in the area than the general tourist. These tourists are also likely to emanate from overseas, travel in groups or as independent travellers.

3.6.5 Sports & Adventure

The following sports and adventure markets were identified:

- Hiking;
- Horse trails;
- Canoeing/rafting;
- 4X4 tracks;
- Quad biking;
- Abseiling;
- Mountain biking;

- Marathons;
- Cycling tours;
- Sky diving;
- Gliding;
- Fishing; and
- Sports training.

Special interest markets in adventure tourism include activities such as sky diving, canoeing, abseiling, rafting, etc. The area has beautiful natural features including rivers, mountains, etc. which lends itself to offer a large number of adventure and sports activities. The nature of the main attraction, i.e. large dome shaped geological structure in the area makes it very difficult to see on ground level. However, it opens up new opportunities to view the attraction from the air, i.e. skydiving, gliding and to a lesser extent hot air ballooning.

Niche markets in nature tourism could include hiking trails, 4X4 trails, bird watching, horseback trails, etc. Over the last decade, the increased demand for eco-tourism³ has represented not only a growing trend in the tourism industry, but also one of the most significant challenges to the sector. According to the World Resources Institute, while tourism in general has been increasing at a rate of 4% per annum, nature travel is growing more than 10% per annum. The demand for eco-tourism has arisen out of the shift away from mass tourism towards experiences perceived to be more individualistic and enhancing.

Trends within the eco-tourism industry include:

- An increase in the average age of eco-tourists and the growth in foreign independent travellers as opposed to group tours is characteristic of a **broadening eco-tourist clientele;**
- **Increased interest in cultural interaction/meeting and assisting local people;**
- **Increased eco-commercial development and planning;**

³ Ecotourism is defined by the Ecotourism Society as "responsible travel to natural areas which conserves the environment and sustains the well-being of local people"

- **Desire for shorter and cheaper trips;**
- **Increase in adventure tourist attractions and activities;**
- **Expansion into new destinations and unique trips;** and,
- **Increased *tour operator education of clients about sensitive destinations.***

In South Africa, very little is known about the nature-based tourism market. The 1996 Tourism White Paper stresses that one of the national tourism objectives is to ensure that the countries unique selling features in tourism, i.e. its natural environment, fauna and flora are protected and developed rapidly to maximize their contribution to the economy, with due care been taken to protect fragile ecological systems.

Tracking of increased interest in the adventure and eco-tourism markets is denoted by the increased number of multi purpose and leisure vehicles on the market. According to NAAMSA (*National Association of Automobile Manufacturers of South Africa*), new vehicles sales in this category have increased by an average of 14% per annum for the past three years.

4. SWOT ANALYSIS

4.1 STRENGTHS

4.1.1 Tourism Products & Markets

4.1.1.1 Unique geological attraction

4.1.1.2 Growing number and range of products

4.1.1.3 A range of natural, geological, archaeological, historical and other attractions exist

4.1.1.4 Variety of tourism options

4.1.1.5 Proximity to markets

4.1.2 Awareness & Education

4.1.2.1 Some conservation and tourism culture exists

4.1.2.2 Conservancy exists and operates well

4.1.2.3 Conservancy circulates a newsletter

4.1.2.4 Market system and farmer unions available to network on Free State side

4.1.3 Infrastructure

4.1.3.1 Good access (N1)

4.1.3.2 Good services (electricity, telephone lines, underground water)

4.1.3.3 Good road network

4.1.4 Land Tenure

4.1.4.1 Majority of landowners positive

4.1.4.2 Transition from agriculture to tourism

4.1.5 Funding

4.1.5.1 Government support for Development and Management Plan

4.1.6 Management

4.1.6.1 Elected executive management in place

4.1.6.2 Strong leadership (NW side)

4.1.7 Conservation

4.1.7.1 Bergland Conservancy in NW

4.1.7.2 Area earmarked for incorporation into World Heritage Site

4.1.7.3 Government support

4.2 WEAKNESSES

4.2.1 Tourism Products & Markets

4.2.1.1 No single branding

4.2.1.2 Small overseas market

4.2.1.3 Strong competition

4.2.1.4 Products mainly below industry standard

4.2.1.5 Seasonality

4.2.1.6 Lacks co-ordinated marketing

4.2.1.7 Products not necessarily aligned to market potential – focused mostly on the low end of the market (many group facilities)

4.2.1.8 Lack of day visitor facilities (picnic sites, ablutions, etc)

4.2.1.9 Poor signage and interpretation

4.2.1.10 Low occupancy levels

4.2.1.11 No general public/day visitor facilities

4.2.2 Awareness & Education

4.2.2.1 Lack of awareness and involvement of some landowners and labourers (particularly in Free State)

4.2.2.2 No central management structure

4.2.2.3 Conservation and tourism culture not apparent everywhere (particularly amongst non-product owners)

4.2.2.4 Lack of conservation guidelines and regulations

4.2.2.5 Tourism operating standards, lack of ethics and operating guidelines and trained operators and personnel

4.2.3 Infrastructure

4.2.3.1 No management infrastructure

4.2.3.2 Bad cell phone reception

4.2.3.3 Limited tourism support infrastructure

4.2.4 Land Tenure

4.2.4.1 Many small landowners

4.2.4.2 Some difficult and non-interested landowners

4.2.5 Funding

4.2.5.1 Lack of funding – particularly for infrastructure

4.2.6 Management

4.2.6.1 No central management capacity exists

4.2.6.2 No clarity on rules and regulations or rights and obligations of landowners and operators

4.2.6.3 No clarity on individual vs collective roles, responsibilities and rights of landowners and that of operators

4.2.6.4 No guidelines on capacities/densities, developments

4.2.7 Conservation

4.2.7.1 Erosion

4.2.7.2 Water quality

4.2.7.3 Bush encroachment

4.2.7.4 Alien plant, animal, fish and bird species

4.2.7.5 Air and noise pollution

4.2.7.6 Ruins, rubble and internal fences

4.2.7.7 Illegal activities (unlicensed change in land use and business activities, squatting, etc.)

4.3 OPPORTUNITIES

4.3.1 Interpretation Potential

4.3.1.1 Interesting geology, archaeology and mining history makes for excellent interpretation opportunities and museums

4.3.1.2 NASA interest in a project in the region

4.3.2 World heritage Site Status

4.3.2.1 Prominence of a world heritage site has great marketing value

4.3.2.2 Government has major responsibilities IRO world heritage sites

4.3.2.3 A world heritage site can draw sponsorships

4.3.3 Controlled Access

4.3.3.1 Improved security when fenced as a single project

4.3.3.2 Potential to charge an income and control access and numbers with entrance gates

4.3.4 Development

4.3.4.1 New tourism developments and improved infrastructure can be expected as interest grows

4.3.5 Land Tenure

4.3.5.1 Potential for land values to increase once the area is known as an ecotourism destination or heritage site

4.3.6 Peripheral Land

4.3.6.1 Peripheral potential for landowners "outside" the project. Future expansion areas identified: i) West – PUCHE land, mountain range and 2 Bergland Conservancy members ii) South – mountain range, unused farms iii) North-east – Towards Lindequesdrift, Game farms, similar hills, road forms boundary iv) Lesotho's kraal

4.3.7 Financial

- 4.3.7.1 Income potential exists from tourism operations and entrance fees
- 4.3.7.2 Business-, employment- and other socio-economic spin-offs to the region
- 4.3.7.3 Potential government sources exist for capital requirements (eg Poverty Relief)
- 4.3.7.4 Potential private sources exist (landowners, corporate sponsors, development agencies and financiers)

4.3.8 Planning & zoning

- 4.3.8.1 Different areas have different potentials and capacities – should be optimised through a zoning plan
- 4.3.8.2 Potential expansion areas outside of core should be identified
- 4.3.8.3 IDPs could control peripheral developments on outside areas

4.3.9 Tourism Potentials

- 4.3.9.1 The opportunity exists to integrate the wide range of attractions and activities into packages, routes, tours and joint marketing
- 4.3.9.2 Development of special interest sites and tours
- 4.3.9.3 Improved market awareness when branded as a single destination

4.4 THREATS

4.4.1 Interpretation Potential

- 4.4.1.1 The area is not understood or valued without interpretation
- 4.4.1.2 Mining as a threat to ecotourism

4.4.2 World heritage Site Status

- 4.4.2.1 More controlled and restricted environment

4.4.3 Controlled Access

- 4.4.3.1 Poaching is rife

4.4.4 Development

- 4.4.4.1 Increased pollution, congestion, uncontrolled developments, visual impacts, more traffic, noise, etc

4.4.5 Land Tenure

4.4.5.1 Uncertainties, lack of interest and co-operation/participation and negative attitudes amongst some land owners

4.4.6 Peripheral Land

4.4.6.1 Perception of reduced development potential for landowners "inside" due to controls

4.4.7 Financial

4.4.7.1 Uninformed and/or negative tenants (landowners and labourers) are not interested or convinced

4.4.7.2 Uncertainties regarding expected financial contributions and the distribution of potential income (particularly IRO small landowners and poor tenants)

4.4.8 Planning & zoning

4.4.8.1 Unless a zoning plan and development and operational guidelines are not in place, the potential can not be reached

4.4.8.2 Areas outside the core area could have negative impact if developments are not controlled

4.4.9 Tourism Potentials

4.4.9.1 Risk of uncoordinated and unacceptable types of development can dilute the potential if not planned, organised and controlled by development guidelines

4.4.9.2 Development and tourism densities can become a problem if not controlled

4.4.9.3 Adventure activities need to be co-ordinated to optimise potentials

5. STAKEHOLDER RECOMMENDATIONS

5.1 CURRENT POLICIES AND GUIDELINES

It appears that the Dome Conservancy is accepted as a workable starting point and that the mission, vision and objectives reflected in their constitution (refer section 2.10) could be used to guide the development of the overall policies and guidelines for the Vredefort Dome, after considering the outcome of the SWOT analysis exercise within which the stakeholders participated (refer section 4).

It is however necessary to develop individual strategies, policies and guidelines for each aspect of developing and managing the greater Vredefort Dome.

5.2 STRATEGIC ISSUES

During the public participation workshops held in the study area, the following strategic issues were raised and discussed:

5.2.1 Consider UNESCO guidelines

It is necessary to align the management plan with the UNESCO guidelines.

5.2.2 Internal Awareness

The landowners and other affected parties are still reluctant to participate in the planning process, mainly due to a lack of awareness. It was therefore recommended by participants that;

- A single and concise internal publication that will educate the stakeholders should be published and distributed to all affected parties (to be entered on a comprehensive database);
- Topics to be covered should include the value of the unique geological formation, the value of eco-tourism land (vs agriculture), the World Heritage Listing application and its consequences, the potential of the area, potential institutional and management models, how the perceived conservancy will affect landowners and other affected parties;

- Find a champion on the Free State side where landowners are more apathetic that has the capacity, time and inclination to drive the process and make a special effort on the Free State side to get them at least on par with the North West level of awareness and participation;
- An effort should be made by the executive to visit each landowner and other key stakeholders and to enter into debate with them regarding the merits of the project;
- Make better use of available communication channels to encourage stakeholders to attend meetings (Marnet system, telephones, farmer unions, etc)

5.3 PLANNING ISSUES

5.3.1 Project Focus

Ensure that the project focus is aligned with UNESCO requirements and that the area is developed in accordance with its best potential rather than in accordance with pre-conceived ideas.

5.3.2 Zoning

It will be necessary to regulate future developments and visitor densities in accordance with the capacity of the land and the objectives and strategies of the proposed conservancy. To accommodate different markets and products it will be necessary to zone the study area into different zones, each with its own set of guidelines, rules and regulations.

It is expected that high-, medium- and low density zones would be required. However, it is necessary to consider land potential and capacities, potential markets and IUCN criteria when defining different zones.

5.3.3 Phasing-out Approach

The principle of gradually phasing out unacceptable land use practices and phasing in desirable practices in line with the Management Plan that is to be drafted, is preferred above a forced transition.

5.3.4 Short Term Focus

It is strongly recommended that the priority actions that will show maximum cost-benefit should be identified up front and that the limited energy and resources should be focussed on these items that will generate maximum benefit. A main entrance gate with interpretation centre, central packaging, booking and promotion capacity, appropriate management and co-ordination staff and basic trading outlets, could place the project on the map. A single peripheral fence could also kick-start the charging of entrance fees to all outside visitors, thus providing a flow of income to the project.

5.4 OPERATIONAL ISSUES

5.4.1 Land Ownership and Institutional Models

It is essential that stakeholders understand the various land ownership and institutional model options before deciding on the most appropriate. Particularly the differentiation between the centralised management body and the individual stakeholders need to be clarified.

Issues such as land ownership, cost sharing, individual rights, constraints and obligations, contribution towards costs, distribution of income and many other issues will need clarification and agreement.

It is important that certain universal principles are specified and agreed by all and that they be entrenched in the final constitution of the conservancy.

5.4.2 Roles and Responsibilities

The roles and responsibilities of all the parties have to be clearly understood and accepted by them before it can be adopted into a final Management Plan.

5.4.3 Marketing and Promotions

Apart from the need to jointly and individually market the project, it was suggested that a popular book on the area be commissioned, possibly with sponsorship from one or more corporate body.

5.4.4 Funding

In view of the limited resources available to the project, it will be important to consider all sources of funding and to make specific recommendations in this regard.

6. CONCLUSIONS

6.1. MATRIX OF CRITICAL ISSUES AND RECOMMENDATIONS

The **strengths and weaknesses**, the **opportunities and threats** and the **other issues** identified during the situation analysis and the recommendations made by the participating stakeholders were used in a Strategy Formulation Matrix from which the major strategies were identified for the Vredefort Dome Conservancy (Annexure D).

6.2. KEY STRATEGIES

The key strategies that were identified include the following, which will be individually discussed in the Strategic Development and Management Plan:

- Marketing and Interpretation Strategy
- Development Strategy
- Institutional Arrangements
- Internal Communications
- Funding Strategy
- Conservation Management
- Tourism Management

7. AUTHOR AND ACKNOWLEDGEMENTS

7.1. Author Details

The authors are:

Willie Boonzaaier

Contour Project Managers CC

PO Box 4906

Rustenburg 0300

Tel +27- (14) - 537 2226

Fax +27 - (14) - 537 2118

E-mail contour@mweb.co.za

Website www.linx.co.za/contour/

Marlien Lourens

Grant Thornton Kessel Feinstein

Postal address: Private Bag X28 Benmore 2010, South Africa

Tel +27 - (11) - 322 4500

Fax +27 - (11) - 322 4545

Email mbosman@gt.co.za

Website www.gt.co.za

7.2. Management Team

The Executive Management Committee and various academics and stakeholders are thanked for their enthusiastic co-operative in making contributions, providing important background information, responding to the many requests for further literature or answering questions, setting up and hosting various meetings and workshops and supporting the professional team in general.

8. REFERENCES

8.1. BIBLIOGRAPHY

Reference Documents:

Advertising Research Foundation, 1997, All Media Purpose Survey (AMPS)

Brink M.C. 1999, Die Oorsprong van die Geologiese Ringstruktuur by Vredefort

Brink M.C. Waanders F.B. & Bischoff A.A. The Katdoornbosch-Witpoortjie Fault: a ring thrust of Vredefort Event age, School of Chemical and Mineral Engineering, Potchefstroom University

Burger A. Dome Highlands Nature Park: Motivation for Funding, Steering Committee Working Document

Conroy D.J. 1983, Inligting oor 'n voorgestelde bewaringsgebied, SA National Parks

De La Harpe H. Vredefort Dome in Line-up for World Heritage Nomination, Vredefort Dome World Heritage Initiative

Dinokeng Consortium, 2001, Research conducted for DACEL Dinokeng project, Gauteng Day & Weekend Visitor Trends

Du Preez P.J. 1987, Ekologie van die Boomgemeenskappe van Vredefortdistrik, Oranje Vrystaat, Masters thesis (University of Orange Freestate)

De Swart & Dyus 2001, Vredefort Dome Initiative Status Quo Report Northern Freestate District Council

Erasmus C. 2001, General Information regarding Vredefort Dome as a possible World Heritage Site, Freestate Province Department of Environment Affairs and Tourism

Erasmus C & Cronje E. 2001, Vredefort Dome World Heritage Site (Draft Proposal), Freestate Province Department of Environment Affairs and Tourism

Gibson R.L. & Reimold W.U. 1999, The Vredefort Impact Structure, South Africa (The Scientific Evidence and a Two-day Excursion Guide), Department of Geology, University of the Witwatersrand

Human Science Research Council, 1998, Educational Requirements in Gauteng

Jansen J. Map of the Vredefort Dome Proposed World Heritage Site. DEAT

Labuschagne P. 2001, Vredefort Dome Initiative, Minutes of Meetings, Potchefstroom Local Municipality

Lourens M. 2001, Tourism Survey of the Vredefort Dome Region, Grant Thornton Kessel Feinstein

Muller T. 2001, Proposed Dome Nature Park, Freestate and North West Provinces

Pelser Anton. 2000, A report on the first phase of a cultural resource survey on the Vredefort Dome, National Cultural History Museum Archaeology Department

Reimold W.U. 2001, The Vredefort Saga, a Controversy Around the World's Largest Gold Source, Geotimes, Magazine of the Earth Sciences

Reimold W.U. The Geological Significance of the Vredefort Dome: Motivation for World Heritage Status, Department of Geology, University of the Witwatersrand

Reimold W.U. & Coney L. 2001, The Vredefort Dome Impact Structure and Directly Related Subjects: an Updated Biography Economic Geology Research Institute, University of Witwatersrand

Reimold W.U. & Gibson R.L. Geology and the Evolution of the Vredefort Impact Structure, South Africa, Department of Geology, University of the Witwatersrand

South African Tourism, 1999 to 2000, International Tourism Surveys

South African Tourism, 1996 –2001, Domestic Tourism Surveys

Van Der Merwe J. 2000 Vredefort Dome, Potchefstroom in 2000

Viljoen M.J. & Reimold W.U. An Introduction to South Africa's Geological and Mining Heritage, Mintek in association with the Geological Society of South Africa

Environmental Problems Related to Mining the Kimberley Reefs Horizon in the Vredefort Mountain Land Area

Konsepgrondwet vir die Koepelbewaria, Dome Bergland Conservancy

1997, Operational Guidelines for the Implementation of the World Heritage Convention, UNESCO

Websites:

<http://protea.worldonline.co.za>, 2001, Vredefort Dome 17 - 18 February 2001

www.geosites.co.za/vredefort, 2001, Geological Heritage Tours: Vredefort Dome

www.gwu.edu/~spctour/market, 1996, Space tourism surveys

www.hartrao.ac.za/other/vredefort/, 2001, Deep Impact - The Vredefort Dome

www.linx.co.za/trails/backtrack/rooihaas, 2001, The Rooihaas Hiking Trail: Vredefort Dome

www.mintek.co.za/pubs/geobook/vredefortdome, Landsat Images of the Vredefort Dome

www.space.com, 2001 Reinstating citizens in space

www.space.com, 2001 Tourism as a catalyst

www.spacefuture.com, 1997 Introduction: What is Space Tourism?

www.spacefuture.com, 1997 Space Tourism: How soon will it happen?

www.sciencenorth.on.ca, 2001 Science North Foundation

8.2. STAKEHOLDER WORKSHOPS AND ORIENTATION VISITS

A number of field trips were made by the professional team, during which the study area was covered extensively to obtain an understanding of the landscape, the rich geological, archaeological, historical and natural attractions, the tourism potential and other relevant features of the study area.

In this regard, Adv. Steven de la Harpe, Mr Johannes van der Merwe and Dr Maartin Brink were particularly helpful in orientating and hosting the team and introducing them to landowners and operators on the ground.

Stakeholder workshops were held at Dimalachite and Kiepersol on the 23rd and 24th November 2001 respectively.

Vredefort Dome Establishments

North West

Name	Type of Establishment	No. of Beds	Type of accommodation	Bed Occ	Bednights sold per annum	Max Conf Size	Delegate days per annum	campsites	occupancy	sitenights sold p.a.
Lenaga	Nature reserve & eco-tourism	8 fixed tents		15%	438					
Morala Private Nature reserve	Nature reserve & eco-tourism	20 chalets		15%	1,095					
Kiepersol	Conference & Weddings	20 huts		15%	1,095	20	225			
Benjoh	Fishing resort	40 chalets		15%	2,190					
Thabela Thabeng	Conference & eco-tourism	80 chalets & dormitories		30%	8,760	35	1500			
Kwa Nokeng	Conference & eco-tourism	180 dormitories		10%	6,570	180	1500			
Old Imperial Inn	Guest house & eco-tourism	15 house		5%	274		0			
Veldwaarts	Conference & Adventure tourism	40 huts		10%	1,460	40	1200			
Lenyebi	Conference & eco-tourism	30 rooms		10%	1,095	30	600			
Suikerbos	Nature reserve & eco-tourism	10 chalets		10%	365			20	5%	730
Bo-plaas & Bundu camps	Nature reserve & eco-tourism	50 dormitories		10%	1,825					
Koepel Gastehuis	Guest house & eco-tourism	12 rooms		15%	657					
Donkervliet	Nature reserve & eco-tourism	150 dormitories		10%	5,475					
Sunwa River Rafting	Conference & adventure	60 log cabins		15%	3,285	120	2000			
Stonehenge	Conference	120 hotel		30%	13,140	120	14400			
Kya Ibubezi	Conference	20 guesthouse		10%	730	100	7200			
Kwagga Park	Resort	50 huts		5%	913			50	2%	913
Smilin Thru	Resort & conference	144 chalets		15%	7,884	120	12600	150	3%	4,106
Uitkyk	Resort	50 chalets		5%	913			40		
Takwasa	Nature reserve & eco-tourism	150 dormitories		5%	2,738					
Venterskroon	Nature reserve & eco-tourism	150 dormitories		5%	2,738					
El Shammah	Conference centre	0 None			0	80	525			

Nature based activities:

Kwenkwezi	Hiking trail
Boot & Paddle	Hiking trail
Thabela Thabeng hiking	Hiking trail
Thabela Thabeng Tours	Geological tours
Berakah	4x4 route

Other support infrastructure:

Hanzet Restaurant	Restaurant
-------------------	------------

Total	1399	63,638	845	41750	260	5,749
-------	------	--------	-----	-------	-----	-------

Name	Type of Establishment	No. of Beds	Type of accommodation	Bed Occ	Bednights sold per annum	Max Conf Size	Delegate days per annum	campsites	site occupancy	sitenights sold p.a.
<u>Free State</u>										
Tshwane Game Reserve	Game Lodge	20 rooms		15%	1,095	20	300			
Chazen Game Lodge	Game Lodge	16 chalets		15%	876	20	800			
Dimalachite	Resort	14 chalets		15%	767		0			
Hadeda Creek	Conference & adventure	40 fixed tents		25%	3,650	80	5000			
Hakuna Matata	Conference & adventure	40 fixed tents		25%	3,650	80	2250			
Klein Paradys	Resort	100 huts		10%	3,650	50	600	50	2%	912.5
Savanah	Resort	24 chalets		5%	438	150	2025			
Udolpho	Resort	65 huts		5%	1,186		0			
Festival Grounds	Resort	0		-	-		0	60	2%	1095
Grasdak	Guesthouse	8 rooms		15%	438		0			
Green Gables	Guesthouse	18 rooms		25%	1,643	20	562.5			
Janmart	Guesthouse	3 rooms		15%	164		0			
Rivierhuys	Guesthouse	6 rooms		15%	329		0			
Soetdoring	Guesthouse	6 rooms		15%	329		0			
Sonnestraal	Guesthouse	2 rooms		11%	80		0			
Travellers Rest	Guesthouse	5 rooms		15%	274	15	450			
Villa Sparrow	Guesthouse	3 rooms		15%	164		0			
Parys Palm Court	Hotel	19 rooms		25%	1,734	40	4500			
Bridge Lodge	Guesthouse	30 rooms		15%	1,643	30	250			
The White House	Guesthouse	4 rooms		15%	219		0			
Desmar	Guesthouse	8 rooms		25%	730		0			
Riverbush Lodge	Guesthouse	5 rooms		25%	456		0			
Mimosa Gardens	Resort	214 chalets		20%	15,622	300	4500	150	5%	8212.5
The Haven	Resort	5 rooms		12%	219		0			
Total		655		16%	39,354	805	21,238	260		10,220

Summary:

Total bednights sold	102,992
Total camping nights sold	15,969
Total nights sold	118,961

Total conference delegate days	62,988
Total conference delegates	36,725
Total conference day delegates	21,214
Total conference overnight	15,511

Total guests **80,694**

Additional to the above there are around 30 000 day visitors per annum to the Dome area

Total visitors:

110000	
overnight	59%
day	41%
Day conference as % of day vis	48%

Breakdown of Bednights Sold per annum:

Breakdown:

Type of accommodation:

Beds	80%
Camping	20%
	<u>100%</u>

Type of market:

Conference	54%
General leisure	46%
	<u>100%</u>

1 EXPECTED MARKET FOR DAY VISITORS TO THE VREDEFORT DOME AREA

1.1 Day Visitor Demand from North West

North West Population	3,500,000 **
% Of population earning income	45.0% **
Number of population earning income	1,575,000
Estimated % of population that could afford going on day trips	15.0% #
Number of population that could afford going on day trips	236250
Estimated % of people that might visit the Vredefort Dome	7% #
Estimated number of people that might visit the Vredefort Dome	15,356
Estimated frequency of visit to the Vredefort Dome	0.30 #
Total estimated number of visitors to the Vredefort Dome	<u><u>4,607</u></u>

1.2 Day visitor demand from Gauteng

Gauteng Population	7,600,000 **
% Of population earning income	45% **
Number of population earning income	3,420,000
Estimated % of population that could afford going on day trips	30% **
Number of population that could afford going on day trips	1,026,000
Estimated % of people that might visit the Vredefort Dome	15% #
Estimated number of people that might visit the Vredefort Dome	153,900
Estimated frequency of visit to the Vredefort Dome	0.1 #
Total estimated number of visitors to the Vredefort Dome	<u><u>15,390</u></u>

1.3 Day visitor demand from the Free State

Free State Population	2,900,000 **
% Of population earning income	20% #
Number of population earning income	580,000
Estimated % of population that could afford going on day trips	15% #
Number of population that could afford going on day trips	87000
Estimated % of people that might visit the Vredefort Dome	10% #
Estimated number of people that might visit the Vredefort Dome	8700
Estimated frequency of visit to the Vredefort Dome	0.1 #
Total estimated number of visitors to the Vredefort Dome	<u><u>870</u></u>

1.4 Day visitor demand from Schools Groups

Number of school children in Gauteng	1,427,872 ##
Number of school children in North West	958,120 ##
Number of school children in the Free State	725,000 ##
Total potential school children in catchment area	3,110,992

% Of school children going on day excursions	40% #
Number of school children able to undertake day excursions	1,244,397
Estimated number of students per group visiting the area	50 #
Number of students taking day excursions per annum	
Estimated % of students that might visit the Vredefort Dome area	1% #
Estimated number of students that might visit the Vredefort Dome	12,444
Estimated frequency of visit to the Vredefort Dome	0.5 #
Total estimated number of visitors to the Vredefort Dome	<u><u>6,222</u></u>
Total number of groups that might visit the area per annum	124

1.5 Day visitor demand from day Conferences & Teambuilding

Total number of conference events organised in South Africa in 2000	101,344 *
Total number of domestic delegate days in 2000	11,046,496 *
% Day conferences organised in South Africa in 2000	80%
Number of day conference delegates in South Africa in 2000	8,837,197
% Day events organised in the North West Province & Free State	3.5% *
Number of day events organised in the North West Province	309,302
% Day conference visitors to the Vredefort Dome area	5% #
Number of day conference visitors in the Vredefort Dome area	<u><u>16,702</u></u>
Average delegate size of day events	40
Estimated number of day events to the Vredefort Dome area	418

1.6 General & Special Interest Breakdown of the Day visitor market

Estimated % general interest day visitors	70%
Estimated number general interest day visitors	19,254
Estimated % special interest day visitors	30%
Estimated number special interest day visitors	8,252

Notes:

* South African Conference Centre Study (2000)

** STATSSA 1998 Domestic Survey

Grant Thornton Kessel Feinstein Estimate

HSRC data (1998)

VREDEFORT DOME
LITERATURE DATABASE

Author	Year	Title
Pelser Anton	2000	A report on the first phase of a cultural resource survey on the Vredefort Dome
Burger A		Dome Highlands Nature Park: Motivation for Funding
De La Harpe H		Vredefort Dome in Line-up for World Heritage Nomination
Erasmus C	2001	General Information regarding Vredefort Dome as a possible World Heritage Site
Erasmus C & Cronje E	2001	Vredefort Dome World Heritage Site (Draft Proposal)
	1997	Operational Guidelines for the Implementation of the World Heritage Convention
Du Preez PJ	1987	Ekologie van die Boommegemenskappe van Vredefortdistrik, Oranje Vrystaat
?		? Map of the Vredefort Dome Structure
Brink M	1999?	Die Oorsprong van die Geologiese Ringstruktuur by Vredefort
Brink MC, Waanders FB & Bischoff AA		The Katdoornbosch-Witpoortjie Fault: a ring thrust of Vredefort Event age
Gaylard M	2001	Deep Impact - The Vredefort Dome
Gibson RL & Reimold WU	1999?	The Vredefort Impact Structure, South Africa (The Scientific Evidence and a Two-day Excursion Guide)
Reimold WU	2001	Landsat Images of the Vredefort Dome
Reimold WU		The Geological Significance of the Vredefort Dome: Motivation for World Heritage Status
Reimold WU & Coney L	2001	The Vredefort Dome Impact Structure and Directly Related Subjects: an Updated Biography
Reimold WU & Gibson RL		Geology and the Evolution of the Vredefort Impact Structure, South Africa
Viljoen MJ & Reimold WU		An Introduction to South Africa's Geological and Mining Heritage
		Environmental Problems Related to Mining the Kimberley Reefs Horizon in thne Vredefort Mountain Land Area
Labuschagne P	2001	Vredfort Dome Initiative, Minutes of Meetings
		Konsepgrondwet vir die Koepelbewaria
Conroy DJ	1983	Inligting oorr 'n voorgestelde bewaringsgebied
De Swart & Dyus	2001	Vredefort Dome Initiative Status Quo Report
Jansen J		Map of the Vredefort Dome Proposed World Heritage Site
Belckner L	2001	The Rooihaas Hiking Trail: Vredefort Dome
Heydenrych R	2001	Vredefort Dome 17 - 18 February 2001
Muller T		Proposed Dome Nature Park
Reimold WU	2001	The Vredefort Saga, a Controversy Around the World's Largest Gold Source
Van Der Merwe J	2000	Vredefort Dome
	2001	Geological Heritage Tours: Vredefort Dome
Laourens M	2001	Tourism Survey of the Vredefort Dome Region
		Tourism in the Dome Bergland Conservancy

ANNEXURE C

Publisher	Source	Category	Return
National Cultural History Museum Archaeology Department	Anton Pelser	Archaeology	No
Steering Committee Working Document	Adv Steven de la Harpe	Conservation	No
Vredefort Dome World Heritage Initiative	Adv Steven de la Harpe	Conservation	No
Freeestate Province Department of Environment Affairs and Tourism	Coenie Erasmus	Conservation	No
Freeestate Province Department of Environment Affairs and Tourism	Coenie Erasmus	Conservation	No
UNESCO	Coenie Erasmus	Conservation	No
Masters thesis (University of Orange Freestate)	Coenie Erasmus	Ecology	Yes
	Council of Geoscience	Geology	
	Adv Steven de la Harpe	Geology	No
School of Chemical and Mineral Engineering, Potchefstroom University	Adv Steven de la Harpe	Geology	No
HartRAO	Worldwide Web	Geology	No
Department of Geology, University of the Witwatersrand	Dr Uwe Reimold	Geology	No
Mintek	Worldwide Web	Geology	No
Department of Geology, University of the Witwatersrand	Adv Steven de la Harpe	Geology	No
Economic Geology Research Institute, University of Witwatersrand	Dr Uwe Reimold	Geology	No
Department of Geology, University of the Witwatersrand	Dr Uwe Reimold	Geology	No
Mintek in association with the Geological Society of South Africa	Dr Uwe Reimold	Geology	No
	Adv Steven de la Harpe	Geology	No
Potchefstroom Local Municipality	Pieter Labuschagne	Institutional	No
Dome Bergland Conservancy	Johannes vd Merwe	Institutional	No
SA National Parks	Adv Steven de la Harpe	Planning	Yes
Northern Freeestate District Council	Coenie Erasmus	Planning	Yes
DEAT	Coenie Erasmus	Planning	No
Linx Africa	Worldwide Web	Publicity	No
Protea Atlassing	Worldwide Web	Publicity	No
Freeestate and North West Provinces	Johannes vd Merwe	Publicity	No
Geotimes, Magazine of the Earth Sciences	Dr Uwe Reimold	Publicity	No
Potchefstroom in 2000	Adv Steven de la Harpe	Publicity	No
Noordvandieberg	Worldwide Web	Publicity	No
Grant Thornoton Kessel Feinstein	Marlien	Tourism	No
	Adv Steven de la Harpe	Tourism	No

VREDEFORT DOME CONSERVANCY
STRATEGIC EXERCISE MATRIX

Strengths	Weaknesses	Marketing & Interpretation Strategy	Development Strategy	Institutional	Communication	Funding Strategy	Conservation Management	Tourism Management
SWOT Table Reference No's								
Tourism Products & Markets								
1.1								
1.2								
1.3								
1.4								
1.5								
	1.6							
	1.7							
	1.8							
	1.9							
	1.10							
	1.11							
	1.12							
	1.13							
	1.14							
	1.15							
	1.16							
Awareness & Education								
2.1								
2.2								
2.3								
2.4								
	2.5							
	2.6							
	2.7							
	2.8							

Strengths	Weaknesses	Marketing & Interpretation Strategy	Development Strategy	Institutional	Communication	Funding Strategy	Conservation Management	Tourism Management
	2.9							
Infrastructure								
3.1								
3.2								
3.3								
	3.4							
	3.5							
	3.6							
Land Tenure								
4.1								
4.2								
	4.3							
	4.4							
Funding								
5.1								
	5.2							
Management								
6.1								
6.2								
	6.3							
	6.4							
	6.5							
	6.6							
Conservation								
7.1								
7.2								
7.3								
	7.4							
	7.5							
	7.6							
	7.7							
	7.8							
	7.9							

Opportunities	Threats	Marketing & Interpretation Strategy	Development Strategy	Institutional	Internal Communication	Funding Strategy	Conservation Management	Tourism Management
13.1								
	13.2							
Finances								
14.1								
14.2								
14.3								
14.4								
	14.5							
	14.6							
Planning & Zoning								
15.1								
15.2								
15.3								
	15.4							
	15.5							
Tourism Potential								
16.1								
16.2								
16.3								
	16.4							
	16.5							
	16.6							

Other Issues	Marketing & Interpretation Strategy	Development Strategy	Institutional	Internal Communication	Funding Strategy	Conservation Management	Tourism Management
SWOT Table Reference No's							
17.1							
17.2							
17.3							
17.4							

Other Issues	Marketing & Interpretation Strategy	Development Strategy	Institutional	Internal Communication	Funding Strategy	Conservation Management	Tourism Management
17.5							
17.6							
17.7							
17.8							
17.9							
17.10							
17.11							
17.12							

**VREDEFORT DOME
STAKEHOLDER INPUTS DURING WORKSHOPS OF 23 AND 24 NOVEMBER 2001**

SWOT ANALYSIS

CATEGORY	STRENGTHS	WEAKNESSES
<p>1. <u>Tourism Products & Markets</u></p>	<p>1.1. Unique geological attraction 1.2. Growing number and range of products 1.3. A range of natural, geological, archaeological, historical and other attractions exist 1.4. Variety of tourism options 1.5. Proximity to markets</p>	<p>1.6. No single branding 1.7. Small overseas market 1.8. Strong competition 1.9. Products mainly below industry standard 1.10. Seasonality 1.11. Lack co-ordinated marketing 1.12. Products not necessarily aligned to market potential – focused mostly on the low end of the market (many group facilities) 1.13. Lack of day visitor facilities (picnic sites, ablutions, etc) 1.14. Poor signage and interpretation 1.15. Low occupancy levels 1.16. No general public/day visitor facilities</p>
<p>2. Awareness & Education</p>	<p>2.1. Some conservation and tourism culture exists 2.2. Conservancy exists and operates well 2.3. Conservancy circulates a newsletter 2.4. Marnet system and farmer unions available to network on Free State side</p>	<p>2.5. Lack of awareness and involvement of some landowners and labourers (particularly in Free State) 2.6. No central management structure 2.7. Conservation and tourism culture not apparent everywhere (particularly amongst non-product owners) 2.8. Lack of conservation guidelines and regulations 2.9. Tourism operating standards, lack of ethics and operating guidelines and trained operators and personnel</p>

3. <u>Infrastructure</u>	3.1. Good access (N1) 3.2. Good services (electricity, telephone lines, underground water) 3.3. Good road network	3.4. No management infrastructure 3.5. Bad cell phone reception 3.6. Limited tourism support infrastructure
4. <u>Land Tenure</u>	4.1. Majority of landowners positive 4.2. Transition from agriculture to tourism	4.3. Many small landowners 4.4. Some difficult and non-interested landowners
5. <u>Funding</u>	5.1. Government support for Development and Management Plan	5.2. Lack of funding – particularly for infrastructure
6. <u>Management</u>	6.1. Elected executive management in place 6.2. Strong leadership (NW side)	6.3. No central management capacity exists 6.4. No clarity on rules and regulations or rights and obligations of landowners and operators 6.5. No clarity on individual vs collective roles, responsibilities and rights of landowners and that of operators 6.6. No guidelines on capacities/densities, developments,
7. <u>Conservation</u>	7.1. Bergland Conservancy in NW 7.2. Area earmarked for incorporation into World Heritage Site 7.3. Government support	7.4. Erosion 7.5. Water quality 7.6. Bush encroachment 7.7. Erosion 7.8. Alien plant, animal, fish and bird species 7.9. Air and noise pollution 7.10. Ruins, rubble and internal fences 7.11. Illegal activities (unlicensed change in land use and business activities, squatting, etc.)

	OPPORTUNITIES	THREATS
8. Interpretation Potential	<p>8.1. Interesting geology, archaeology and mining history makes for excellent interpretation opportunities and museums</p> <p>8.2. NASA interest in a project in the region</p>	<p>8.3. The area is not understood or valued without interpretation</p> <p>8.4. Mining as a threat to ecotourism</p>
9. World heritage Site Status	<p>9.1. Prominence of a world heritage site has great marketing value</p> <p>9.2. Government has major responsibilities IRO world heritage sites</p> <p>9.3. A world heritage site can draw sponsorships</p>	<p>9.4. More controlled and restricted environment</p>
10. <u>Controlled Access</u>	<p>10.1. Improved security when fenced as a single project</p> <p>10.2. Potential to charge an income and control access and numbers with entrance gates</p>	<p>10.3. Poaching is rife</p>
11. <u>Development</u>	<p>11.1. New tourism developments and improved infrastructure can be expected as interest grows</p>	<p>11.2. Increased pollution, congestion, uncontrolled developments, visual impacts, more traffic, noise, etc</p>
12. <u>Land Tenure</u>	<p>12.1. Potential for land values to increase once the area is known as an ecotourism destination or heritage site</p>	<p>12.2. Uncertainties, lack of interest and co-operation/participation and negative attitudes amongst some land owners</p>

13. <u>Peripheral Land</u>	13.1. Peripheral potential for landowners “outside” the project. Future expansion areas identified: i) West – PUCHE land, mountain range and 2 Bergland Conservancy members ii) South – mountain range, unused farms iii) North-east – Towards Lindequesdrift, Game farms, similar hills, road forms boundary iv) Lesotho’s kraal	13.2. Perception of reduced development potential for landowners “inside” due to controls
14. <u>Financial</u>	14.1. Income potential exists from tourism operations and entrance fees 14.2. Business-, employment- and other socio-economic spin-offs to the region 14.3. Potential government sources exist for capital requirements (eg Poverty Relief) 14.4. Potential private sources exist (landowners, corporate sponsors, development agencies and financiers)	14.5. Uninformed and/or negative tenants (landowners and labourers) are not interested or convinced 14.6. Uncertainties regarding expected financial contributions and the distribution of potential income (particularly IRO small landowners and poor tenants)
15. <u>Planning & zoning</u>	15.1. Different areas have different potentials and capacities – should be optimised through a zoning plan 15.2. Potential expansion areas outside of core should be identified 15.3. IDPs could control peripheral developments on outside areas	15.4. Unless a zoning plan and development and operational guidelines are not in place, the potential can not be reached 15.5. Areas outside the core area could have negative impact if developments are not controlled
16. <u>Tourism Potentials</u>	16.1. The opportunity exists to integrate the wide range of attractions and activities into packages, routes, tours and joint marketing 16.2. Development of special interest sites and tours 16.3. Improved market awareness when branded as a single destination	16.4. Risk of uncoordinated and unacceptable types of development can dilute the potential if not planned, organised and controlled by development guidelines 16.5. Development and tourism densities can become a problem if not controlled 16.6. Adventure activities need to be co-ordinated to optimise potentials

17. OTHER ISSUES

- 17.1.** Consider UNESCO guidelines when drafting a management plan
- 17.2.** Need to find appropriate model/s for incorporation, cost sharing, usage rights and distribution of revenues, rights and constraints for residents (check Sterkfontein)
- 17.3.** Clarify central vs decentralised roles and responsibilities
- 17.4.** Identify and implement small cost items that have the greatest impact potential (eg fencing, entrance gates and interpretation centre/s)
- 17.5.** Not all the land should be Big Five – consider options and pro's and con's
- 17.6.** High, Medium and Low density zones are necessary – comply with IUCN criteria and match with market potential
- 17.7.** Need a single internal publication (newsletter)
- 17.8.** An effort is necessary to speak to landowners individually
- 17.9.** Consider a popular book on the area
- 17.10.** Identify potential sources of funding
- 17.11.** Identify certain universal principles that have to be incorporated into the management model
- 17.12.** Lack of participation:
 - 17.12.1.** Provide workable models
 - 17.12.2.** enter into direct discussions with landowners
 - 17.12.3.** distribute information by pamphlets and concise proposal
 - 17.12.4.** use available communication channels (Marnet system, farmers unions, etc)
 - 17.12.5.** another orientation meeting in Free State
 - 17.12.6.** inform landowners of true potential of area
 - 17.12.7.** find a champion on Free State side that has the time and the interest to drive the process
 - 17.12.8.** Be specific about how the project affects landowners – highlight the positive aspects
 - 17.12.9.** Create database of landowners with contact details

VREDEFORT DOME DEVELOPMENT AND MANAGEMENT PLAN

By

POTCHEFSTROOM LOCAL MUNICIPALITY

and



Potchefstroomse Universiteit
vir Christelike Hoër Onderwys

SECTION A

A.1 General Response

This application represents the formal study proposal from the **Potchefstroom Local Municipality**, the **Potchefstroom University for CHE** for the development of a Vredefort Dome Spatial Management Plan. The Municipal Manager (or a delegated person) together with a project leader each from MPS and the University's Focus Area for Environmental Science and Management will be responsible for the day-to-day management of the project. It will be this Task Team responsibility to ensure the mobilisation and horizontal integration of experts from various faculties and relevant NGOs to achieve a multi- and inter-disciplinary approach.

Contact information

Contact persons: Mr H Botha (Municipal Manager, Potchefstroom)
Dr E Drewes (Potchefstroom University)
Mr T de Jager

Addresses:

Potchefstroom Local Municipality

PO Box 113
Potchefstroom
2531
Tel 018 299 5111

Focus Area for Environmental Science and Management

Private Bag X6001
PU for CHE
POTCHEFSTROOM
2520
Tel: (018) 299 2543
Fax: (018) 299 2487
E-mail: ssbjed@puknet.puk.ac.za

The project team has been constituted to reflect the multi-disciplinary nature of the project. It includes experts and representatives from local government, development economics, urban and regional planning, social sciences, tourism, geology, institutional sciences, environmental systems and management, civil engineering and service provision, etc. To ensure a high quality product, geological experts from outside the Potchefstroom University will also be included.

The University's project will consist of a core team supported by senior professionals/academics in consultation MPS. It is structured in this way to give less experienced and previously disadvantaged team members and post-graduate students the opportunity to be exposed to practical development

problems and to gain experience, while at the same time providing adequate management and guidance to ensure quality, relevancy and a practical project aimed at enhancing sustainable development. Any changes to the project team will be subject to the approval of the Provincial and Local Government.

The responsibilities and team members are as follows:

Managerial responsibility:	Mr S Roopa	Executive Mayor: Potchefstroom
Project Leader:	Mr P Labushagne Mr H Botha Mr T de Jager Dr E Drewes	Dir Social Services Operational requirements
PU for CHE core team members:	Dr. J.E. Drewes Prof CB Schoeman Mr. M. Phutiagae Dr. M. Coetzee Prof. W.A. Naudé Prof. M Saayman	Spatial planning, land / legal issues Management and Spatial planning Community participation/ Institutional model Geology Social/economic impact; market analysis Tourism/ Marketing
PU for CHE: other team members	Prof. H Bouwman Mr F Retief Dr. M Maboeta Dr. S. Cilliers Mr J Legoete Dr. A Vosloo Mr. R. Terblanche	Zoology Geography / EIA requirements Zoology Botany Zoology Zoology Zoology
GISCOE	Mr T de Jager	Spatial Planning & Geographical Information Systems
Other	Dr. M. Brink	Geology

Prof. Waanders	Geology
Prof. B. Bishoff	Geology

Various team members, including Proff. Naudé, Saayman, Bouwman, Drs. Cilliers, Coetzee and other team members were previously involved in research, policy documents and other projects in the study area. The team therefore has an intimate knowledge of the Vredefort Dome, its people and its development needs.

A.2 Technical brief

According to the invitation for funding, proposals can be lodged from suitably qualified universities, to compile – in this instance - a management and development plan for the Vredefort Dome. As no specific definition of a management and development plan is prescribed by law or policy, the Project Team indicated that the following components should be addressed, i.e.:

- Background to the project
- SEA and EIA requirements
- Legal issues surrounding land ownership, access and servitudes
- Community awareness and participation
- Market analysis including trends and gaps
- Tourism marketing and development requirements
- Social and economic impact assessment requirements
- Research, information and interpretation requirements/strategies
- Project costs and capital requirements
- Funding requirements
- Infrastructural and operational requirements
- Opportunities for private sector involvement and strategic alliances
- World Heritage Site application requirements
- Proposed developments, including but not limited to job creation, SMMF development and community and black economic empowerment
- Proposed institutional and financial models to manage the site in a sustainable fashion

In terms of content and detail regarding the above-mentioned issues, the following principles provide guidance. A *plan* should be a purposeful, forward-looking strategy or design, often with co-ordinated priorities, options and measures that elaborate and implement policy. The proposed plan should, therefore, provide guidance with regard to the implementation of various proposals to be designed and submitted. Although the study area is a unique environmental area, its administrative management falls, amongst others, within the Potchefstroom Local Municipality. Accordingly, this area must be managed by means of a local Spatial Development Plan that has been established for the whole Potchefstroom district area. This Plan makes provision for the compilation of detailed follow-up policies and plans to guide

development and management of **specific** geographical areas, such as the Vredefort Dome.

In order to study the Dome area in a sensible manner, guidance is provided by relevant principles of the Land Use Bill (2002) and the National Environmental Management Act (107/1998). Accordingly, environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably. Also, development must be socially, environmentally and economically sustainable (Section 2, Act 107 of 1998). Thus, it seems appropriate to compile a development (Spatial Plan) and management plan (Zoning Plan) that can be integrated into the framework of existing policies and plans. It is proposed that the project be undertaken in three phases. The *first* would be an analysis of the existing situation, i.e.

- in terms of its natural and man-made *environment*;
- a socio-economic profile of the study area and its residents; and
- in terms of the existing institutional and legal administration.

The second phase would be a campaign where public and affected parties are able to analyse the information gathered in the first phase, and to respond to this in a structured public participation programme. Against the background of the data assembled in the first and second phases, the final plan formulation phase will be embarked upon.

Phase One – Analysis of study area

The aim of the baseline study is to obtain the basic information to be able to formulate a development perspective, which could serve as basis for the development of an appropriate management and development plan. This would entail the following:

1. Background

The purpose of the project, as stated in the request for proposals, is inter alia to formulate a plan that articulates a vision of how to bring about sustainable development in the study area. Since the sustainability of development is of utmost importance, the necessary institutional capacity to drive and to ensure the implementation of a development and management plan forms an important element. Therefore, the proposed methodology is aimed at providing practical strategic guidelines in support of implementation.

2. Environmental profile

- Geology

It is known that the Vredefort Dome is a unique geological structure. Due to this enigmatic geological event a very interesting environment, sustaining distinctive biological habitats, came about. The group of geologists in this project team (proff. Bisschoff and Waanders, and drs. Brink and Coetzee) has been doing extensive research in die Vredefort Dome for the past. The geological map of the Vredefort Dome was mainly revised and mapped by prof Bisschoff; while the personnel of the Geology Department at the Potchefstroom University for CHE was also involved in the revision. Future research anticipated by this team of researchers include impact cratering, the impact structure itself, micro- and mega-scopic results of the meteorite impact, and the geological history of the area before the impact event.

➤ Animal biodiversity

The research on the biodiversity assessment of animal composition of the Vredefort Dome should be conducted in such a manner that it will also have sufficient applications to eco-tourism and environmental impact assessments. The unique geology of the Vredefort Dome, together with the river that flows through it, creates a superb variety of habitats that provides conditions for a diverse animal composition.

The team leader on animal diversity in the Vredefort Dome is prof. Henk Bouwman, who currently also supervises two studies on water birds in the Vredefort Dome. The rest of this team include experts on frogs (prof du Preez), insects (mr Terblanche), birds (dr Vosloo), mammals (mr Kotze & mr Legoete).

➤ Botany

Since 1985 Dr. Sarel Cilliers and his colleagues (PU) have done extensive research projects in the Vredefort Dome, and built up a significant collection of various plant specimens (housed in the A.P. Goossens Herbarium of the Potchefstroom University). These researchers have also identified tree species that were not included in any previous studies. With regard to a management plan such as proposed, it is not enough to only consider the rare and threatened plant species of an area, the unique and vulnerable plant communities are also important. Although a lot of information on the vegetation of the Dome has been published and can be included in an environmental impact study, there are certain other issues that should be addressed as well. This could include more field studies and the compilation of information from different sources, e.g.

1. Large areas of the Dome were not included in previous phytosociological studies, for example the ravines in the North West Province.
2. A complete floral checklist of the Dome does not exist, but can be compiled from a number of existing sources (for example the A.P. Goossens Herbarium of the PU for CHE), lists and some additional

field studies. Floral checklists are regarded as useful tools in the evaluation of areas for conservation purposes and do exist for all the National Parks in our country.

3. A vegetation map indicating the variety and extent of plant communities does not exist for the Vredefort Dome. Such a vegetation map should be constructed and could be used in the management of the area, because vegetation types in natural areas are regarded as good management units.

➤ Spatial analysis

An analysis of the existing land use and level of infrastructure development in the study area will be performed by a group of experts headed by Dr E Drewes and Mr T de Jager. Existing land use management issues and levels of service will be identified in terms of roads, electricity and water supply, sewerage, and communication infrastructure. This will be integrated with the natural environmental issues analysed during this phase, to compile a geographical information system for the Vredefort Dome. The sensible integration of the natural environment with existing and future spatial development will lay the foundation for the future development of the study area in a sustainable manner.

3. **Socio-Economic Profile**

➤ Tourism

The Institute for Tourism and Leisure Studies (PU) has done a pilot study in 1999 to determine the tourism potential of the Vredefort Dome as a tourist attraction. The pilot study included the views of various land-owners and their vision of future tourism developments.

This information will be used as a point of departure for developing a management plan. The institute will be able to do a market analysis and identify travel patterns and gaps. This will give way to tourism marketing and development requirements as well as funding requirements.

From the information above SMME projects can also be identified since the institute has been involved in numerous SMME projects. We will also be able to evaluate the World Heritage Site application requirements in order to draft a proposal.

➤ Economic assessment

The team (headed by prof Wim Naude) will focus on the economic development aspects and socio-economic impacts of the development of the Vredefort Dome. He has been part of the oversight committee that is currently finishing the economic development and industrialisation plan of the province and is Chairperson of the Potchefstroom Economic Advisory Council. From this perspective his participation will ensure that the management plan will take into consideration the economic development needs of the region

and province, and that it is developed to achieve synergies with the provincial and local economic development strategies.

4. Institutional assessment

➤ Existing administrative management

The ability of people to affect the things that matter in their lives is largely dependent on representative institutional structures that facilitate participation and decision-making. The team, headed by mr. Mojaki Phutiagae (expert in public administration and community participation, Dept. Public Management, PU) will develop participation and liaison plans in order to identify the existing:

- interested and affected parties
- inclusion of existing institutional structures
- level of interaction
- level of decision-making
- responsibility sharing
- areas and issues of involvement
- legal issues w.r.t. land ownership and servitudes

➤ Spatial Planning and Land use management (Zoning)

Existing land-use patterns for the Vredefort Dome area will be analysed with regard to the following:

- Land-use type and intensity
- Direction of growth
- Major movement routes

This section will be completed by Dr. Ernst Drewes (Town and Regional Planning, PU) and Maxim Planning Solutions. A substantial part of the information needed during this project is spatially related, and the aforementioned town and regional planning firm has a significant GIS databasis with regard to geographical and infrastructural data in the study area.

Phase Two: Public consultation process

The project team will embark on a public participation programme after completing the first phase of the project. The data that has been assembled during the first phase will be reported in a manner that will be:

- transparent
- consultative
- co-ordinated
- accountable

This will be an ongoing process in the project cycle, and serve as continuous input with regard to the drafting of a Management and Development Plan for the Vredefort Dome.

Phase Three: Compilation: Vredefort Spatial Development Plan and Management Strategy

Based on the information gathered in the first phase, and the input from interested and affected parties in the previous phase, a development perspective will be formulated, taking into consideration relevant policies, guidelines and legislation. The compilation of the proposed development and management plan will highlight, amongst others, the following components:

- Land use management system (Zoning Plan)
- Spatial Development Framework
- Administrative management
- World Heritage application proposals
- Existing spatial development frameworks
- Private sector opportunities
- Infrastructural requirements
- Funding requirements for proposed development

The drafting of a development and management plan for the study area will also include guidelines with regard to the implementation, monitoring and auditing of the plan. This will be integrated with the implementation strategies required in terms of other legislation (e.g. Development Facilitation Act and Environmental Conservation Act). Where appropriate, the implementation strategy may include:

- mechanisms for implementation and management (e.g. legislation, institutional arrangements, strategic plans, local plans, environmental management systems and environmental assessment);
- roles and responsibilities for various levels of government and other non-governmental organisations;
- financial and human resource requirements; and
- phasing and time frames for implementation; and a communication strategy.

Also, the various environmental impacts of the different development proposals for the Vredefort Dome area should be evaluated in terms of their compliance to relevant EIA Regulations. It is evident that almost any development proposal within such a unique environment could have an environmental impact and thus is subject to these Regulations. The different impacts of development proposals must subsequently be identified, and the management plan formulated to manage the various impacts on the environment to ensure sustainable utilisation of the area.

It should be stressed that the environmental impact assessment would be done on a strategic planning level as part of the Vredefort Dome management plan to ensure that once project level implementation takes place, the required EIA Process is streamlined for each project. This will ensure that proposed developments are evaluated in terms of their strategic significance before project planning commences to save time and resources. Ultimately the EIA Process will ensure that the unique assets and resources of the area are optimally utilised within a sustainable development framework.

Last, resources should be monitored to proactively identify any threat of non-sustainable use and allow for measures to restore sustainability. A programme for the monitoring of the plan is, therefore, also required. The information obtained from the monitoring should be fed back into the baseline information¹, in order to promote continual improvement.

¹ See also SEA Guideline document, Dept of Environmental Affairs and Tourism, 2000

SECTION B

B.1 Financial Response

It is envisaged that the project will take five months, about four months for phases one and two, and another six weeks for phase three. The commencement of phase two will be subject to final approval of the baseline document prepared during phase one.

A consultancy rate of R350 per hour will be applicable. Travel and subsistence will be at standard rates, that is R2,12/km and subsistence of R250-00 per day or by invoice if higher.

ITEM		COST
Phase 1: Baseline Study (Duration 11 weeks)		
Aerial photos		R70 000
S&T		R35 000
Consultancy time	850 h @ R350/h	R297 500
Phase 2: Public consultation (Duration 4 weeks)		
Workshops	300 h @ R350/h	R105 000
Phase 3: Plan formulation (Duration 6 weeks)		
Photography	GIS Database	R350 000
S&T		R450 000
Consultancy time	550 h @ R350/h	R22 000
Printing		R192 500
TOTAL		R1 537 000

(All budgetary items exclude VAT)

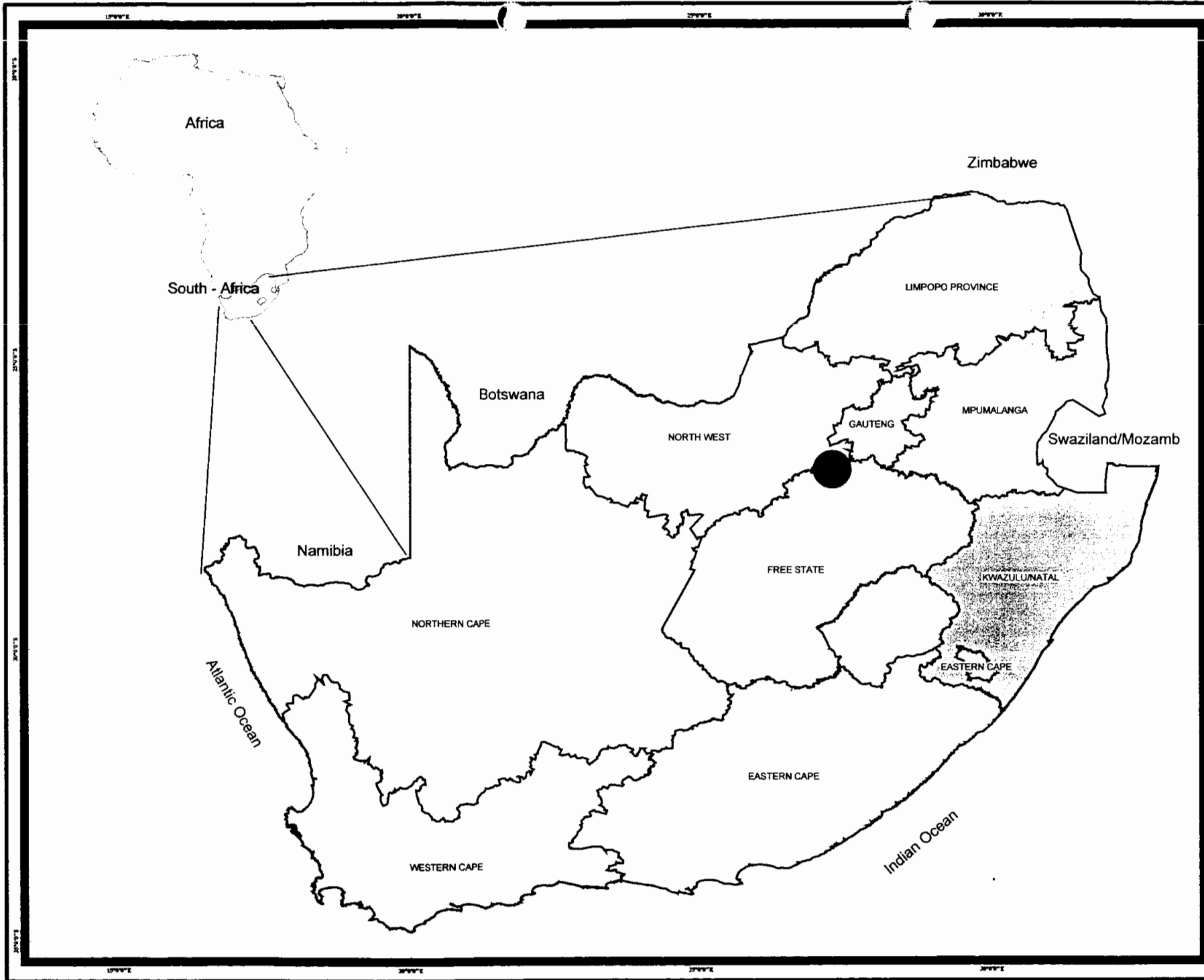
Assumptions:

- Project will be completed in a period of six months from date of formal appointment.
- Where possible, information and relevant documents will be supplied by the government.
- Existing base-data available at MPS and the university will be available free of charge.
- Direct expenses (S&T, printing etc.) can be claimed on a monthly basis.
- The balance of payment will be effected in three tranches, at the completion and acceptance of each phase.

B.2 Project Management

If this proposal is successful, a detailed management plan will be prepared in consultation with, and subject to the approval of the Local and Provincial Government. From the project team's side the following will apply:

- Overall responsibility for the project will reside with Mr S Roopa, the Executive Mayor of Potchefstroom.
- Prof. G.J. du Toit in his capacity as Director of the Focus Area for Environmental Science and Management will assume administrative responsibility at the University.
- It will be the Focus Area's task to ensure the mobilisation, horizontal integration and management of experts from various faculties to achieve the necessary required multi-and inter-disciplinary approach.
- The project management, financial management and administration will be the responsibility of Maxim Planning Solutions and the said Focus Area's Financial Official, subject to the University's normal accounting practices and external audits.



PROPOSED WORLD HERITAGE SITE

VREDEFORT DOME

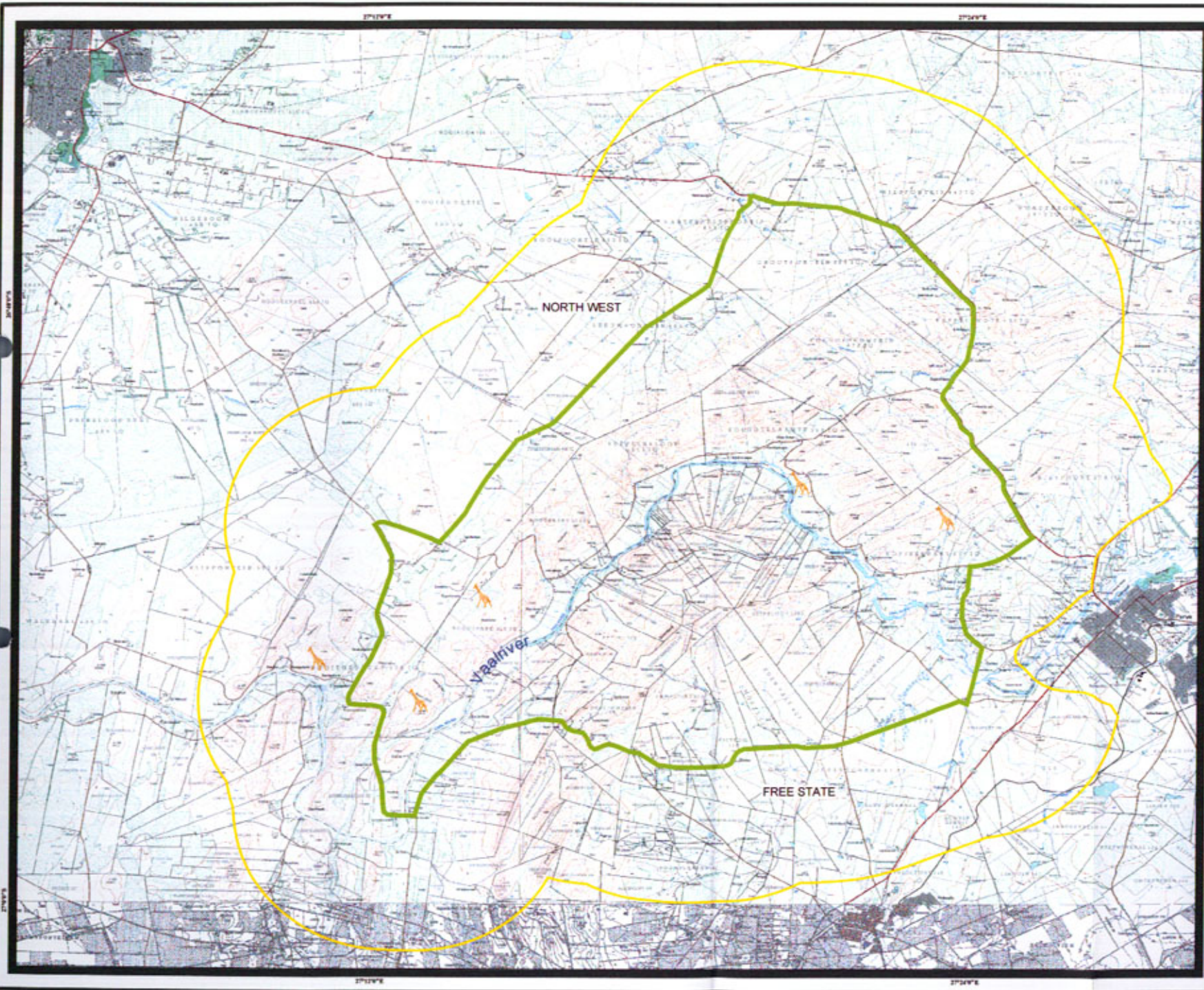
**Map 1
Locality Map**

September 2003

Legend

● Vredefort Dome








PROPOSED WORLD HERITAGE SITE
VREDEFORT DOME

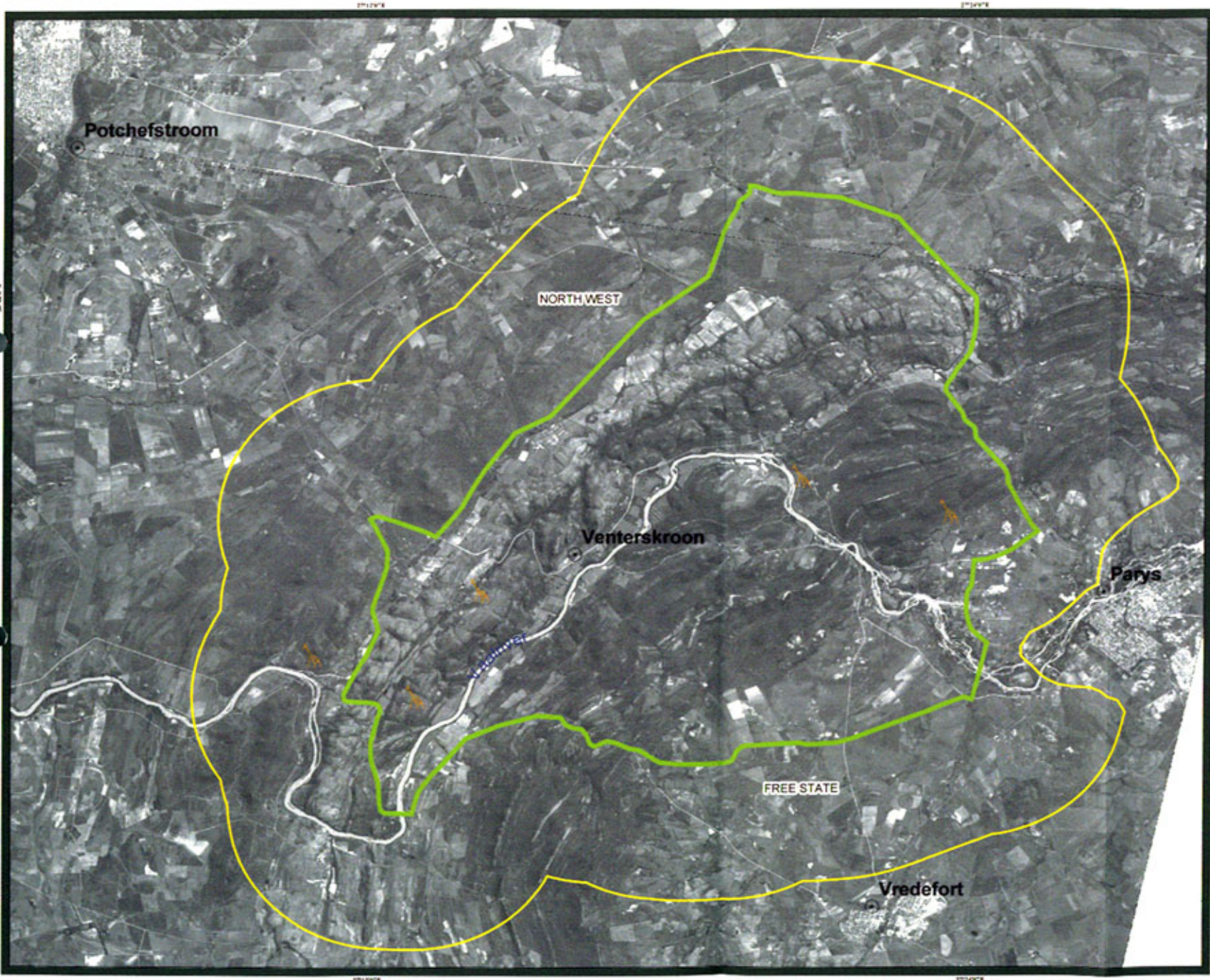
Map 3
The Proposed Area

September 2003

Legend

-  Game farms & Lodges
-  Proposed WHS
-  5 Km Buffer around WHS





PROPOSED WORLD HERITAGE SITE
VREDEFORT DOME

Map 2
The Proposed Area

September 2003

- Legend**
- Towns
 - Game farms & Lodges
 - Proposed WHS
 - 5 Km Buffer around WHS



THE GEOLOGY OF THE IMPACT STRUCTURE AROUND
VREDEFORT

A GEOTECHNICAL DESCRIPTION

COMPILED BY:
DEPARTMENT OF TOURISM, ENVIRONMENTAL
AND ECONOMIC AFFAIRS – FREE STATE
PRIVATE BAG X 20801
BLOEMFONTEIN 9200
SOUTH AFRICA

M.C. BRINK, A.A. BISSCHOFF, F.B. WAANDERS
AND A.E. SCHOCH
P.O. BOX 6308
BAILLIE PARK 2526
SOUTH AFRICA

22 NOVEMBER 2004

**THE GEOLOGY OF THE IMPACT STRUCTURE AROUND VREDEFORT
TECNICAL DESCRIPTION**

CONTENTS

Abstract	1
1. Geology, morphology and evolution of the impact structure	1
1.1. General description and terminology	4
1.2. Evolution of the structure, immediately after impact	6
1.2.1. The pre-impact environment	6
1.2.2. The "far-out" faults	11
Pseudotachylite generated on friction planes	11
Shand's pseudotachylite	12
The Johannesburg Dome	12
1.2.3. The Wuma Faults	15
1.2.4. The Rand Anticline	18
1.2.5. The Potchefstroom Synclinorium – an annular syncline that circles the Dome	18
1.2.6. Thrust faults associated with the distal upcline of the synclinorium – the Foch Fault ramp and fault stack	24
1.2.7. The Blaauwbank Anticline	26
1.2.8. The Spitskop Syncline	26
1.2.9. The Potchefstroom-Master Bedding Plane Fault	31
1.2.10. The Ensels Fault	31
The Ensels Fault sole and the Ensels Allochthon	32
Vibroseis section Gencor V-01-87 and Coward's interpretation	32
Metamorphism that affected the Witwatersrand Supergroup	34
The relationship between the hornfels and the alkali granite plutons	34
The Schurwedraai Alkali Granite Complex and the overlying fault	35
The Trans-Wits Vibroseis line	37
A restoration of the crater zone	38
The granitoid hub	41
1.2.11. Conclusions	44
2. Representative features that identify the structure to be an astrobleme	45
2.1. General description of the "Classical Suite" of impactites	45
2.1.1. Introduction	45
2.1.2. Planar deformation features	45
2.1.3. Coesite and stishovite	47
2.1.4. Shatter cones	48
2.1.5. Pseudotachylite	49
2.1.6. Pseudotachylite, related to the ramps of thrust faulting, in the Vredefort Event context	51
2.1.7. Representative features, found within the proposed World Heritage Site	52
2.1.8. Representative features, found outside, but adjacent to, the proposed World Heritage Site	53
3. A comparison: the World's complex impact structures	55
4. Landowner and community support	55
5. Management	55
6. Landscape conservation	56
7. Geological site conservation and access	57
8. Presentation	57
Bibliography	59

THE GEOLOGY OF THE IMPACT STRUCTURE AROUND VREDEFORT: STAGES OF CREATION

ABSTRACT

About 2 000 Ma ago, a large body from outer space collided with the earth near the present town of Vredefort. The collision released the energy equivalent of an asteroid of about 12 km in diameter, moving at 20 kilometres/second relative to the earth's surface. With a measured radius of about 190 km, the resulting crustal blemish is the largest so far found on earth

Theory (Gault et al., 1968; Grieve and Head, 1981; Melosh, 1989) states that, in response to a massive shock wave, a crater (the "transient crater" Melosh, 1989) will be excavated around and below impact sites. At Vredefort, there is sufficient evidence of shock effects to infer a very large energy release episode, but what long eluded geologists was evidence of the shape and size of any excavated crater. A second question concerned the evolution of the astrobleme, beyond and below the crater zone. Extensive mapping and the decyphering of the stratal relationships provided answers. As requested, the purpose of the report is devoted to the evolution of the structure. Because there is clear evidence that, while crater excavation was in progress, the development of the outer sector took place from the distal areas to the proximal. In summary, the several recognisable stages are the following:

1. The pre-impact, shallow crust consisted mainly of near-horizontally bedded strata, containing several unconformities of regional extent. The Black Reef Formation at the base of the Transvaal Supergroup was deposited upon the shallowest of these. The formation consists of conglomerate and quartzite beds, overlain by a bed of carbonaceous shale. This bed formed a preferential surface for the propagation of fault movement. Shortly before impact, a body of igneous rocks related to the Bushveld Complex was emplaced towards the northwest of the future impact site. The heat derived from this intrusive formed a hornfels aureole in the adjacent beds of the Witwatersrand Supergroup.
2. Contact and the generation of a massive (compressional) shock wave occurred, followed by stress release. Simplistically, the effect of release or "release waves" was to "explode" the shock-compressed crust around and below the impact site and to excavate a transient crater..
3. A compressional stress field was created, immediately after the impactor came into contact. Stress was directed away from the impact point, but its influence was felt mainly by the rocks surrounding the crater zone. It caused the centrifugal acceleration of crustal material into areas far removed from the crater.
4. The first structural response was for detachment to occur within the relatively shallow Black Reef Formation. Great crustal plates were subsequently accelerated over the detachment surface, away from the centre. These are now recognisable as distally situated "lobate nappes" and the proximal limb of the detachment surface can be recognised as a zone with large amounts of fault-frictionally derived pseudotachylite, accompanied by chocolate tablet-type boudinage in chert beds thicker than one metre, that once formed the floor ramps of the thrust. Boudinage occurred in zones, where the fault is associated with chert beds of the Malmani Subgroup, consisting of dolomite and chert.
5. A crustal dent, up to 40 km deep and 140 km wide, was formed around the impact point. The rim of the dent now forms the Rand Anticline, that follows a great circle around the centre

of the astrobleme (Figure 1). Thrust faulted nappes, driven away from the impact point, moved up the sides of the ramp to form an imbricate stack, called the Foch Thrust Stack. The sole fault of this system, called the Foch Thrust, came to surface to form a bow-shaped outcrop. It was displaced, still within the Vredefort evolutionary system, by at least the Potchefstroom-Master Bedding Plane Fault (PMBF), a Vredefort age component of an older, centripetally displacing extensional fault. The Foch Thrust outcrop parallels the outline of the distal limb of the Potchefstroom Synclinorium (Figure 1), which forms the great annular syncline around the hub of the structure. Within the greater synclinorium, various other structural effects were formed. Their sequence of formation can be deciphered from episodes of movement over the Blaauwbank Anticline, an old, linear feature with a north-south strike.

6. Around the point of impact, a crater was excavated to a depth of about 23 Km. Uplift of the floor of this crater, in the central part of the structure, completed the synclinal form of what is now the Potchefstroom Synclinorium.
7. There are only very few indications of the collapse and movement inversion of the centrifugally-directed stress field. Centripetal movement over the Potchefstroom-Master Bedding Plane Fault surface (Fletcher and Gay, 1972; Brink et al., 2000) could not be followed at depth on the basinward side of the gold field called the gold field the West Wits Line (De Kock, 1964). Apart from the PMBF, very little sliding down the outer slopes of the dent, outlined by the Rand Anticline, is evident. There is no indication that the transient crater was obliterated by sliding that originated from beyond the axis of the Potchefstroom synclinorium (Figure 1).
8. The transient crater is now recognisable only by an extensive allochthonous layer, formed on an apparent detachment surface called the Ensels Fault (Figure 1). The Ensels Fault once formed the floor of the original crater, i.e. the surface above which displacement and excavation took place. The allochthon consists of overturned beds from near the base of the displaced zone of the crater, and within the allochthonous beds, virtually all of the components of the "classical suite" of astrobleme effects can be found. However, erosion may have removed much of this evidence.
9. During the last recognisable stage, gravitationally induced movement, attributed to the removal of a mass of material from the crater, caused the further rising of the core. The previously overturned strata were intersected by faults to form what now appears to be sets of nappes, which formed over thrust faults. However, some of the faults may have originated as gravity slides. After extensive erosion, kept in check only by the upturned spines of quartzite, the nappes possess linguoid outlines, reminiscent of plates stacked in a dishwasher.
10. No indication of any form of transitional crater collapse is seen. The only modification to its original shape was uplift and no crater is visible anymore. Initial uplift may have been rebound-induced, possibly as an effect of very sudden stress release. However, in the granulites situated at the centre of the structure, only very little pseudotachylite, indicative of stress release, is found. The central region is underlain by a gravity high, that may be caused by a mantle dome and raising of this dome may have taken place under the influence of isostasy, a result of the removal of the contents of the transient crater. Rocks presently found near the centre of the structure reflect P.T. conditions found 30 km below surface, indicating that rebound-related rising of the centre did take place, to be subsequently kept in check and flattened by erosion.
11. The impact occurred at approximately 2 000 Ma ago. The Dwyka period of glaciation and subsequent deposition occurred at about 350 million years ago. The two periods were

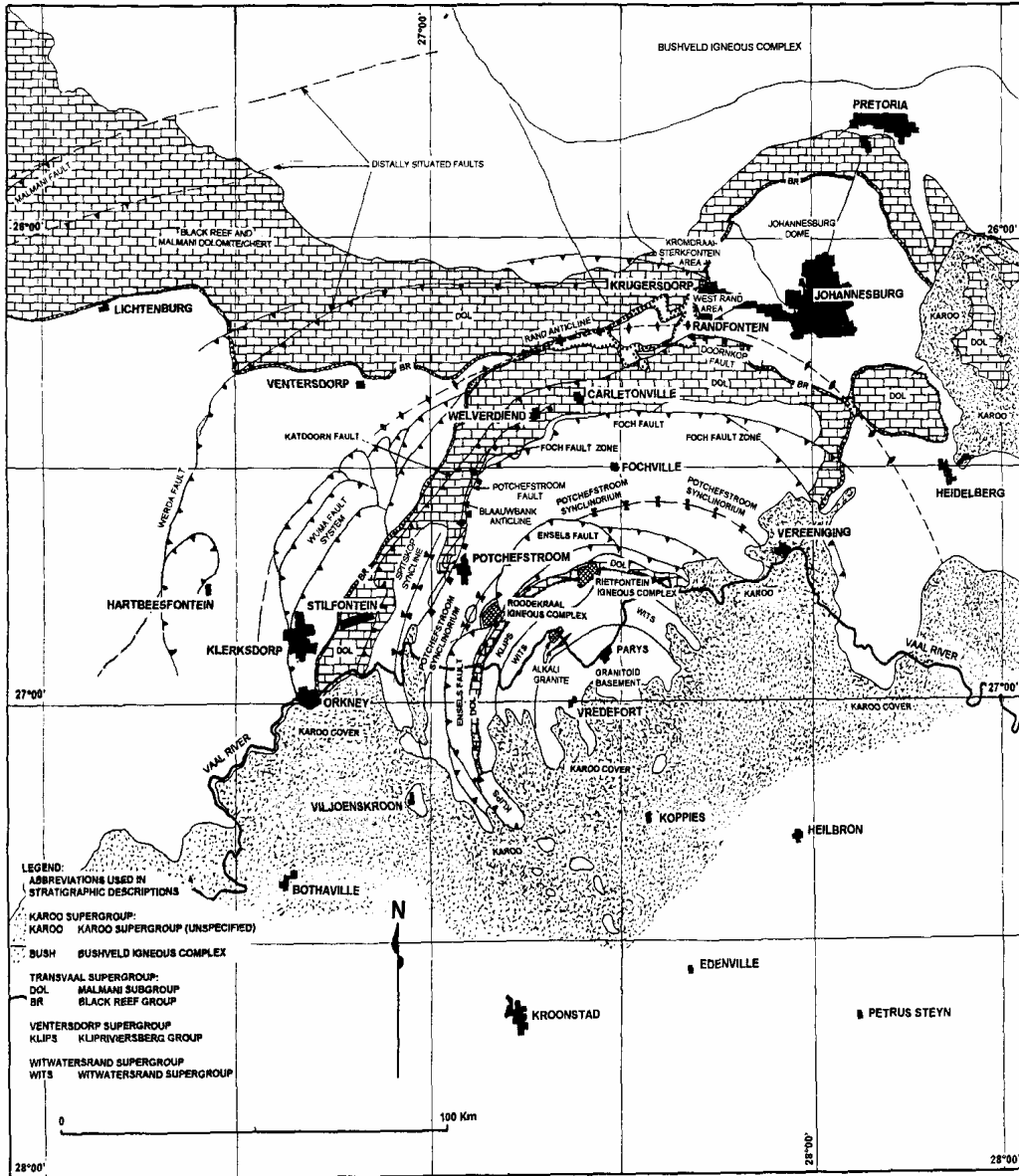


FIGURE 1. THE NORTHERN HALF OF THE VREDEFORT ASTROBLEME, EMERGING FROM BELOW THE KAROO SUPERGROUP.

separated by a time span 1650 million years, during which erosion occurred to produce the present-day structure.

INTRODUCTION

The Vredefort Structure (South Africa) is the oldest (Trieloff et al., 1994: 2006 ± 17 Ma; Kamo et al., 1996: 2023 ± 4 Ma, U-Pb single zircon) and largest known (radius about 190 Km, this report; Figures 1 and 2) ring structure of impact origin found on earth.

Historically, those geologists who had opinions on the origin of the ring structure were divided into two groups, the endogeneticists and the exogeneticists. Even now, there are many who cannot accept that there is no evidence whatsoever for a source of endogenetic energy large enough to have caused the intense disruption currently visible around Vredefort. The reasons are mainly philosophical.

The sheer amount of energy released during the explosive event is much larger than that known from any conceivable magmatic system. French (1998) reported that an object of only a few metres across will carry the kinetic energy of an atomic bomb, and its impact will devastate a city. The impact of an object of a few kilometres in diameter will release more energy in a few seconds, than the whole earth releases through volcanism, earthquakes, tectonic processes and heat flow in hundreds or thousands of years. A 200 km diameter astrobleme (half as large as the one now recognised at Vredefort) forms within less than 10 minutes after impact, although subsequent adjustments of the geology, mostly gravity-driven, may continue for many more years. An impact that was large enough to form the Vredefort structure, must have been accompanied by catastrophic environmental effects on a global scale. Such impacts could have been the causes of widespread extinctions.

French (1998) provided the table given in Figure 3, from which it is clear that the amount of energy released at Vredefort is much too large to be associated with any earth process. Furthermore, there are no indications of any (super Mount Saint Helens or any other) volcanicity of a suitable size in the rock record around Vredefort. Sills of two ages are intrusive into the rocks of the West Rand Group. The oldest of these is composed of epidiorite, and is of Ventersdorp age. The second generation, comprising a tholeiitic suite, is recognised by intrusives of a dioritic and alkaline composition. These are the only significant indications of magmatic activity of an age near-related to that of the astrobleme. However, the geographic placing of the intrusive bodies excludes any possible genetic relationship to the creation of the structure. They display no genetic relationship to the larger characteristics of the astrobleme, such as the annular syncline and the far-out nappes. No known tectonic process has ever made a pimple-like ring structure of this magnitude.

1. GEOLOGY, MORPHOLOGY AND EVOLUTION OF THE IMPACT STRUCTURE

1.1. GENERAL DESCRIPTION AND TERMINOLOGY

The proximal, circular, core-and-ring zone (Figures 1 and 2) was the first indication of the existence of a strange, circular, structural phenomenon. The granitic hub and encircling collar were first systematically described by Molengraaff (1891). In 1925, Molengraaff, joined by Hall, referred to this zone as the "dome" of Vredefort. Hall and Molengraaff (1925) were the first geologists who noticed the resemblance of the inner structure, in shape and cause, to the craters of the moon, writing (1925, p 160) that: "anyone occupying a suitable point within the central granite...and studying the regular amphitheatre determining his horizon cannot fail to realise the striking aspects of the... fundamentals...stated above. The grand simplicity of the design at once suggests a corresponding broad simplicity in the major cause: Almost inevitably one is reminded of the ring-like features displayed by the craters of the moon..." Eleven years later, Boon and Albritton (1936) adopted their idea.

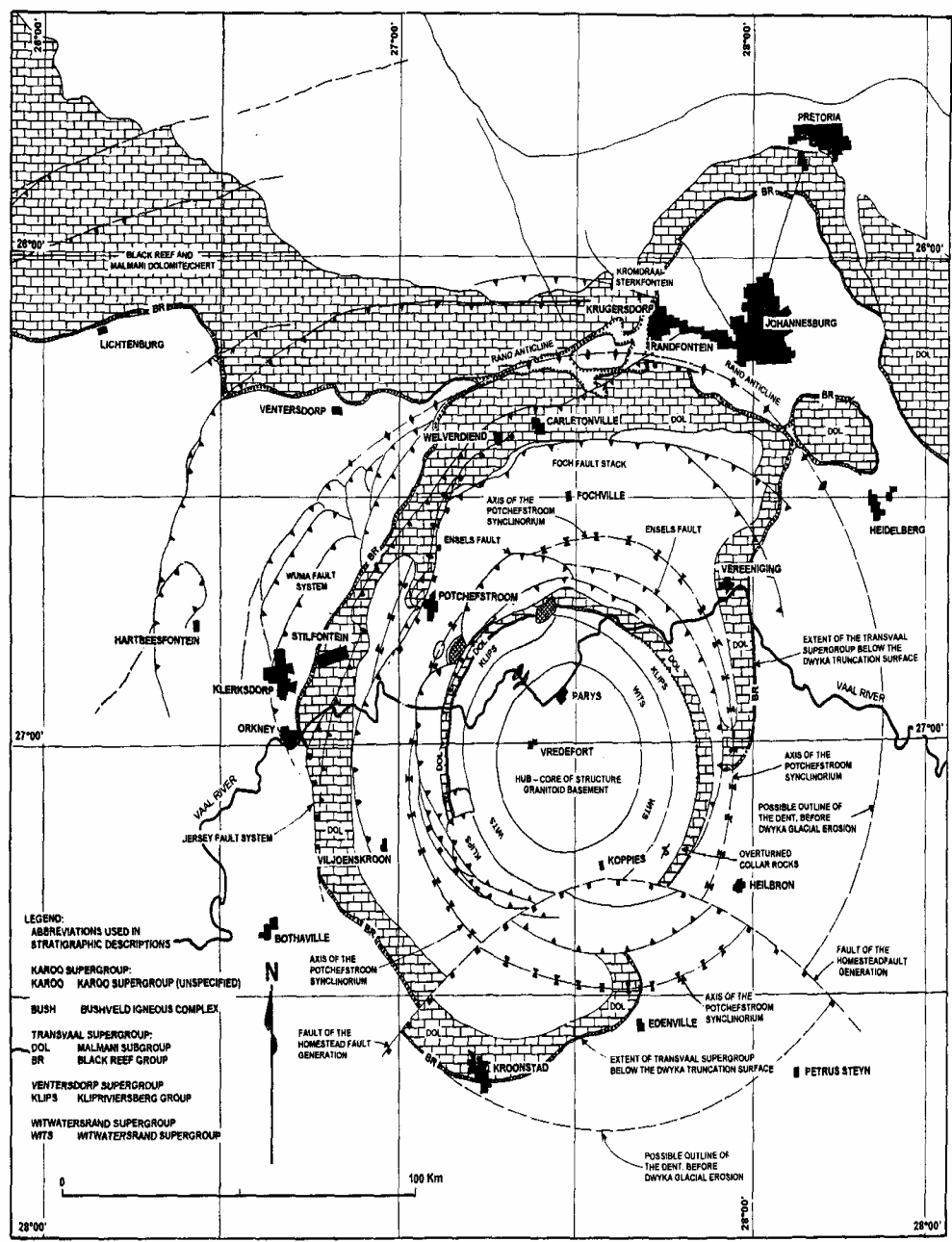


FIGURE 2. THE EXPOSED VREDEFORT ASTROBLEME. THE SOUTHERN HALF IS KNOWN FROM NUMEROUS GOLD EXPLORATION BOREHOLES, VISBOEIS SECTIONS AND MINING TUNNELS, EMPLACED IN THE SEARCH FOR THE AURIFEROUS BEDS OF THE CENTRAL RAND GROUP OF THE WITWATERSRAND.

The potentially auriferous beds of the Central Rand Group of the collar were discovered during the 1880's. The prospecting for gold in the Free State and Transvaal areas, that adjoin the structure, reached a climax in the late 1980's. For many years, the culmination of this investigative work was to be in the mapping of L.T. Nel (1927). One of the most outstanding aspects of the structure brought out, even by the early workers, was that virtually the full stratigraphic succession was preserved, despite even as severe a structural complication as the overturning of the collar beds. Hall and Molengraaff (1925) also found that there were more repetitions than gaps in the Witwatersrand stratigraphy, leading them to point out the constrictive nature of the collar structure.

Many gold exploration boreholes were drilled and vibroseis sections were obtained in the areas underlain by the auriferous Central Rand Group (Figure 4). Presently, large amounts of data are held by various mining companies. Provided that the researcher knows what specifically to ask for, this source of knowledge can be made available.

The term "allochthon" will be used to describe the beds overlying a detachment surface called the Ensels fault sole, a wide, ring-shaped feature of the central structure. The beds displaced over this surface are now recognised to be the ones that display the "classical," impact-related effects, including overturning and the so-called "shock effects," including lamellae in quartz ("PDF's"), and "shatter cones" (rocks exhibiting curved, striated joint surfaces). The term "allochthon" is thus used to indicate a mass of rock, formed away from its present site, with "foreign' or "exotic" characteristics, and introduced over a low angle fault that now exhibits the characteristics of a thrust fault.

1.2. EVOLUTION OF THE STRUCTURE, IMMEDIATELY AFTER IMPACT

1.2.1. THE PRE-IMPACT ENVIRONMENT

At the time of impact, the crystalline middle crust of the earth was covered by more or less horizontally bedded rock sequences (Figures 5 and 6). The sequence consists of a basal layer of lava (Dominion Group); sediments (quartzites and shales, the Witwatersrand Supergroup); more lavas (the Ventersdorp Supergroup); chemical sediments (dolomite); clastic sediments (quartzites and shales), lava (Hekpoort Andesite) with more sediments, locally culminating in the overlying Magaliesberg Quartzite beds.

Some of these sequences contain incompetent layers, such as the black shale beds that form the upper section of the Black Reef Formation, near the base of the Transvaal Supergroup. At the time of impact, the Black Reef lay on a relatively flat, undisturbed plane of unconformity, mostly formed upon lavas of the Ventersdorp Supergroup. This Formation consists of a basal conglomerate and orthoquartzite sequence, overlain by a black, carbonaceous, graphitic shale. The shale is incompetent, and being horizontally bedded, it formed a preferential detachment zone. The formation also forms one of the best vibroseis reflectors in the whole of the stratigraphic pile of the area. Because it was deposited on a reasonably flat truncation surface, it also constitutes a fortuitously placed reference bed for later structural movement. In the dolomite and chert rocks that overlie the Malmani Subgroup (Figure 6), the life form of that time is represented by the layered, domed structures named stromatolites, once the habitats of prokaryotic algal colonies. A stromatolite site of great significance, with well preserved, museum grade stromatolites of up to a metre in size are found on Rooipoortje 453.

The Bushveld Igneous Complex was intruded into this stratigraphic sequence, shortly before impact occurred, at about 2060 – 2040 Ma ago (Walraven et al., 1990). There are indications of remnant heat in the renewed growth of new and fragmented garnet crystals that were taken up in impact-generated pseudotachylite, after the impact occurred. This subject is not relevant to a discussion of the structure and it will be described in detail in a paper by Bisschoff et al., now (2004) in preparation.

TABLE 2.1. Terrestrial meteorite impact craters: Crater sizes, projectile sizes, frequencies, and comparable terrestrial events.

Crater Diameter	Approximate Projectile Diameter	Energy (J)	Energy (TNT Equivalent)	Impact Frequency (No. per m.y., Whole Earth)	Mean Impact Interval (T_{mean} , Whole Earth)	Comparable Terrestrial Event
35 m	2 m	$2.1 E + 12$	500 tons	250,000	4 yr	Minimum damaging earthquake (M = 5) Largest chemical explosion experiment ("Snowball", Canada, 1964)
75 m	4 m	$1.9 E + 13$	4,500 tons	69,000	15 yr	Largest chemical explosion (Helmholtz Fortifications, 1947)
120 m	6 m	$8.3 E + 13$	20,000 tons	28,000	35 yr	Atomic bomb explosion (Hiroshima, Japan, 1945)
450 m	23 m	$4.2 E + 15$	1 MT	2,700	370 yr	"Typical" hydrogen-bomb explosion (1 MT)
1 km	50 m	$4.6 E + 16$	11 MT	640	1,600 yr	Wolfe Creek, Australia (D = 0.875 km) Pretoria Salt Pan, South Africa (D = 1.13 km)
1.1 km	55 m	$6.2 E + 16$	15 MT	540	1,900 yr	Barringer Meteor Crater, Arizona (D = 1.2 km) Tunguska explosion, Siberia, Russia (1908) Mt. St. Helens, Washington (1981) (blast only)
1.8 km	90 m	$2.5 E + 17$	60 MT	230	4,400 yr	San Francisco earthquake (1906) (M = 8.4) Largest hydrogen-bomb detonation (68 MT)
3.1 km	155 m	$1.3 E + 18$	310 MT	83	12,000 yr	Mt. St. Helens, Washington eruption (1981) (total energy, including thermal)
5 km	250 m	$5.7 E + 18$	1,400 MT	35	28,500 yr	Gardnos, Norway (D = 5.0 km) Goat Paddock, Australia (D = 5.1 km)
6.9 km	350 m	$1.5 E + 19$	3,600 MT	20	51,000 yr	Largest recorded earthquake (Chile, 1960; M = 9.6)
7.2 km	360 m	$1.7 E + 19$	3,700 MT	18	55,000 yr	Krakatoa volcano eruption (Indonesia, 1883) (Total energy, including thermal)
10 km	500 m	$4.6 E + 19$	11,000 MT	10	100,000 yr	Lake Mien, Sweden (D = 9 km) Bosumtwi, Ghana (D = 10.5 km) Oasis, Libya (D = 11.5 km)
12.2 km	610 m	$8.4 E + 19$	20,000 MT	7.1	142,000 yr	Tambora volcano eruption (Indonesia, 1815) (Total energy, including thermal)
20 km	1 km	$3.7 E + 20$	87,000 MT	2.9	350,000 yr	Houghton Dome, Canada (D = 20.5 km) Rochechouart, France (D = 23 km) Ries Crater, Germany (D = 24 km)
31 km	1.5 km	$1.3 E + 21$	310,000 MT	1.4	720,000 yr	Total annual energy release from Earth (Heat flow, seismic, volcanic)
50 km	2.5 km	$5.8 E + 21$	$1.3 E + 6$ MT	0.22	4.5 m.y.	Montagnais, Canada (D = 45 km) Charlevoix, Canada (D = 54 km) Sifjan, Sweden (D = 55 km)
100 km	5 km	$4.6 E + 22$	$1.1 E + 7$ MT	0.04	26 m.y.	Manicouagan, Canada (D = 100 km) Popigai, Russia (D = 100 km)
200 km	10 km	$3.7 E + 23$	$8.7 E + 7$ MT	0.007	150 m.y.	Largest known terrestrial impact structures (original diameters 200-300 km) Sudbury, Canada; Vredefort, South Africa; Chicxulub, Mexico

Atmospheric effects on small projectiles neglected. (In real impacts, projectiles <50 m are probably destroyed in the atmosphere.)

Frequency distributions from *Grieve and Shoemaker (1994)* and *Neukum and Ivanov (1994)*.

Spherical projectile: $V = 4/3(\pi)r^3$.

Projectile density = 3500 kg/m³ (stony meteorite).

Impact velocity = 20 km/s vertical impact.

Crater diameter/projectile diameter is constant, = 20 for all crater sizes.

Crater-forming energy = projectile kinetic energy = $1/2 mv^2$.

J = joules, m.y. = million years, M = Richter magnitude, E = exponential notation ($E + 6 = 1$ million, etc.), MT = megatons.

Impact structures shown in boldface type.

FIGURE 3.
TERRESTRIAL METEORITE IMPACT STRUCTURES.
CRATER SIZES, PROJECTILE SIZES AND HIGH ENERGY TERRESTRIAL EVENTS ARE COMPARED (FROM FRENCH, 1998).

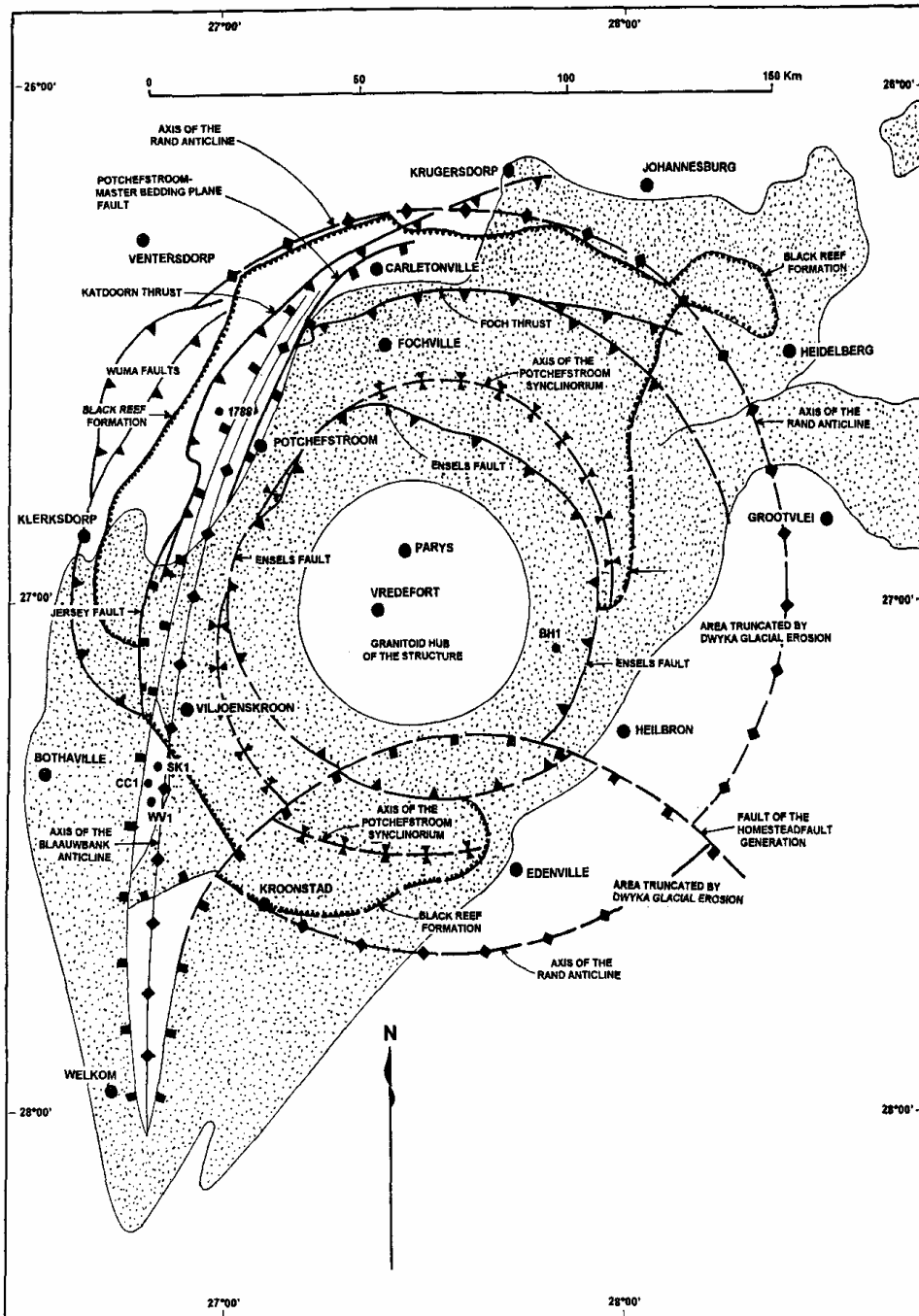


FIGURE 4.
THE EXTENT OF THE CENTRAL RAND GROUP, WITH THE VREDEFORT ASTROBLEME SUPER-
IMPOSED ON IT. THE SHAPE OF THE CENTRAL RAND GROUP WAS DERIVED FROM NUMEROUS
BOREHOLES, DISCUSSED IN THE TEXT.

KAROO SUPERGROUP		ECCA GROUP DWYKA GROUP	SHALES, SANDSTONES GLACIAL DEPOSITS		345 Ma			
INTRUSION OF THE BUSHVELD COMPLEX (2040 Ma), FOLLOWED BY THE IMPACT EPISODE (2000 Ma)								
					2090 Ma			
		MALMANI SUBGROUP BLACK REEF GROUP	DOLOMITE/CHERT SHALES, CONGLOMERATE					
VENTERSDORP SUPERGROUP		KLIPRIEVSBERG SUBGROUP	VOLCANIC ROCKS		2820 Ma			
			FAULT					
WITWATERSRAND SUPERGROUP (NORTHWEST VREDEFORT COLLAR)		CENTRAL RAND GROUP	TUREFFONTEIN SUBGROUP	MONDEOR FORMATION	SCATTERED CONGLOMERATES ON PEDIMENT; 99% COVERED BY ALLUVIUM	6320m		
				ELSBERG FORMATION	FAULT ("BREAKER FAULT") PEBBLY QUARTZITE	6180m		
				KIMBERLEY FORMATION	QUARTZITES, WACKES, PEBBLY BEDS THIN, INTERMITTENT SHALE DENNY'S QUARTZITE AND REEF	5770m		
					CONGLOMERATES REEF CONGLOMERATES AND ORTHOQUARTZITE	5380m		
					MUDSTONE CLAYSTONE MUDSTONE			
		JOHANNESBURG SUBGROUP	BOOYSENS FORMATION	BOOY	2 CONGLOMERATES; ROUS' REEFS PEBBLY WACKE	4940m		
			KRUGERSDORP FMN LUIPAARDSVLEI FORMATION	VR LUI	ORTHQUARTZITE + LIVINGSTONE CONGLOMERATES	4730m		
			RANDFONTEIN FORMATION	SRG	ORTHQUARTZITE (+ SOUTH REEF)	4520m		
			MAIN FORMATION	MRL MRZ	QUARTZITE CONGLOMERATE ZONE UPWARD COARSENING SEQUENCE, PEBBLY IN PLACES	4260m		
			ROODEPOORT/MARAISBURG FORMATION	JEP	UPPER JEPPE QUARTZITE, ARKOSES AND SHALES			
		WEST RAND GROUP	GOVERNMENT SUBGROUP	CROWN FORMATION	CROWN	CROWN AMYGDALOIDAL LAVA	3800m	2740 Ma
				BABROSCO FORMATION		INNER BASIN REEF	3420m	
				RIETKUIL		VELDSCHOEN REEF AND ORTHOQUARTZITE	3090m	
				KOEDOESLAAGTE				
				ELANDSLAAGTE / PALMIETFONTEIN				
HOSPITAL HILL SUBGROUP	TUSSCHENIN FORMATION		QUARTZITE SHALE DIAMICTITE ("CORONATION REEF")	2370m				
	CORONATION FORMATION							
	PROMISE FORMATION		BONANZA (RED) REEF CONGLOMERATE UPPER PROMISE QUARTZITE	1650m 1430m				
	BRIXTON FORMATION		PRINCIPAL HOSPITAL HILL QUARTZITE	1025m				
	PARKTOWN FORMATION		BIF; CONTORTED BEDS	400m				
		ORANGE GROVE FMN	ORANGE GROVE QUARTZITE					
		DOMINION GROUP	DOM	LAVA				
		PARYS GRANITE	GRANITE	GRANITES, GNEISSES				
		INLANDSEE GNEISS		GRANITE/GNEISS WITH OLDER MEGA-INCLUSIONS	3560 Ma			

FIGURE 5. STRATIGRAPHY OF THE WITWATERSRAND SUPERGROUP, INDICATED BY THE MAIN QUARTZITE BEDS.

MARCO SUPERGROUP	ECCA GROUP	VOLKSRUST FORMATION	SHALE	
		VRYHEID FORMATION	CARBONACEOUS BEDS/SHALE	
		DWYKA	TILLITE/PEBBLY MUDSTONE	

UNCONFORMITY - EROSIONAL PERIOD OF 1650 Ma

TRANSVAAL SUPERGROUP	PRETORIA GROUP	MAGALIESBERG	MAG	WHITE TO YELLOWISH QUARTZITE	3320m	
		SILVERTON FORMATION	SIL	BLACK SHALE, CARBONACEOUS	3120m	
		DASPOORT	DAS	LIGHT YELLOWISH QUARTZITE, CHERT BED AT TOP	3000m	
		STRUBENKOP		YELLOWISH-WEATHERING SHALE, FERRUGINOUS NEAR BASE	2725m	
		HEKPOORT FORMATION	HEK	ANDESITE	2840m	
		BOSHOEK		GREENISH QUARTZITE, CONGLOMERATIC TOWARDS TOP	2000m	
		TIMEBALL HILL FORMATION	TBH	RED-WEATHERING FERRUGINOUS SHALE		
				QUARTZITE		
			TBH	FERRUGINOUS QUARTZITE		
		ROOIHOOGTE		SHALE	1415m	
			QUARTZITE, CHERT CONGLOMERATE AT BASE	1370m		
	CHUMIESPOORT GROUP	MALIMANI	ECCLES FORMATION		CHERT, OFTEN BRECCIATED (CHOCOLATE TABLET BOUDINAGE) NEAR TOP (MOSTLY DISTAL AREAS)	1000m
			LYTTELTON FORMATION	DOL	DOLOMITE	
			MONTE CHRISTO FORMATION		CHERT, OFTEN BRECCIATED BY CHOCOLATE TABLET BOUDINAGE (PROXIMAL AREAS)	
			OAK TREE FORMATION		DOLOMITE, CHERT BEDS TOWARDS MIDDLE	
			BLACK REEF		CONGLOMERATE, overlain by BLACK SHALE	0
	VENTERSDORP SUPERGROUP	PLATBERG GROUP	MAKWASSIE		QUARTZ-FELSPAR PORPHYRY	
			KAMEELDOORNS		MIXED-CLAST RUBBLE	
KLIPIRVIERSBERG			KLIPS	VOLCANIC ROCKS		

FIGURE 6. STRATIGRAPHIC COLUMN FOR THE TRANSVAAL SUPERGROUP. NOTE THAT THE VENTERSDORP SUPERGROUP (VOLCANICS) VARY IN THICKNESS FROM ZERO TO A MAXIMUM OF ABOUT 3.1 KM IN THE VREDEFORT COLLAR.

The "Bushveld Line" (a vague lineament along which the Great Dyke of Zimbabwe, the centre of the Bushveld Complex and the igneous complexes below the Karoo at Brandfort and Trompsburg in the Free State are found) has been invoked as evidence against an exogenetic origin ("why would your meteorite have struck the earth right on a prominent lineament?"). The Bushveld Igneous Complex is very much larger than the Vredefort Structure, but it is characterised by a complete lack of evidence indicating any sudden energy release.

As they do all over the Transvaal, Bushveld age intrusions do also occur in the Vredefort structure. However, even the most substantial of these is recognised, where it lies hidden below the present surface, more by its geophysical fingerprint than by the disruption it caused to the roof strata. The paper, in preparation, by Bisschoff et al., mentioned above and the present report will provide data to indicate the nature and size of this intrusive body, known from its outcrops at Roodekraal, Rietfontein and the Schurwedraai areas, which are situated within and around the proposed World Heritage Site. As inferred from mapping and geophysics, the intrusive body lies to the northwest of the central structure.

1.2.2. THE "FAR-OUT" FAULTS

At impact, detachment and delamination occurred, preferentially within the Black Reef shales. "Plates" of the Transvaal Supergroup were accelerated outward and deflected upward to surface in the distal areas, where the fault outcrops now delineate the "distal nappes" that can be seen in the northwestern areas of Figures 1 and 2.

The fault was first recognised by Fletcher and Reimold (1989), who called it the Black Reef Decollement Zone (BRDZ). It was probably seen, but not recorded, as a planar detachment surface of regional extent in numerous gold exploration boreholes that penetrated the Malmani Dolomites. Since it was recognised, it was found in borehole cores from the West Rand to Stilfontein.

Pseudotachylite generated by friction on fault planes

The expulsion of sheets of strata over the BRDZ, accompanied by ramping, formed the "far out" fault structures marked on Figures 1 and 2. At the outcrop, the faults that intersected the chert beds of the Malmani Subgroup are characterised by two types of fault rocks; both related to "pseudotachylite" in the present usage of the term.

The first of the two types was generated by fault surface friction. At some outcrop occurrences, of the Foch Fault west of Fochville (Figures 1 and 16), thick "smears" of frictionally generated pseudotachylite were formed where fault surfaces assumed a fluted morphology and some fragments of chocolate tablet-deformed chert were taken up in the smears.

The second type forms the matrix of a peculiar type of brecciation (Figure 7), the result of chocolate tablet boudinage (Wegman, 1932). Boudinage was caused by the sudden release of hydrostatic stress conditions, and the brecciation is now visible as "exploded" fragments, still spatially related. Where subsequent movement broke this coherency, masses of brecciated chert fragments may be formed, but the breccias always contain some larger fragments that display the original exploded character. Where he first saw the exploded chert zone in the upper Eccles Formation of the Malmani Subgroup near Carletonville, de Kock (1964) described it as the result of dessication of the chert beds and termed this part of the upper Malmani the "Giant Chert Formation." Where it was formed near the Foch Thrust surface, the zone containing chert fragments can be shown to be related to the ramps below the thrust plane (see Figure 16). We postulate that the ramps formed obstructions that were subjected to severe compressional stress during the centrifugal acceleration of crustal material, immediately before the detachment of the fault over the ramp took place. Subsequent stress release,



FIGURE 7.
CHERT BED AFFECTED BY CHOCOLATE TABLET BOUDINAGE.
GROOTEDRIFT 499, POTCHEFSTROOM DISTRICT

associated with detachment, came suddenly and the compressed chert beds exploded. In the instance described here, the fragments exploded "in situ," probably deep below the earth's surface and chocolate tablet-type boudinage was the result. The brecciated zones are chronologically, spatially and structurally related, not only to ramps of faults such as the Foch Thrust, but to virtually all of the concentrically sited ramps of the thrusts of Vredefort age, that intersected the various chert horizons of the Malmani Subgroup. These are similar to the "rings" described by Spray and Thompson (1995). Another similarity is the fact that a thickness of up to 170 metres of chocolate tablet-type breccia, interspersed with mylonite/pseudotachylite was recorded in boreholes that intersected the Foch Thrust zone (Figure 8, reproduced by kind permission of Angiogold Exploration Services). Spray and Thompson's description of pseudotachylite with associated faulting could very well apply to the pseudotachylite body, its position away from the site of impact, its size, its implied mechanism of formation and the fact that both apparently contain large amounts of fault frictionally-derived pseudotachylite. Chert, being competent, thus forms a breccia through the process of chocolate tablet-type boudinage, where other rock types may merely be plastically deformed. In the borehole cores, the fault-associated pseudotachylite and the boudinage breccia were eventually further cut by relatively small intrusions, consisting mostly of mobilised, graphitic carbon, probably generated in the same episode as the pseudotachylite. The environment and relationships described by Spray and Thompson (1995) seems identical to that of the Foch Fault, that will be more fully described later in this report. The difference is that the host rock of the Foch occurrences was chert.

By far the most spectacular outcrop occurrence of the chocolate tablet type of brecciation is found on the farm Grootedrift, on the Vaal River. At this site, the boudinage and faulting occurred approximately 200m above the Black Reef, but still within the first stages of astrobleme formation. The fault zone mylonite-pseudotachylite was subsequently overturned during the excavation of the crater. In this occurrence, the similarity in morphology and petrographic fabric between the chocolate tablet type and the pseudotachylite-cemented breccias of the inner structure of Vredefort becomes very apparent, and one has to ask the question whether they are not merely facies of the same phenomenon. Of course, the one is a cherty rock type and the other is composed of the general country rock type of Vredefort; pseudotachylite assumes the composition of the country rock in which it was formed (Therriault et al., 1997). There are no shock effects such as PDF's developed in the cherty types, simply because they fall outside the zone in which the shock energy was high enough (see discussion under PDF's in section 2.1.2.).

The Grootedrift occurrence, which continues south of the Vaal River on to Feesdrif, also contains a fault-generated chert pseudotachylite. This fault-generated pseudotachylite and the matrix of the chocolate tablet type consist of recrystallised chert, both with a coating of surface iron and manganese oxides.

Shand's pseudotachylite

Although fault-generated pseudotachylite conforms to a series of fault filling types as described by Sibson (1975, 1977), it does not conform to the "pseudotachylite" described by Shand (1916), which simply is not associated with fault movement. Because the term has now become entrenched for fault friction-associated melt rocks, we will refer to this type as a fault-related type of pseudotachylite. The type described by Shand, found in the centre of the astrobleme, we will term Shand-type pseudotachylite or Vredefort-type pseudotachylite. Again, the latter type was never generated by fault friction and it does not occur near any fault surfaces. Copious amounts of this rock type are found in the granites of Vredefort, described by Stepto (1979) as the Outer Granite-Gneiss zone of the core.

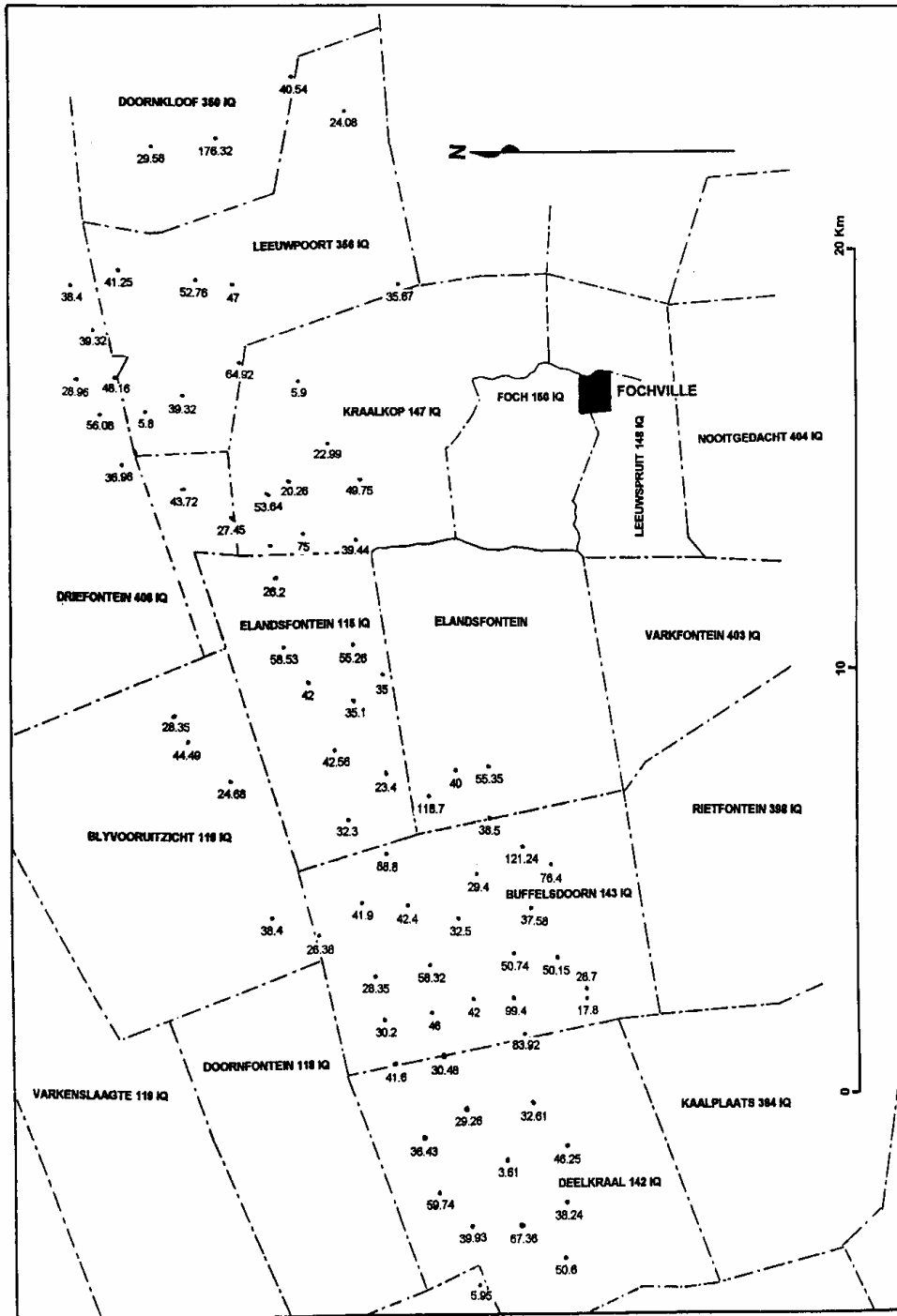


FIGURE 8.
OCCURRENCES OF THE GIANT CHERT, I.e. THE TOP OF THE ECCLES FORMATION OF
THE MALMANI DOLOMITE, AFFECTED BY CHOCOLATE TABLET BOUDINAGE AND
LARGE AMOUNTS OF ULTRAMYLONITE/PSEUDOTACHYLITE. THICKNESSES OF
BOREHOLE INTERSECTIONS ARE GIVEN IN METRES.
DATA FROM ANGLOGOLD EXPLORATION SERVICES

South of Johannesburg, authors such as Killick and Reimold (1990), Berlenbach and Roering (1992) and Killick and Roering (1995) found "smears" of fault-generated pseudotachylite, emplaced as fault fillings. In the Vredefort collar, an example is found within the mylonite generated by an old, displaced fault of Venterdorp age, related to the Lindequesdrift displacement, mentioned by Brink et al., (1997). Here, secretions of black melt rock, cut by shatter cone surfaces, forms a component of the familiar type of mylonite, found in most of the gold mines of the Witwatersrand. In a total time of almost a century of mapping in the collar of Vredefort, the present authors can name four sites where fault type pseudotachylite was developed. These are all related to faulting of Venterdorp age, displaced by the Vredefort Event. Outside the collar, most of the Vredefort age faults are characterised by smears of pseudotachylite, sometimes emplaced as thick smears between fluted surfaces. Some of the smears in flutes may be thick enough that, especially where they consist of mylonite (indurated rock flour), they are sometimes mistaken for folds in the limited exposures provided by mine tunnels.

The Johannesburg Dome

An interesting point may be whether the "Johannesburg Dome" (Figures 1 and 2) could be one of the distal lobes, related to faulting of early Vredefort Event age. However, in post-Black Reef, post-Vredefort Event times, this structural phenomenon probably developed as a gravitationally uplifted area. Periodic uplift influenced the sedimentation of the Witwatersrand Supergroup long before the impact event. The Johannesburg Dome underwent several evolutionary stages. During a stage of tectonic tranquility, erosion was followed by the deposition of the Black Reef, unconformably over its surface. The Black Reef depositional surface was typically flat and near horizontal, but a pattern of syn-depositional troughs and linear topographic highs are found to have affected the morphology of the Formation around the area of Randfontein, to the southwest of the Dome (Figure 1).

Faulting and chocolate tablet boudinage of the chert beds observed in the Kromdraai-Sterkfontein area northwest of Krugersdorp, shows that the decollement that affected the Black Reef (the BRDZ) also occurs in this area. The zone itself can be observed within the shales of the Black Reef, northwest of Krugersdorp in the Kromdraai-Sterkfontein area, where, the cave formations host ancient hominid fossils, which are now famous and declared a World Heritage Site..

The occurrence of the BRDZ in the Kromdraai-Sterkfontein area implies that, before uplift, the fault must have passed over the present domal surface. The dome was then flat and not uplifted by far-out ramp faulting.

1.2.3. THE WUMA FAULTS

North of Klerksdorp, a stack of faults emerge from below and to the west of the Black Reef outcrop (BR, Figure 1). These are the toe-zones of the re-activated Kameeldoorns-age faults that formed extensionally off the Blaauwbank anticline. The Blaauwbank Anticline (Figure 4) comprises a linear, north-south striking feature that reaches from north of Potchefstroom to the Free State goldfields around Welkom. The origin of the Wuma Faults and their evolution is best described in terms of a section through the Spitskop Syncline and the Wuma fault stack (Figures 9 and 10; and also 18-20).

During the period associated with middle-Venterdorp taphrogenesis, lystrically shaped extensional faults detached down the flanks of the anticline. The Wuma faults moved westward from the anticline. Long after the period of taphrogenesis, during the Vredefort Event, the old, incompetent fault surfaces were reactivated in the centrifugally-directed stress field of the impact. Near their toes, they assumed thrust-like displacement relationships.

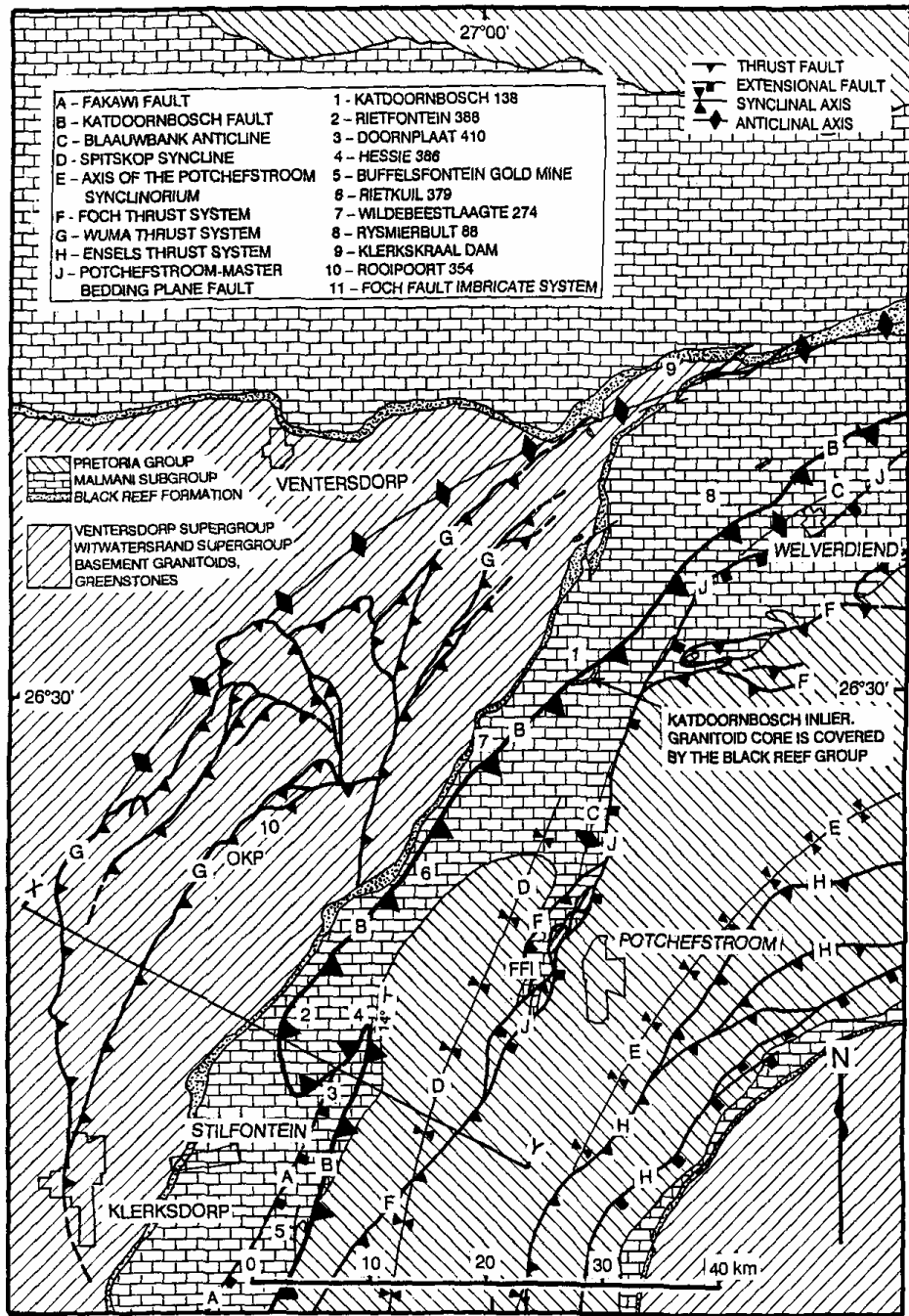


FIGURE 9. STRUCTURAL GEOLOGY OF THE SECTOR OF THE VREDEFORT ASTROBLEME IN WHICH THE SPITSKOP SYNCLINE AND THE WUMA FAULTS ARE FOUND. NOTE THAT THE INDEX NUMBERS AND LETTERS MAY DIFFER FROM THOSE OF THE SECTIONS GIVEN IN FIGURE 8. Based on Brink et al., 2000, S.Afr. J. Geol 103(1), 15-31.

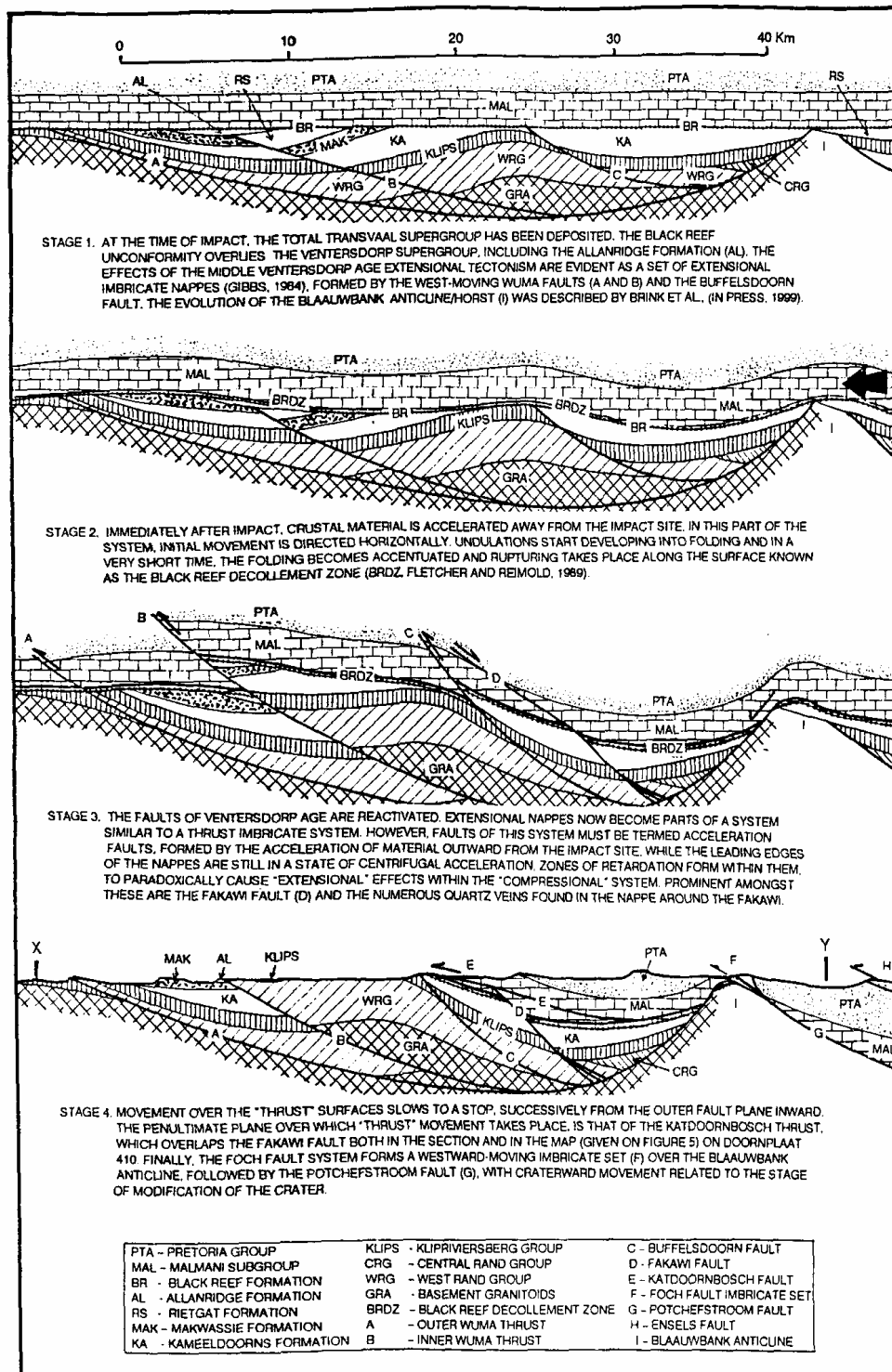


FIGURE 10. SCHEMATIC MODEL, ILLUSTRATING STAGES IN THE DEVELOPMENT OF THE STRUCTURAL SECTION THROUGH THE LINE X - Y IN FIGURE 7. THE LINE STRADDLES SEVERAL GOLD MINES OF THE STILFONTEIN GOLD MINING AREA, EXPLORATION BOREHOLES AND VIBROSEIS SECTIONS. Based on Brink et al., S.Afr. J. Geol., 2000, 103(1), 15 - 31.

North of Klerksdorp, the distal (sole fault) outcrop outline of the Wuma fault stack is bow-shaped, coinciding with of the southwestward extension of the Rand Anticline (Figure 1). This is possibly an erosional effect, caused by the uplift associated with the formation of the anticline (see below), followed by erosional truncation.

1.2.4. THE RAND ANTICLINE

The Rand Anticline (Figures 1 and 2), obvious in the West Rand area, can be followed around most of the greater Vredefort Structure. In the north, it may have formed partly by uplift (or upfolding), as the result of the placing of the Bushveld Igneous Complex, adjacent to, but north of the area that would shortly afterwards be deformed by the impact. Where not removed during the Dwyka period of glacial erosion, the annular anticline continues below the Karoo cover (Figure 2). It therefore constitutes the ring-shaped, distal upcline of the Potchefstroom Synclinorium and the second or third structural "ring" of the structure. Mapping does not indicate a simple, conventional "square root of two" or any other spacing (Melosh, 1989) for recognisable Vredefort rings. The crest of the Rand Anticline outlines the rim of a great crustal dent, formed during the impact, in a way similar to a hailstone striking the bodywork of a motorcar.

The Rand Anticline can be followed below the Karoo Supergroup, in boreholes, from Kroonstad in the south (Figures 1, 2 and 4) to Klerksdorp. Along this sector, its outline is delineated first by the sub-outcrop of the Black Reef Formation against the overlying Karoo (removed in Figures 2 and 4) and then northward by the distal outline of the Wuma Fault sole. Its type area stretches from near Ventersdorp past Randfontein and Johannesburg to the East Rand – Heidelberg area. South of Heidelberg, near Grootvlei (Figure 4) the anticlinal high is indicated by a bow-shaped embayment (to the north) in the outline of the truncation boundary of the Central Rand Group. Surface outcrops, north and west of Grootvlei, confirm the existence of the embayment. Southward from Grootvlei, past Edenville in the Free State, the pre-Karoo rocks were truncated by glacial erosion to the surface upon which the Dwyka Formation of the Karoo Supergroup was deposited. From here on southward, no indication of the anticline can be recognised. However, the preserved circumference of the ring remains recognisable over about 80% of its original extent.

1.2.5. THE POTCHEFSTROOM SYNCLINORIUM – AN ANNULAR SYNCLINE THAT CIRCLES THE DOME.

Circling the outcrop trace of the Ensels Fault, downfolded strata consisting of the upper beds of the Pretoria Group indicate the existence of the annular feature termed the Potchefstroom Synclinorium. Below the Karoo beds, it can be followed for some distance in vibroseis sections and boreholes (Figures 2,3,4, 11, 12, 13 and 14; with sections through Figure 11 given in Figure 15). In the southeastern sector, a great part of it is removed by the glacial erosion of Karoo age, and possibly also during the long period before the onset of the Dwyka glacial period (about 1650 million years, where impact occurred at 2023 Ma and the Dwyka erosion about 350 Ma before the present).

Prospecting boreholes and mining excavations that intersected the once near-flat Black Reef Formation indicate that the centreward dips around the distal rim of the greater Potchefstroom synclinorium are relatively flat, approximately between 8° and 15° (Section 2 of Figures 11 and 15). At approximately 15 km craterward from the the distal outcrop, a sudden increase in dip occurs. This phenomenon is also seen in the northern sector of the structure. Southeast of Potchefstroom, the depth below surface of the deep part of the Black Reef in the synclinal trough is probably about 3.5 km,

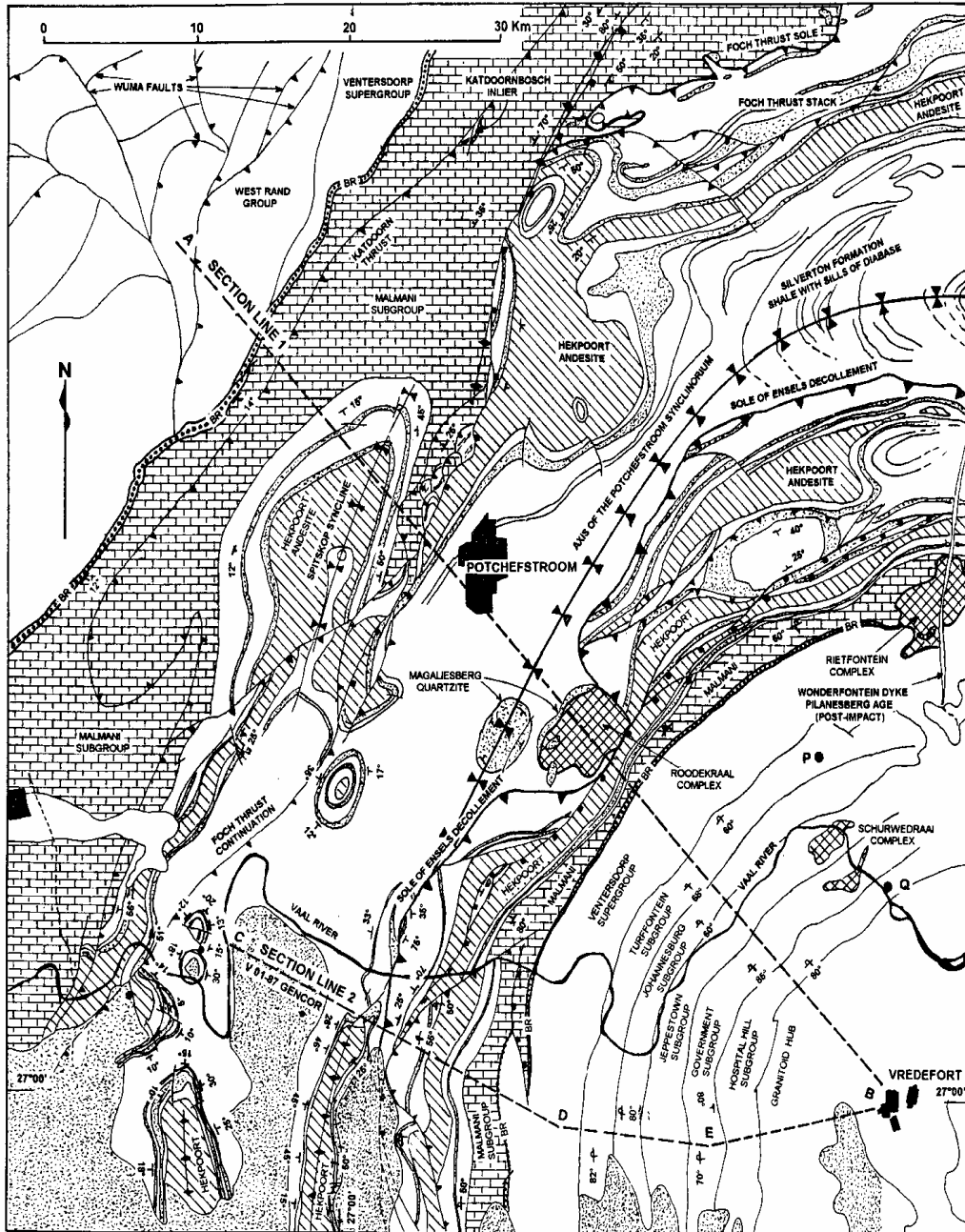


FIGURE 11.
 MAPPING OF THE NORTHWESTERN SECTOR OF THE VREDEFORT ASTROBLEME. TWO SECTIONS
 ARE SHOWN, THE FIRST FOLLOWS THE LINE OF THE TRANS-WITWATERSRAND VIBROSEIS LINE
 OF 1988 (S. AFR. COUNCIL FOR GEOSCIENCE). THE SECOND FOLLOWS GENCOR'S VIBROSEIS
 LINE V-01-87.
 NOTE THE TECTONIC TRANSRESSION OF THE SOLE OF THE ENFELS DECOLLEMENT UP TO
 AND OVER THE AXIS OF THE POTCHEFSTROOM SYNCLINORIUM.
 POINTS P AND Q ARE SITES WITH PRIME DEVELOPMENT OF HORNFELS METAMORPHISM.

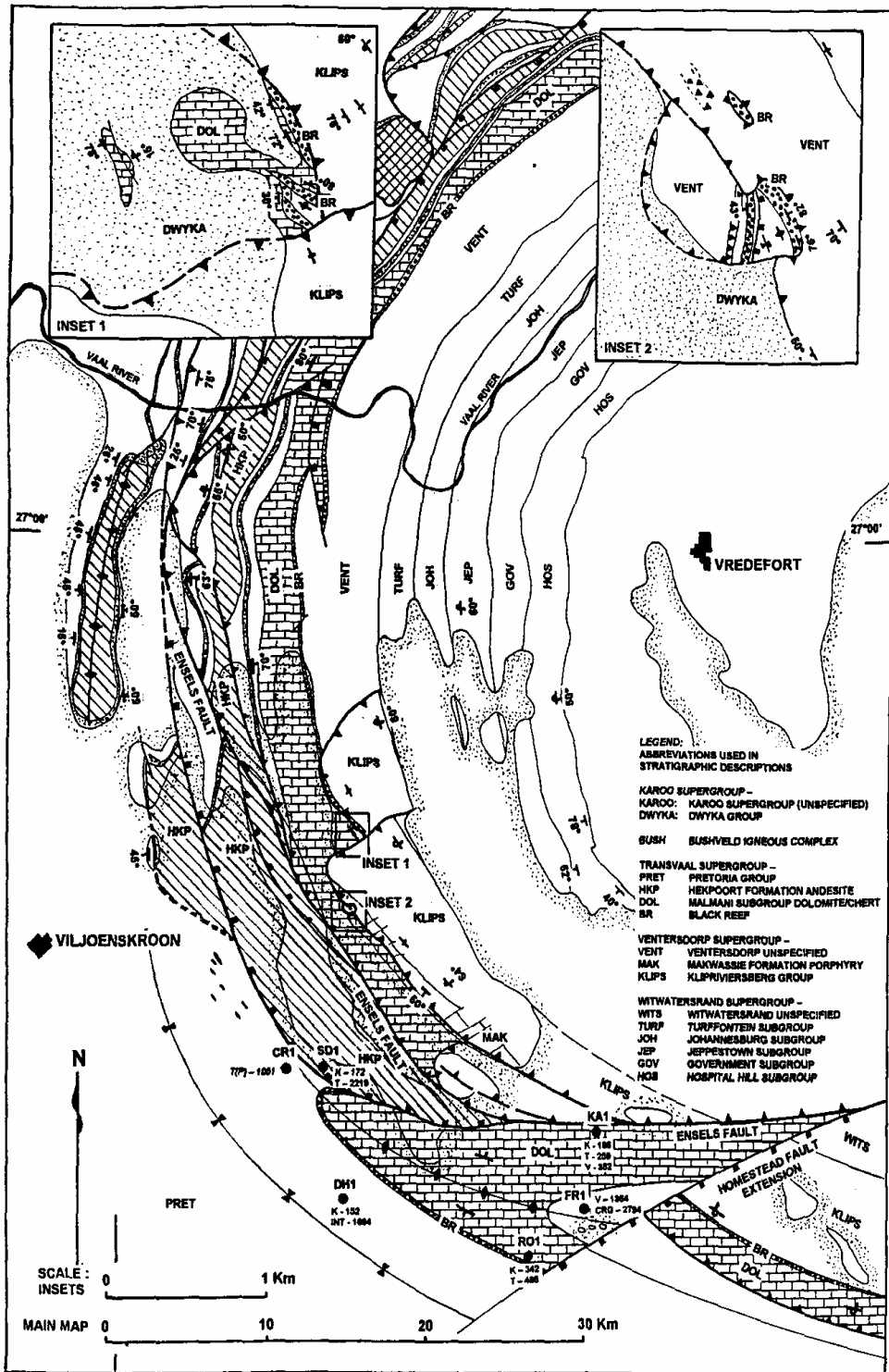


FIGURE 12.
 MAPPING OF THE VREDEFORT COLLAR IN THE SECTOR WEST OF VREDEFORT

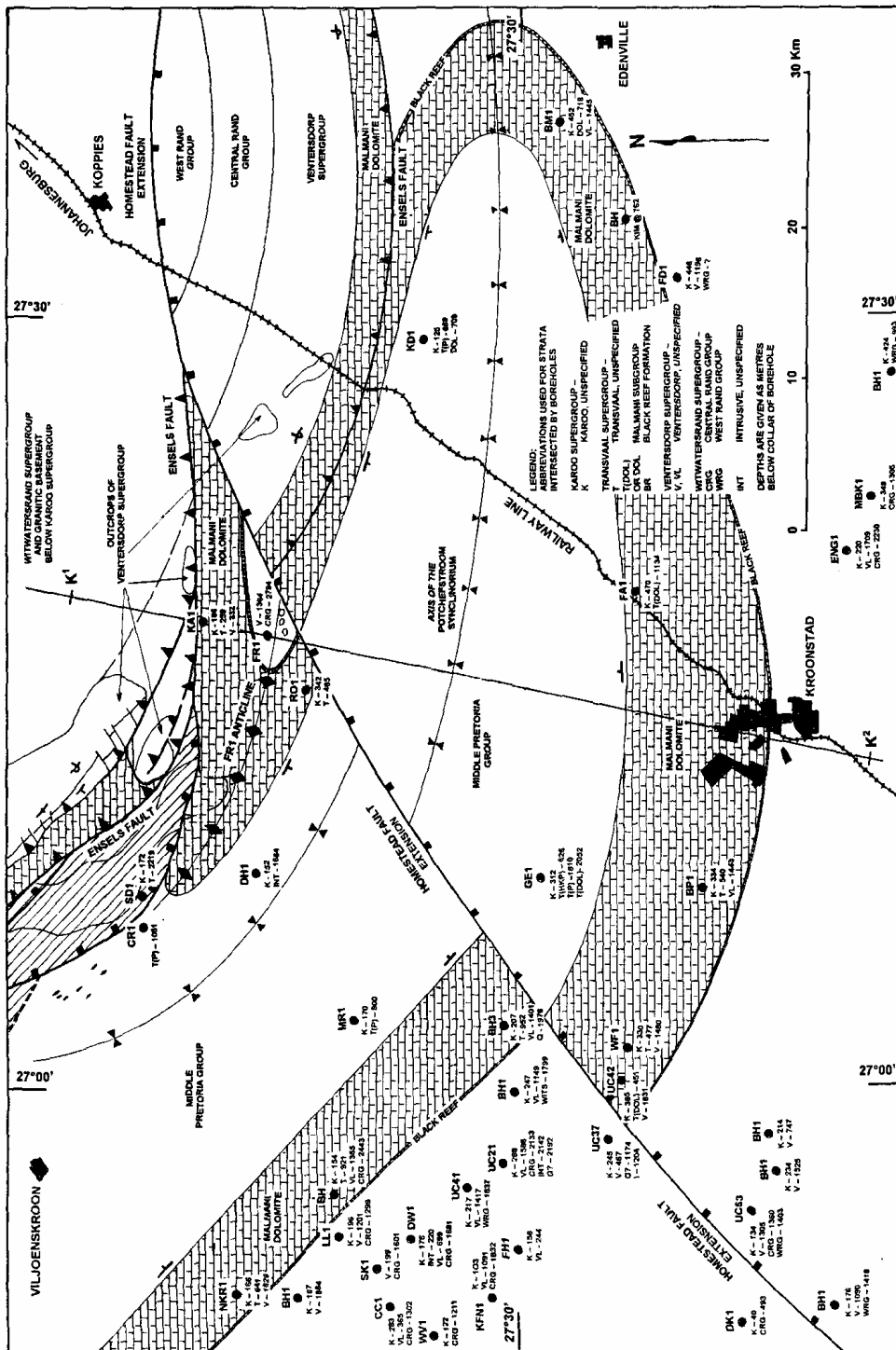


FIGURE 13. STRUCTURAL GEOLOGY OF THE SOUTHERN (KROONSTAD) SECTOR OF THE COLLAR OF THE ASTROBELT. NOTE THE DISPLACEMENT OF THE SYNCLINE BY THE EXTENSION OF THE HOMESTEAD FAULT, MADE VISIBLE BY SEVERAL BOREHOLE INTERSECTIONS. VIRTUALLY ALL OF THE GEOLOGY SHOWN IN THIS MAP LIES BURIED BELOW THE KAROO, BUT OUTCROPS DO OCCUR AROUND THE FRI ANTICLINE (MIDDLE, TOP).

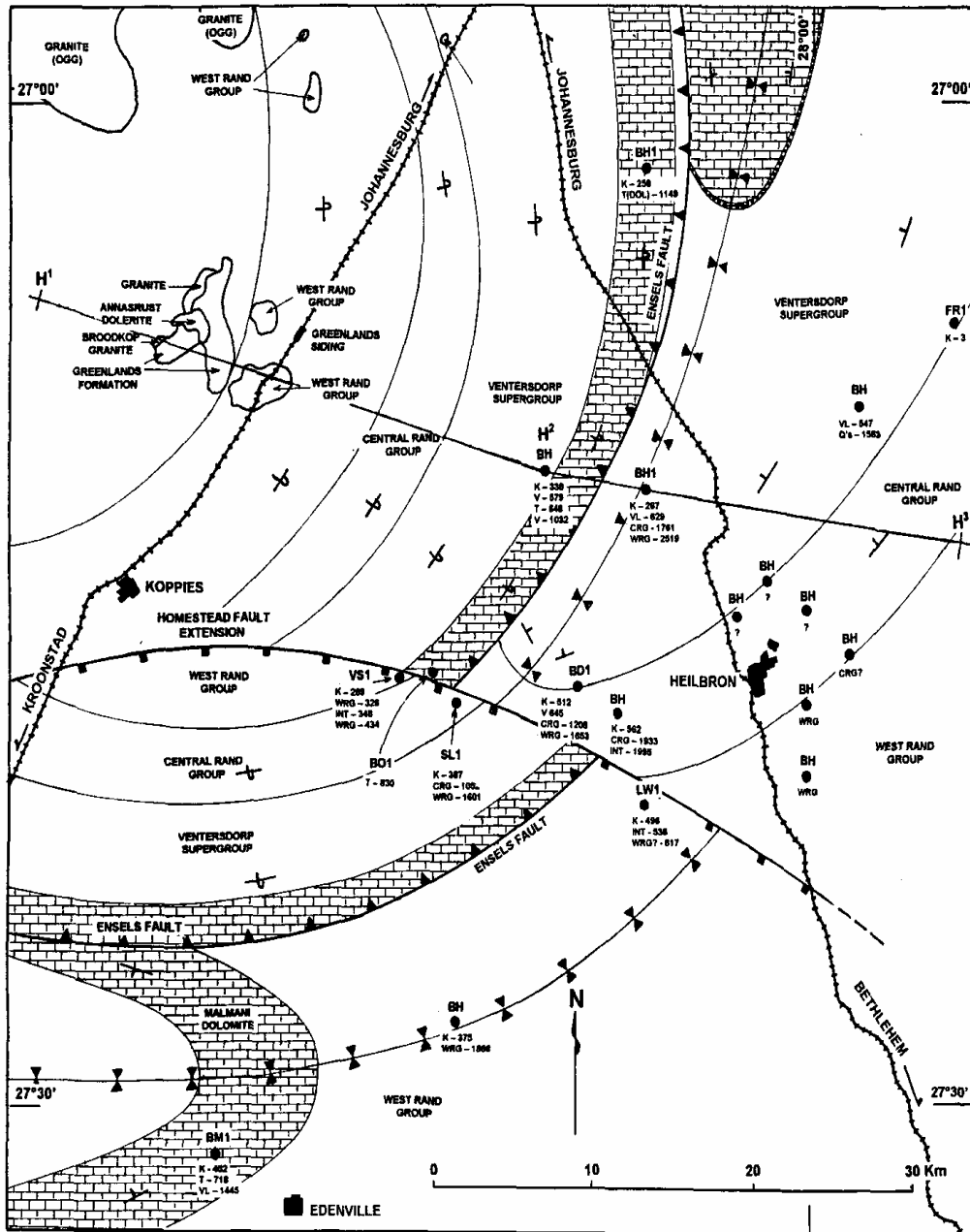


FIGURE 14.
 STRUCTURAL GEOLOGY OF THE SOUTHWESTERN (HEILBRON) SECTOR OF THE COLLAR OF THE
 ASTROBLEME. NOTE THE INTERSECTION OF VENTERSDORP ROCKS IN CONTACT (OVERTURNED)
 WITH MALMANI DOLOMITE AND THEN VENTERSDORP AGAIN, BELOW THE ENSELS FAULT, IN
 BOREHOLE BH. VIRTUALLY ALL OF THE GEOLOGY SHOWN ON THIS MAP LIES BURIED BELOW
 THE KAROO, BUT OUTCROPS TO THE NORTH AND PROSPECT BOREHOLE INTERSECTIONS
 MAKE IT TRANSPARENT.

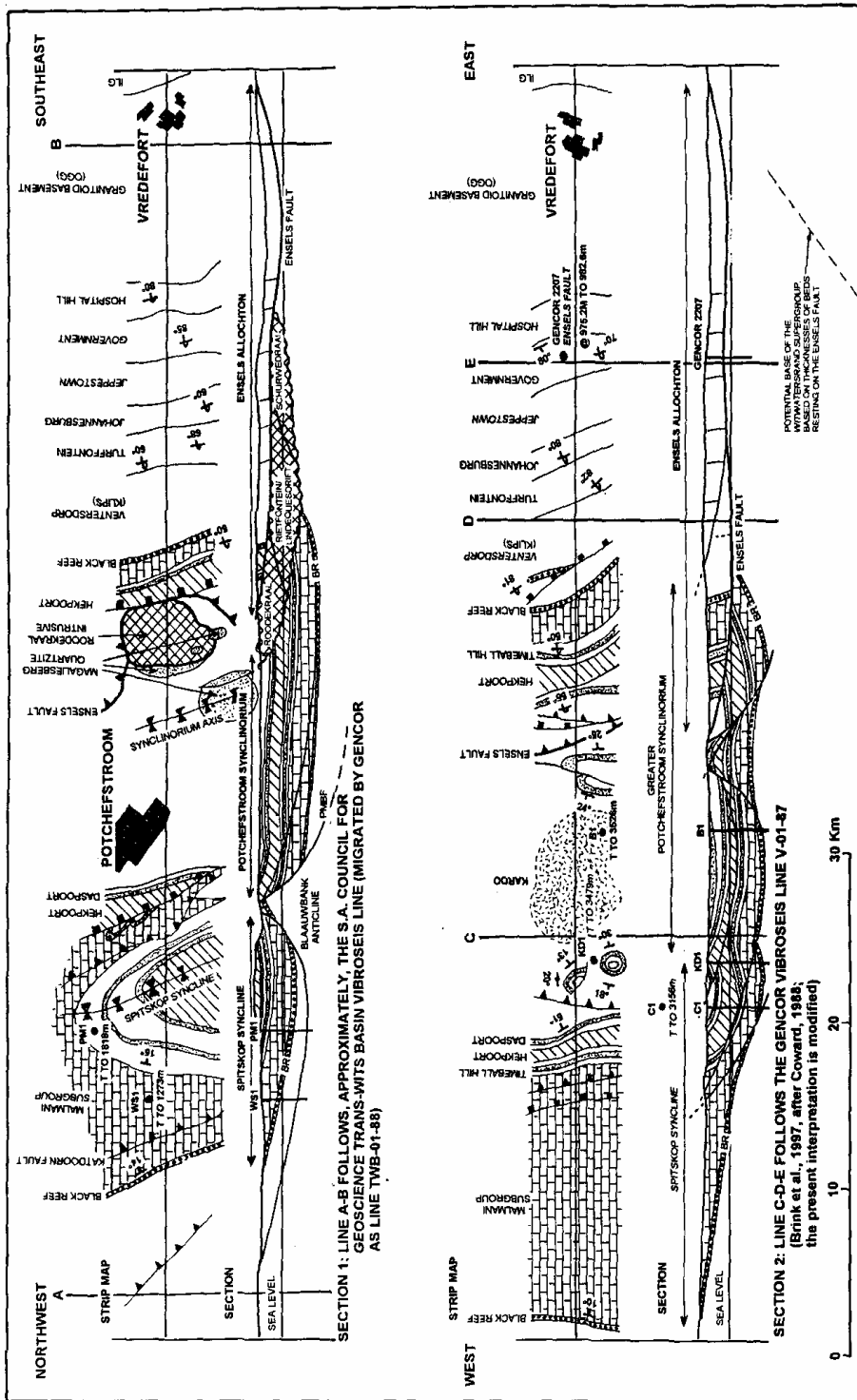


FIGURE 15. SECTIONS THROUGH THE TWO LINES SHOWN IN FIGURE 7. NOTE THE ROODEKRAAL, RIETfontein AND SCHURWEDRAAI IGNEOUS COMPLEXES, SHOWN AS A COMPOUND ONE, BELOW THE ENSEL'S ALLOCHTON IN SECTION 1.

increasing to about 5 km in the north. This depth is considered to be much too deep for viable gold mining and beyond the economic reach of prospect drilling.

The steepened slopes may have been the sites for gravity slides into a crustal dent, formed early in the evolution of the astrobleme. Slopes of the dent are reflected in dips of the Black Reef and overlying beds, such as those of the Pretoria Group of the Fochville hills. During the stage of transient crater modification, the slopes of the dent may have become the loci for gravity sliding. However, a problem with this argument is that an amount of gravity sliding may be evident as faults such as the Doornkop Fault south of Randfontein (Figure 1) and the Potchefstroom-Master Bedding Plane Fault (indicated as the Potchefstroom Fault, on Figure 1, to be described below). These faults possess age components that can fit the Vredefort Event, but it cannot be stated that they even reached the area in which a transient crater would have formed in time to have had any influence at all. Craterward, they become lost at depth. The possibility exists that their displacements were absorbed by the shale beds, of which there are an abundant number in the stratigraphic sequence.

Near Heidelberg (Figure 2), the southeastern portion of the syncline was largely truncated by almost 1600 million years of erosion, which reached a climax during the Dwyka age glacial erosion that marks the beginning of Karoo sedimentation. Structures that complicate the simplicity of the synclinorium are mostly anticlines and faults (Figures 11 - 14). A very large fault intersects the southern sector of the structure, called the Homestead Fault extension, below the Karoo, in the Free State (Figures 2, 13 and 14). It was seen in boreholes (Figure 13), where it displaces strata down to the south and east, causing a sizeable portion of the Potchefstroom Synclinorium to be preserved below the Dwyka truncation. This fault component is younger than the Vredefort structure, but its place in any structural system that affected the Vredefort area is not known.

1.2.6. THRUST FAULTS ASSOCIATED WITH THE DISTAL UPCLINE OF THE SYNCLINORIUM – THE FOCH FAULT RAMP AND THRUST STACK.

In the Fochville area, a stack of thrust faults follows the curve of a topographic feature, called the Fochville hills (Figure 16). The highly competent quartzite beds of the Pretoria Group, that form the hills, dip towards the centre of the astrobleme, with very regular dips ranging between 10 and 15 degrees. The Foch Fault sole follows the upper chert beds of the Malmani Subgroup (the Eccles Formation), to outcrop near the Pretoria-Malmani contact zone. Above its sole, the thrust stack intersects the Pretoria Group (Figure 16). Much of the sole surface lies in the Eccles Formation, which forms the upper cherty beds of the Malmani Subgroup. On first mapping the Foch Fault stack, Brink et al., (2000a) noticed that, where it intersects the upper Malmani Subgroup, it is always accompanied by brecciation of the type formed by chocolate tablet boudinage.

Figure 16 shows the outlines of thrust faulting that formed imbricate nappes in the area between Fochville and Carletonville. Where the dolomite of the Malmani Subgroup was broken by the faults, caves and sinkholes formed, giving rise to the old Voortrekker name of the "Gatsrand" (hill of holes) for the range of hills so affected. De Kock (1964) proposed the name Gatsrand Formation for the chert beds of the Eccles Formation that underwent chocolate tablet-type boudinage (Figure 7), thinking that it represented a stratigraphic horizon. However, the effect is now coupled to the Malmani Subgroup immediately below, but often still within the fault zone. In places, fracturing was followed by chemical weathering, mainly derived from the penetration of slightly acidic rainwater. No dessication of any cherty gel caused the boudinage, there is no need for a stratigraphic subdivision involving a Gatsrand or Giant Chert Formation and the chert affected by boudinage still forms part of the Eccles Formation. Other chert beds, lower down in the Malmani succession, display precisely the same types of boudinage

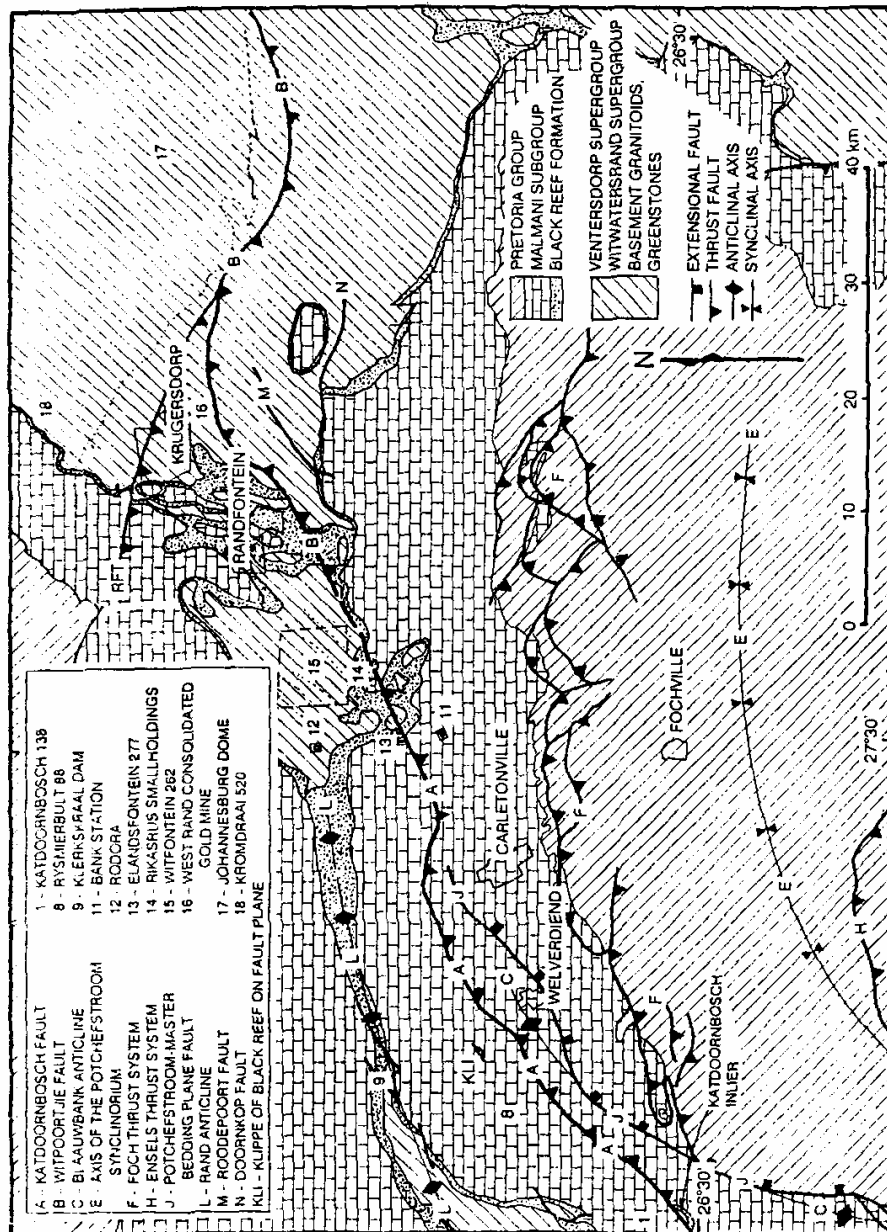


FIGURE 16. STRUCTURAL GEOLOGY OF THE AREA NORTH OF FOCHVILLE, THAT WAS AFFECTED BY THRUST FAULTING COUPLED TO THE VREDEFORT EVENT. COMPARE THE OUTCROP OF THE FOCH THRUST STACK WITH FIGURE 8, WHICH SHOWS THE BOUDINAGE AND MYLONITE UNDERGROUND, WITHIN THE FAULT ZONE. BOUDINAGE ZONES IN THE MALMANI CHERT BEDS INDICATE THE POSITION OF THRUST FAULTING. (Brink et al., J. Afr. Earth Sci.,30, 99-117).

effects, where these were severely stressed and then destressed after failure, by centrifugal fault movement of Vredefort age.

1.2.7. THE BLAAUWBANK ANTICLINE

The western sector of the Potchefstroom Synclinorium is interrupted by an old anticline with a north-south axis strike, designated the Blaauwbank anticline (Figures 1, 4, 9, 10, 15, 16 to 20). The anticline forms the western, uplifted boundary of the West Wits Line of gold mines. Some 20-25 Km west of this line, an uplifted zone formed another, but genetically related, uplifted hinterland for the Klerksdorp gold field. The Blaauwbank Anticline probably originated in the same manner as other such parallel, linear uplifts that form the boundaries of gold mining areas of the Witwatersrand, the structural architecture of which can be vaguely compared to a sinusoidal wave form.

The Blaauwbank anticline is important, because prospecting for gold along its flanks entailed the drilling of many boreholes that now makes its shape nearly transparent. Much of the episodic, westward-directed components of centrifugal crustal movement ascribed to the impact event moved over it, from which succeeding stages in the evolution of the astrobleme can be deciphered (Figures 17-20, after Brink et al., 2000b). The anticline also divides the greater synclinorium into two parts, the distal of which is termed the Spitskop Syncline. The Klerksdorp goldfield is situated on, structurally, the distal flank of this syncline, which also forms part of the distal limb of the basin in which the Central Rand Group was deposited. The gold content of the Vaal Reef of Klerksdorp was not influenced in any way by the Vredefort impact. Gold mineralisation was almost solely influenced by depositional parameters, and the statistical manipulation of parameters such as reef conglomerate pebble sizes, plotted to construct isopleth maps and sedimentary transport directions were long used as a predictive norm for the determination of pay streaks in gold-poor areas of some of the Rand mines. Virtually all of the reef conglomerates of the Witwatersrand that were found to contain gold in payable quantities only did so along the sedimentologically proximal areas of the Central Rand Group basin, where energy conditions during depositional times (say, 600 Ma before impact) were suitable for the deposition of heavy metal particles. Metamorphism of the Witwatersrand sediments did take place, but it was of a regional type, caused by deep burial and not by a meteorite impact and resulting heat dissipation.

Kirk et al., (2002) found a precise age for the gold deposited in the Vaal Reef conglomerate of 3.03 Ga, with a maximum age for the deposition of the Central Rand Group (CRG) of 2.89 Ga, derived from the youngest detrital zircons found in the lower CRG. These findings make the philosophy of the hydrothermal introduction of gold and any redistribution of old gold in the conglomerates of the Witwatersrand by a much later collision, without any chronological resetting, very difficult to support. The distribution of auriferous conglomerates in the sedimentologically proximal areas of the Central Rand Group depository, shows that the gold fields are confined to structural foreland basins, all situated along the western and northern distal peripheries of the Central Rand Group depository, and far from the centre of the Vredefort impact structure. Even the relatively minute zones of gold enrichment that occur within the collar are confined to thin sheets or lenses of reef-type quartz pebble conglomerates.

1.2.8. THE SPITSKOP SYNCLINE (FIGURES 9 AND 10)

The structural system that determined the formation of the presently prominent Blaauwbank Anticline, developed as a system best described in terms of "cyclic tectonics." During the depositional period of the Central Rand Group, compressional folds with NE-SW axes (in this area) formed in association with ramping "blind" thrusts (Brink, 1986). During the period of the formation of the

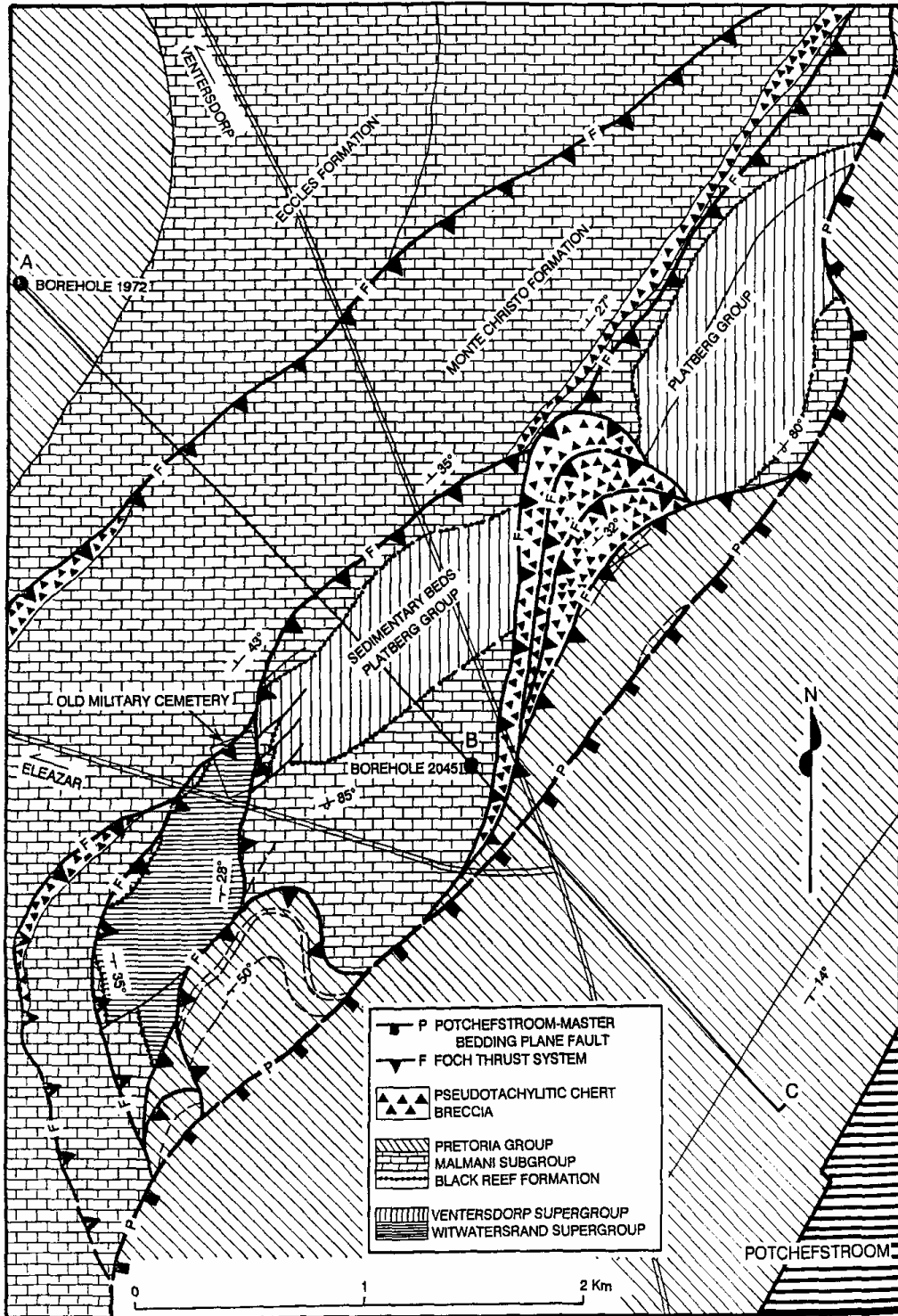


FIGURE 17. STRUCTURAL GEOLOGY OF THE FOCH THRUST-POTCHEFSTROOM FAULT (PMBF) INTERACTION IN THE AREA NORTH OF POTCHEFSTROOM. BOREHOLE LOGS WERE SUPPLIED BY GENCOR, LTD. A RESTORATION OF LINE A-B-C IS GIVEN IN FIGURES 18-20. (Brink et al., *J. Afr. Earth Sci.*, 30, 99-117).

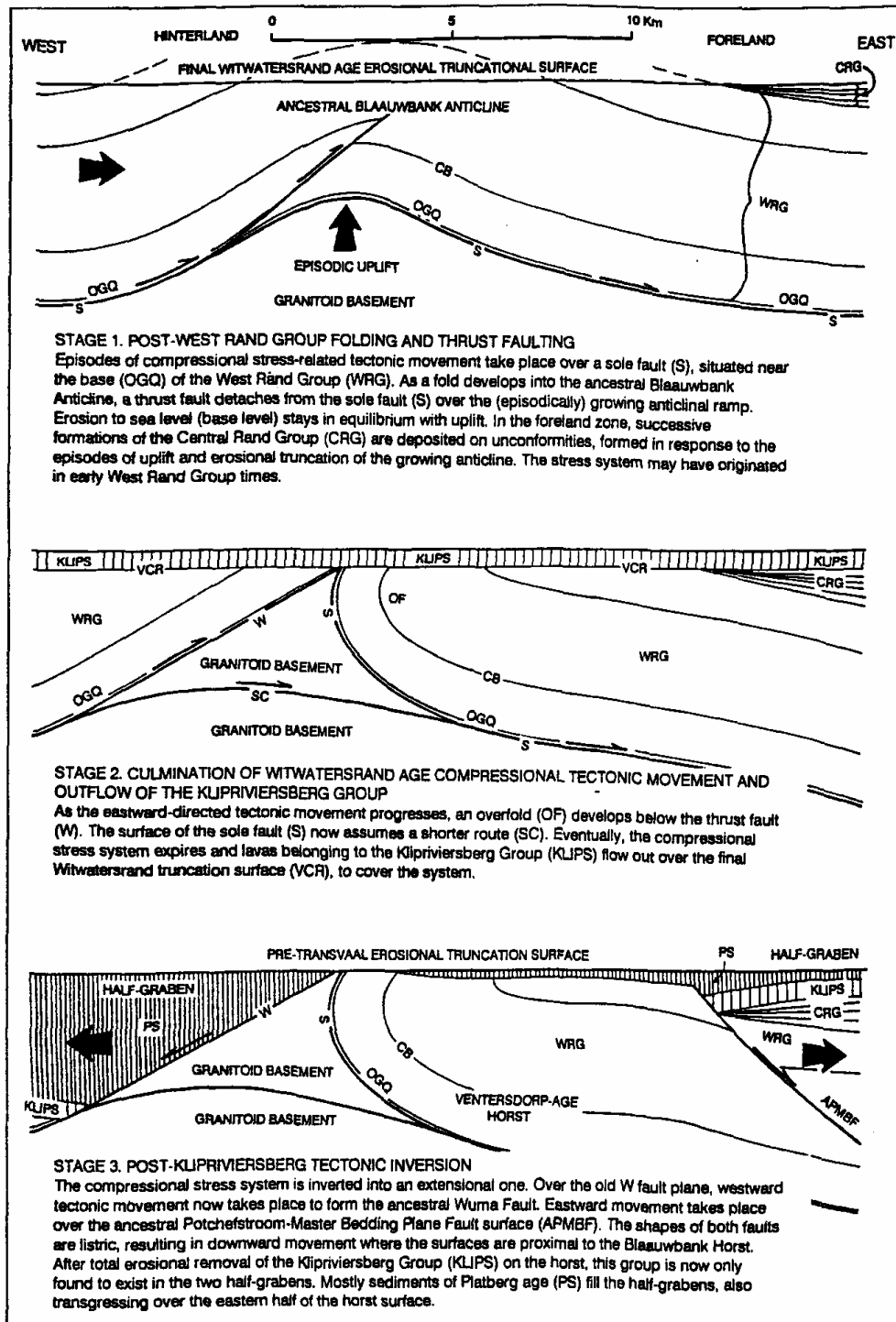


FIGURE 18. STRUCTURAL EVOLUTION OF THE BLAAUWBANK ANTICLINE, STAGES 1 - 3. (Brink et al., *J. Afr. Earth Sci.*, 30, 99-117).

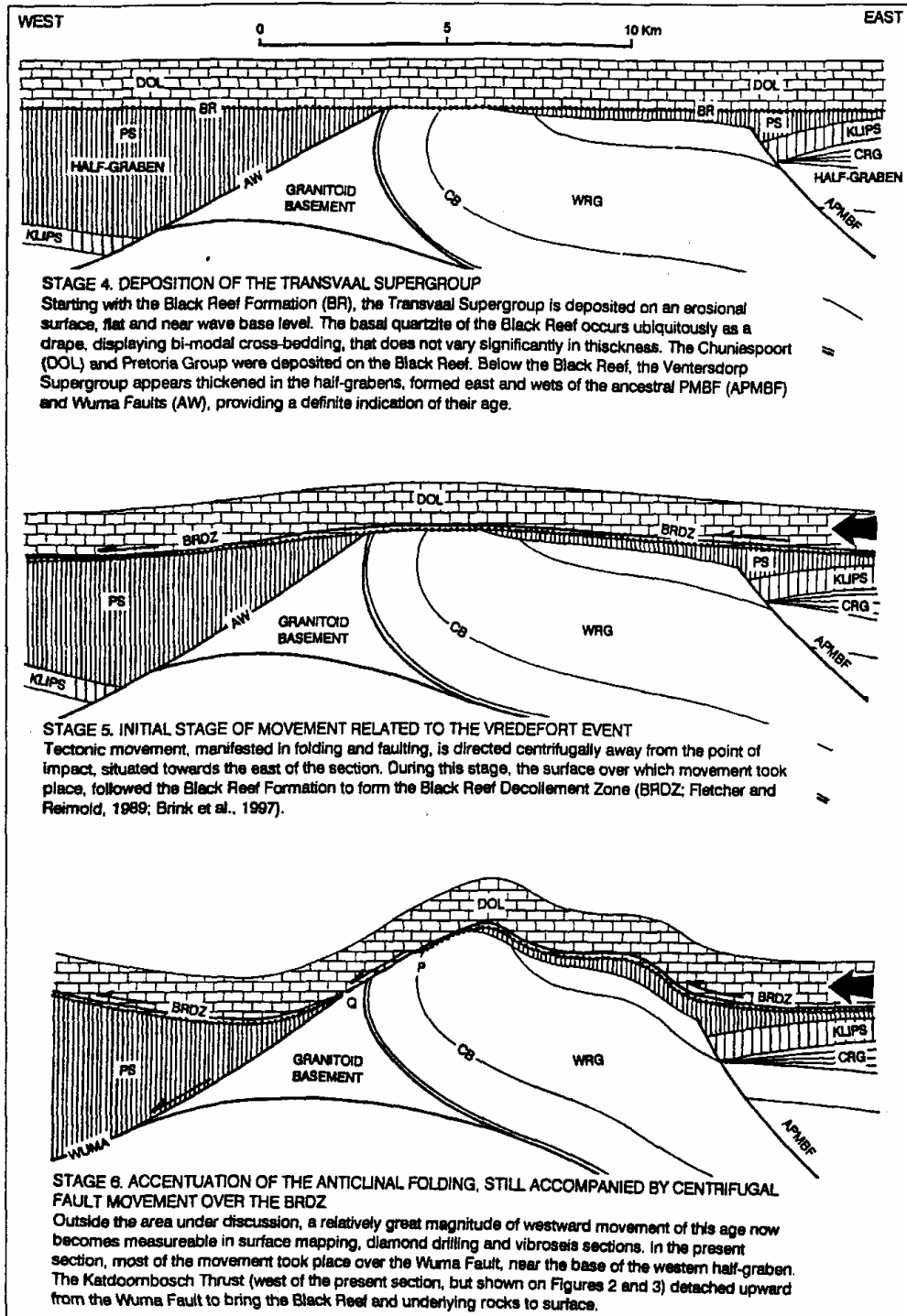


FIGURE 19.
 STRUCTURAL EVOLUTION OF THE BLAAUWBANK ANTICLINE, STAGES 4 - 6. (Brink et al., J. Afr. Earth Sci., 30, 99-117).

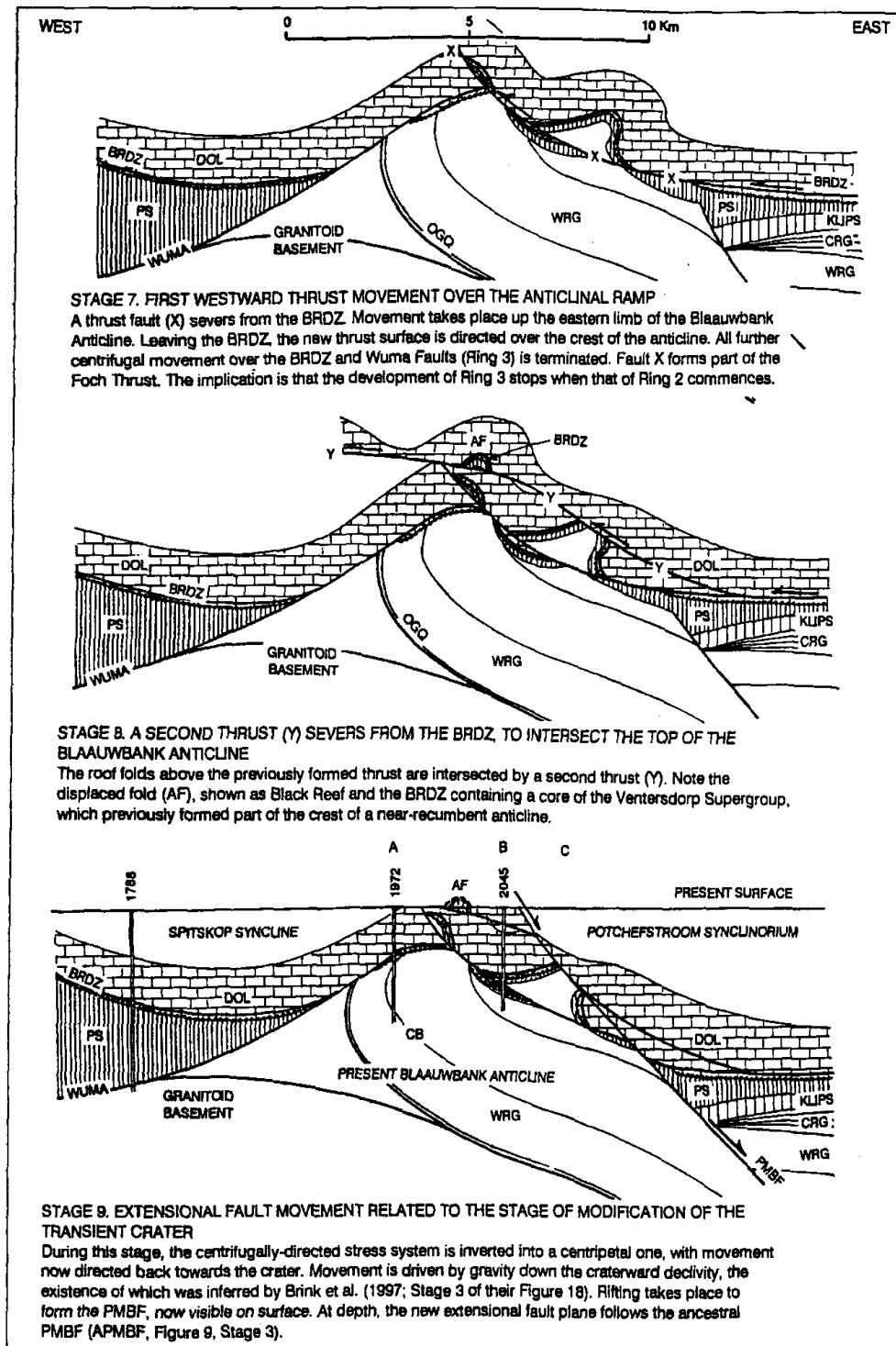


FIGURE 20.
STRUCTURAL EVOLUTION OF THE BLAAUWBANK ANTICLINE, STAGES 7 – 9. (Brink et al., *J. Afr. Earth Sci.*, 30, 99-117).

Ventersdorp Supergroup (about 2620 Ma ago), the compressional tectonic system was succeeded by one during which extensional faults with lystric shapes were formed (Figure 10).

As stated, the Spitskop Syncline was formed as a downfold, that developed into a half-graben, west of the Blaauwbank anticline. During the Vredefort Event, the previously formed, westward-directed, lystric fault planes were reactivated and the effect was to displace the Black Reef downward and to accentuate the fold-shape of the syncline.

1.2.9. THE POTCHEFSTROOM/MASTER BEDDING PLANE FAULT

In 1939, Truter mapped the Potchefstroom district and found a significant linear, north-south striking tectonic disturbance immediately to the west of Potchefstroom. Truter (1939) did not have the help of many boreholes but he mapped meticulously. With the help of modern data, Brink et al. (2000a) were able to distinguish a westward-moving thrust component (the Foch Fault) and an eastward extensional component in the system, both controlled by the Blaauwbank Anticline, which was unrecognised in Truter's times.

The Master Bedding Plane Fault was first described by Fletcher and Gay (1972) from the Carletonville mining area to be one caused by gravity sliding. Although its relative movement direction was towards Vredefort, these authors ascribed no Vredefort-associated cause to the origin of the fault. Brink et al. (2000a) showed that the eastward-extensional component of Truter's mapping and the Master Bedding Plane Fault joined underground to become one, and gave it the cumbersome name of "Potchefstroom-Master Bedding Plane Fault," shortened to PMBF. On Figure 1, the PMBF is indicated as the Potchefstroom Fault and on Figure 9 as "J". North of Potchefstroom, a long history of episodic movement over the fault plane can be inferred from the displacement of variously aged beds. In the Carletonville area, the fault caused many problems to the gold mining industry. At depth, a relatively young, Vredefort Event age component assumed bedding planes as movement surfaces. The fault thus acquired the ability to displace older faults that already displaced auriferous reef beds, leading to unexpected "losses of ground" and causing havoc with mine planning. It was therefore well studied. It originally detached from the eastern flank of the Blaauwbank Anticline during the Ventersdorp extensional period and was subsequently reactivated during the impact event, when the centrifugally-directed, Foch Fault-associated stress field was spent and inverted into a centripetal one. The Potchefstroom Fault and the Doornkop Fault, south of Randfontein (Figures 1 and 2), are the only two of the easily recognisable faults with Vredefortward movement components. Because it only happened at a late stage in the evolutionary system of the structure, the Potchefstroom Fault can conceivably be related to the mechanism of modification of the crater. However, it cannot be demonstrated to have intersected the central area. Whether it even propagated far enough to approach the crater zone is questionable.

1.2.10. THE ENSELS FAULT

The Ensels Fault fault is only now being recognised for its contribution to the morphology of the collar of the structure. The process of recognition was built on a multi-disciplinary geological foundation, in which structure and even metamorphism had roles to play.

The Schurwedraai Igneous Complex, west of Parys, is shown on Figure 1 as two occurrences of alkali granite. The metamorphic aureole accompanying the intrusive bodies is shown in Figure 22. We propose to demonstrate that there is a genetic link between the overturning of the collar rocks, the metamorphism observed in the Witwatersrand and the Ensels Fault.

The Ensels Fault sole and the Ensels Allochton

In Figure 1 and the scheme presented in Figure 4, it is clearly shown that, in the northwestern, exposed half of the structure, the Ensels Fault sole overlaps the axis of the Potchefstroom Synclinorium. This relationship is also evident on the 1:250 000 scale West Rand geological map (1986) of the South African Council for Geoscience, where displacements are shown, but the position of the fault surface was never inferred, because the outcrop position of the fault surface has never been found. Significantly, the fault is overlain by greatly disrupted strata that also include the overturned beds of the collar. We propose to term the disrupted body displaced by the fault the Ensels Allochton, in time with the terminology used by authors such as Bucher (1963).

In Figures 11, 12, 13 and 14 the Ensels fault is shown to encircle the whole of the collar zone of the Structure, even in the Heilbron area, where much of the evidence was removed by the glacial erosion of Dwyka age.

Vibroseis section Gencor V-01-87 and Coward's interpretation

In 1988, Prof. M.P. Coward, acting as a consultant for Gencor, made a structural interpretation of the Company's V-01-87 vibroseis line, which was subsequently published with Gencor's permission, by Brink et al. (1997). An updated version of this interpretation is given in Figure 15, Section 2, with the Coward interpretation covered by the line between points C,D and E. The interpretation was proved, to a great extent, by the surface mapping given in Figure 11, but also by boreholes drilled in the area covered by the vibroseis line. Borehole 2207, was drilled at Coward's instigation on the section line, at a point where the Ensels Fault was inferred to come to its closest to surface. As predicted, the inference was proven to be correct by its intersection, obtained at a depth of 840m. The main features of Coward's interpretation are not disputed – in fact, it was confirmed by subsequent work, although Coward may have predicted the fault to be some 18.23 metres shallower than the eventual intersection.

The implication is that overturning only occurs around the Vredefort Hub in beds overlying a discrete fault plane, with fault movement arising somewhere in the granites near the centre of the hub. The strata overlying the fault thus comprise an allochton (Bucher, 1963, Figure 3, p 604).

Three sections, drawn from mapping and borehole intersections, are presented in Figure 21. Again, the fault plane and allochton interpretation is confirmed, even in the section near Heilbron. In the core obtained from borehole HB, shown at point H² on Figure 21, an intersection starting with Ventersdorp strata, followed by Transvaal- and then Ventersdorp- again, is interpreted to show first, the overturned Ventersdorp lava, then an overturned Ventersdorp/Transvaal Supergroup contact underlain by overturned Transvaal beds, followed by the Ensels Fault and right-side-up Ventersdorp. The right-side-up Ventersdorp beds form part of the erosional remnant of the Potchefstroom Synclinorium that outcrops to the east of the borehole, where it emerges from below the Ensels Fault and the allochton. This conforms to the collar outcrop seen to the north, as well as to the sequence of Ventersdorp and Witwatersrand beds seen in the boreholes drilled around Heilbron (Figure 14; the logs of some of the boreholes from east of Heilbron are not available).

In the section through boreholes FR1 and KA1 north of Kroonstad (Figure 13 and 21), there are sufficient inliers, outcrops of Ventersdorp lava and Malmani dolomite around the boreholes, plus an intersection of the Central Rand Group in Borehole FR1 to confirm the existence of an anticline south of the Ventersdorp and Ensels Fault outcrops. The present interpretation of this section is substantially the same as that of Brink et al., (1997), but the Malmani Subgroup of the anticline is now placed where it belongs, with the Ensels Fault having moved over it.

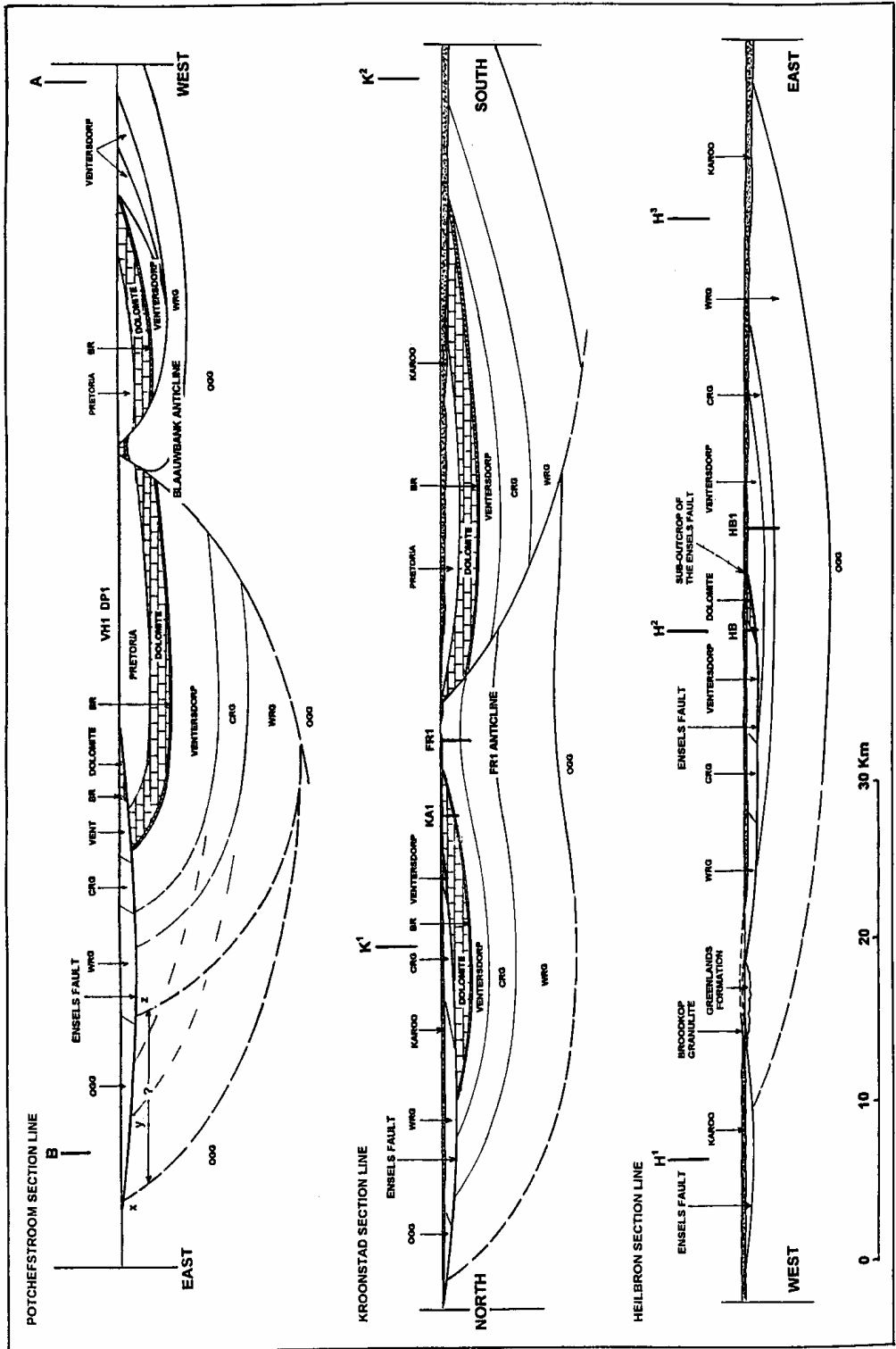


FIGURE 21. SECTION LINES SHOWING THE ENSELS ALLOCHTON ALONG LINES A-B OF FIGURE 11; K¹-K² OF FIGURE 13 AND H¹-H²-H³ OF FIGURE 14.

Metamorphism that affected the Witwatersrand Supergroup

Nel (1927, p 76) noted that several bands of quartzite of the Central Rand Group presented a "peculiar knotted appearance." He found that the knots consisted of kyanite, chloritoid and andalusite in a fine-grained groundmass of muscovite and quartz. Nel's observations were confirmed during mapping and petrographic work (Bisschoff, 1969 & 1982) and later during detailed remapping of the Johannesburg and Turfontein Subgroups by Brink, Bisschoff, Waanders and Coetzee (unpublished). In the area southwest of the Bakenkop Trigonometric Beacon 1 on Buffelskloof (Point P, about 20 Km north of Vredefort on Figure 11), the knotted quartzites attain a thickness of 90 – 100 metres and knots constitute up to 80% of the rock. The most frequently asked question was how these rocks, seemingly so far from any heat source, even if the heat came from the Schurwedraai Complex, could have been subjected to contact metamorphism. The answer is given in the section below.

The argillaceous rocks of the West Rand Group vary considerably in chemical composition, a phenomenon which is strikingly displayed in the mineralogy of their metamorphosed products. Most of the hornfelses are porphyroblastic, with andalusite, cordierite, garnet, staurolite and biotite as the most prominent species. These minerals are spectacularly developed in the Vaal River below Donkervliet (Point Q, 9 Km north of Vredefort on Figure 11), but also to the south of the Vaal River. A paper by Bisschoff et al., in preparation, will treat aspects indicating that the metamorphic effects are older than the Vredefort Event.

The relationship between the hornfelses and the alkali granite plutons

Rocks along several horizons in the Hospital and Government Subgroups show a progressive increase in the metamorphic grade when followed on strike toward the alkali granite plutons (Nel 1927, p 88; Bisschoff, 1982, p 51). Near the "plutons", the highest grade of metamorphism is found in a well-developed staurolite zone. The hornfels metamorphism is the result of a static thermal metamorphism, as was maintained by Hall and Molengraaff (1925), Nel (1927) and Bisschoff (1969, 1982). No form of dynamic metamorphism related to the Vredefort Event had any influence over the origin of the hornfelses.

The Schurwedraai Alkali Granite Complex and the overlying fault

The outcrops of the Schurwedraai and Baviaanskrans alkali granite "plutons," as well as field occurrences of staurolite are shown in Figure 22, with sections along lines SC1 and SC2 given in Figure 23. In this figure, the stratigraphy is indicated as main quartzite exposures of the formations that occur in the area, and the succession is self-evident (compare with Figure 4).

The geology shown in the sections was derived from detailed (1:10 000 scale) mapping by Bisschoff, Brink, Waanders and Coetzee, (not published). Topographic contours derived from elevations obtained along the two alkali granite-Witwatersrand Supergroup contacts, indicate that the pre-erosional upper contact surfaces of the two granite bodies were relatively flat and simple and also that they can be joined, below the Witwatersrand Supergroup, to form a single body underlying a simple fault surface. The sections shown in Figure 23 explain this interpretation, showing overturned beds above a fault surface that overlies the granite bodies, which now merge into one. Even if there were two separate granitic "plugs," it is obvious that they could not have been subjected to the same overturning mechanism as the overlying Witwatersrand beds. There is thus a discontinuity between overturned beds and those below that were not overturned. In the Vredefort context, this discontinuity is the Ensels Fault sole.

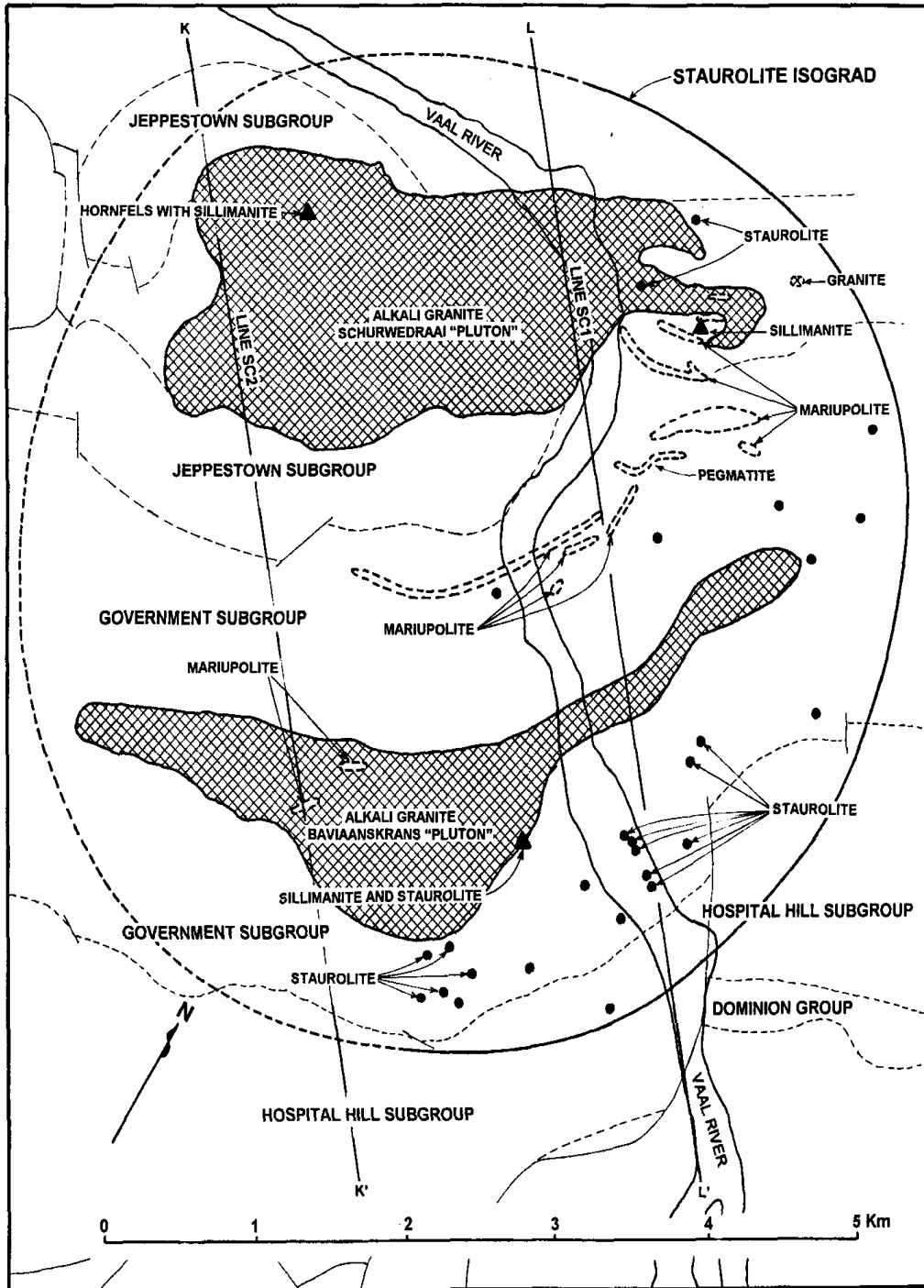


FIGURE 22.
 THE OUTCROP OF THE SCHURWEDRAAI AND BAVIAANSKRANS ALKALI GRANITE PLUTONS,
 STRADDLING THE VAAL RIVER WEST OF PARYS. OCCURRENCES OF STAUROLITE, INDICATING A
 STAUROLITE HORNFELS ZONE OF CONTACT METAMORPHISM, ARE SHOWN.

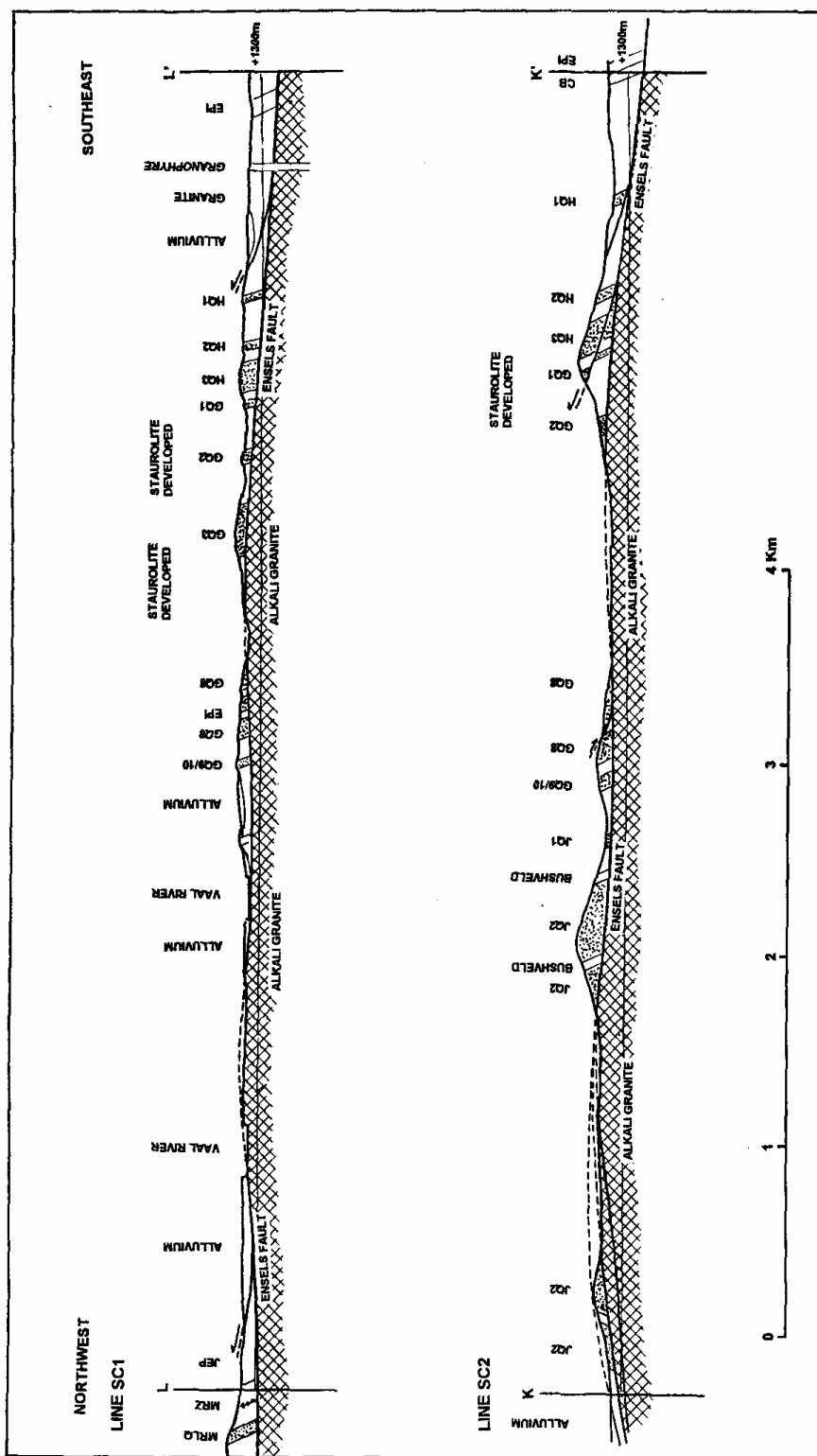


FIGURE 23. SECTIONS THROUGH THE AREA SHOWN IN FIGURE 22, IN WHICH THE ALKALI GRANITES ARE FOUND. THE ALKALI GRANITE BODY IS SHOWN TO BE CONTINUOUS BELOW THE OVERTURNED WITWATERSRAND BEDS THAT CONSTITUTE PART OF THE ALLOCHTON. NOTE THAT MOVEMENT ARROWS INDICATE SOME TO-AND-FRO MOVEMENT, AND THAT THE CENTRIFUGALLY-DIRECTED "THRUST" MOVEMENT DISPLACES BEDS THAT WERE ALREADY OVERTURNED.

Some faults with a thrust sense of movement can be observed to displace the overturned beds of the allochthon, shown in the sections. In the central Rand Group to the north of the sections, mapping shows that there is a local increase of this type of faulting, especially in the Kimberley Formation. The "nappes" so formed, possess linguoid shapes, bow-shaped away from the center of the Vredefort Structure. Figure 23 shows that these centrifugally moving faults displace Witwatersrand beds that were overturned prior to being subjected to this generation of faulting. However, within the allochthon, not all of the beds are overturned and not all of the faults have centrifugal displacements. Inward-extensional faults that displace the Witwatersrand Supergroup of the allochthon may indicate that to-and-fro movement has taken place, but the reason is speculative.

The structural interpretation given above, with the Ensels Fault directly overlying the body of alkali granite indicates that, where affected by contact metamorphism, the affected beds remained nearer than 300m from the alkali granite heat source. Before being overturned, many of them may have been in actual contact with it.

The size of the Bushveld body, including Roodekraal, Lindequesdrift and Rietfontein, which belong to the same generation as the Schurwedraai Complex, is indicated by a substantial gravitational high, indicated on the 1:1 000 000 map of the S. Afr. Council for Geoscience (1984). This gravity high was also recorded by various other authors, such as Durrheim, Corner and Wilsher (1986). Because the gravity field also includes the occurrences at Roodekraal and Rietfontein, we include these into Section 1 of Figure 15 as components of the same occurrence (Figure 15). A magnetic anomaly is also found in precisely the required area in the aeromagnetically derived imagery, presented by Corner et al. (1986) at the Witwatersrand Geocongress 86.

The Trans-Wits Vibroseis line

The South African Council for Geoscience's (1987) Trans Wits Basin vibroseis line is shown in Figures 11 (plan view) and 15 (Section 1), with the structures discussed so far adapted also to this line. The basic principle of vibroseis interpretation is that, whatever one sees or pretends to see, must be correlated with known field mapping or borehole intersections. Mapping (Figure 11) shows that the Ensels Fault outcrop trace bends around the Roodekraal Complex. Occurrences of Magaliesberg quartzite, associated with the underlying Potchefstroom Synclinorium, lie in contact with the complex. The Roodekraal volcanic rocks and the Magaliesberg quartzite belong to the right-side-up block of beds from below the Ensels Fault sole. Elsewhere, such as at Losberg near Fochville, the Magaliesberg quartzites indicate the core of the synclinal fold. Adjoining the Roodekraal Complex, but overlying the Ensels fault, rocks belonging to the Hekpoort Formation are found. The stratigraphic displacement from the Upper Hekpoort lava on the fault plane to the underlying Magaliesberg is about 600m, but much more, if the diabase intrusives of Bushveld age, that were intruded into the Pretoria Group, are brought into the equation. The true stratigraphic overlap could then entail a vertical displacement of close to 1000m, however, this must not be seen as similar to a single displacement from a "normal" fault.

In the near-Vredefort hub half of Section 1 of Figure 15, the structural interpretation given here deviates totally from the "classical" interpretations given by authors such as Durrheim et al., (1991) and Friese et al., (1995). These interpretations are termed "classical" because they show the previously accepted, "logical," up- and overfold profile of Witwatersrand strata which must explain the overfolding. This "logical" profile is expected in any section through the collar, but it was never seen. It is possible that Hall and Molengraaff (1925, p 12) initiated this type of interpretation, which was slavishly followed since. However, Hall and Molengraaff showed that the axis of the reclining fold had to come to surface from its supposed underground position, somewhere in the stratigraphic region of the Gatsrand

(Pretoria) beds, near Carletonville. Nobody has yet found any trace of the existence of a great reclining fold in or near the Gatsrand beds, let alone its axis.

To answer the "fashionable" vibroseis interpretations, we point out that, from station 2600 eastwards, no "bending up" to the vertical or overfolding of the Witwatersrand or any other bed is evident in the original Trans Wits vibroseis line, nor in the version of the line in our possession, migrated by Gencor as their line TWB-01-88. This was also seen by Henkel and Reimold (1998), who (according to Gibson and Reimold, 2001), attributed the phenomenon to a zone, within which shock-compression brought rocks to above their Hugoniot Elastic Limit during the Vredefort impact event. However, on line Gencor V-01-87, discussed above, reflectors were observed into the centre of the system, disregarding any elastic limit of Vredefort times.

A relatively shallow ($\sim \frac{1}{2}$ sec TWT) reflector may be present on both sections, but its presence as well as its true depth may be debateable. Although the Ensels Fault is not obviously present in the vibroseis section, the overturned strata must lie on some structural element, probably at a shallow depth, which must be a shallow, subhorizontal fault. This is contrary to the interpretations given by Durrheim et al., (1991) and Friese et al., (1995). It must be stressed that Durrheim stated that the deeper structures were not reflected in the eastern part of the section discussed here. We would contend that the opacity was caused by the much wider extent of an intrusive body than was previously expected, and that this body, of Bushveld age, joins the outcrops of Bushveld rocks such as Roodekraal, Rietfontein and Schurwedraai below the allochthonous cover.

North of Parys, a vibroseis section obtained by Gencor, ca. 1987, showed no reflectors at all. At the time, this was attributed to a postulated dyke that presumably followed, precisely, the line of the road along which the vibroseis section was taken, but remained buried under overburden. No other reason could be seen in the adjacent hills. The hill rocks were, significantly, also overturned above the Ensels fault. The road traverses the area between Rietfontein and Lindequesdrift (Figure 26) and these two intrusions both belong to the greater complex.

We point out that this inference is also a geophysical probability. As stated above in the discussion on the structure of the alkali granite plutons, the 1:1 000 000 scale geological map of the South African Council for Geoscience (1984) shows a geophysical anomaly in precisely the required area.

A restoration of the crater zone

In Figure 21, three sections were presented, showing the present attitude of the allochton, that transgresses over the downfolded Potchefstroom Synclinorium. An indication of the original morphology of the "transient" crater can be derived from the projection of the country strata to their presumed, original horizontal attitude, and plotting the Ensels Fault truncation surface over the section so obtained (Figure 24). A flat, bowl shape is obtained (Figure 25), with the allochton "resting" on its "walls." By its shape and the allochthonous material found on its detachment-formed floor, this is the original crater floor.

Based on the work of Melosh (1989, Figure 5.13, p 75), quoted by French (1998), a scenario for the locations of shock-metamorphosed materials distributed in a crater is schematically shown in Figure 25, Section 1. These are adapted to the Vredefort Crater, derived above. All that can be shown at Vredefort is the basal Ensels detachment and the preserved part of the allochton, with the rest of the crater contents now completely removed by erosion.

In section 2, the crater floor is shown to be uplifted to its present profile. No indication of crater collapse or modification exists. Uplift of the central portion of the system occurred, in part possibly

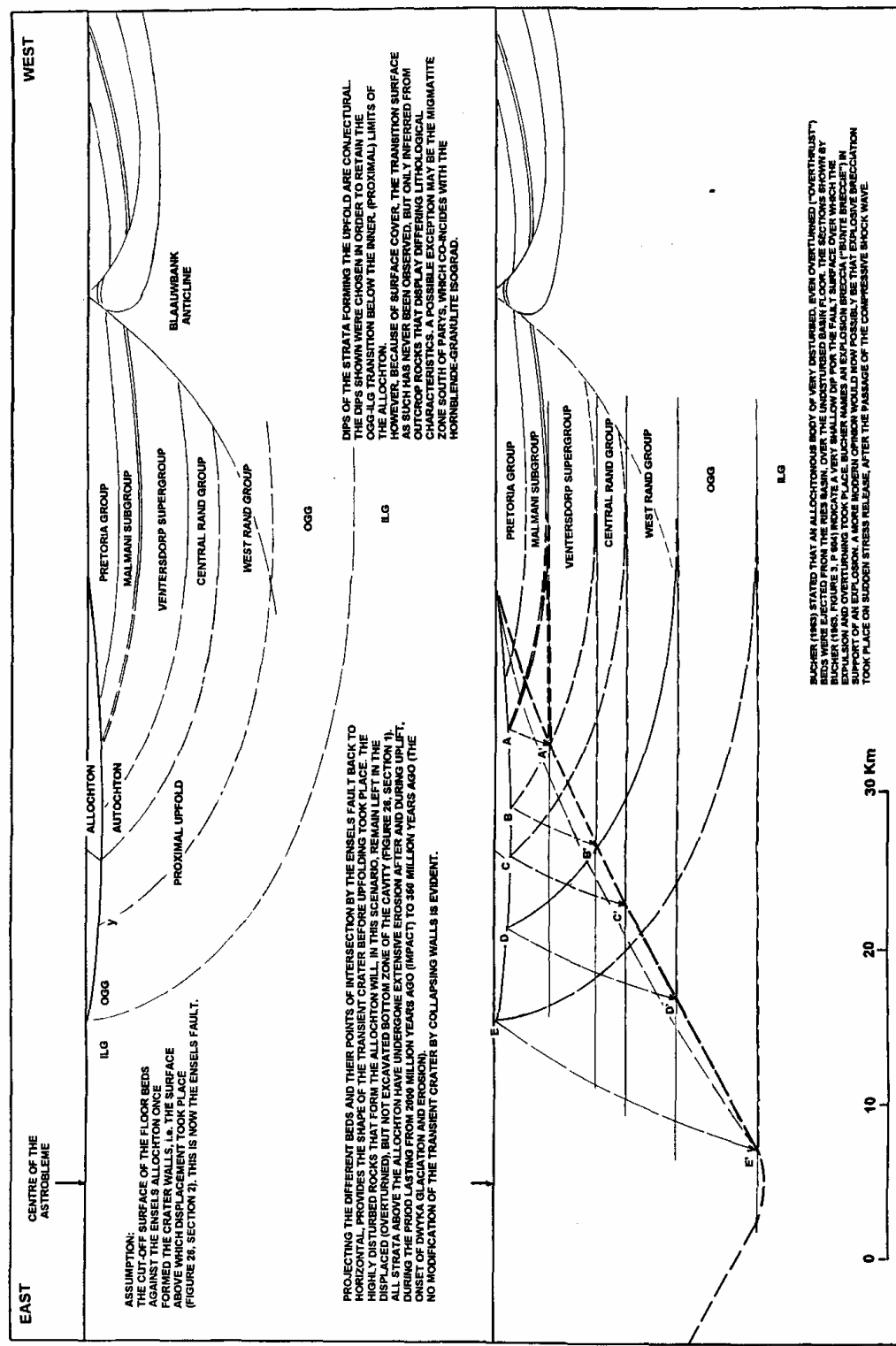


FIGURE 24.
A RESTORATION MODEL FOR THE MORPHOLOGY OF THE CRATER ZONE, BASED ON THE POTCHEFSTROOM SECTION LINE OF FIGURE 21. THIS LINE WAS CHOSEN BECAUSE IT WAS NOT AS DEEPLY ERODED AS THE OTHERS. HOWEVER, IT WAS DRAWN SCHEMATICALLY TO SHOW ONLY RELEVANT ASPECTS. IT CAN BE SEEN THAT THE USAGE OF THE TERM "TRANSIENT" CRATER, IMPLYING CRATER COLLAPSE, IS PROBLEMATIC IN THE VREDEFORT SENSE

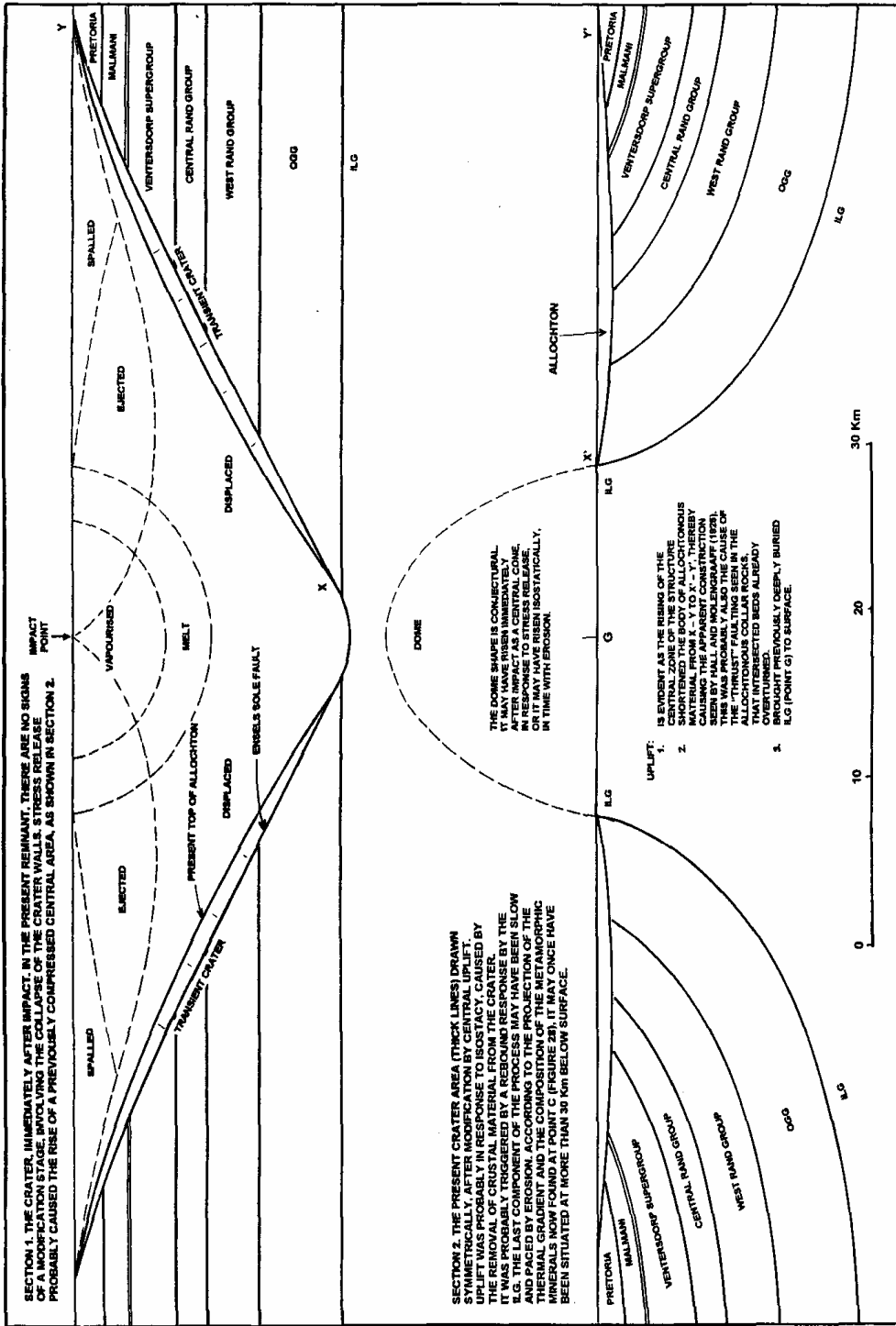


FIGURE 25.
SECTION 1 SHOWS THE LOCATION OF SHOCK-METAMORPHOSED MATERIALS WITHIN THE TRANSIENT CRATER. THE CONCEPTION DEPICTED HERE IS BASED ON THE ONE BY MELOSH (1969).
IN SECTION 2, NOTHING IS LEFT OF THE CENTRAL CRATER, I.e. OF THE MELT, EJECTED AND UPPER DISPLACED ZONES. THERE IS NO REMNANT CRATER MELT, AND MOST OF THE SHOCK-METAMORPHOSED MATERIALS ARE NOW FOUND WITHIN THE ALLOCHTON AND THE I.L.G.

caused by a rebound mechanism. This interpretation may be favoured because of the possible existence of a mantle plug, shown as a high gravity anomaly below the centre of the structure (Maree, 1944; Stepto, 1990). The uplift may partly also reflect isostatic adaptation, in response to the erosion of a previously formed, uplifted zone. Whatever the cause, uplifting the centre turned the craterward dent into the Potchefstroom Synclinorium.

The granitoid hub.

Mapping of the central structure is shown in Figure 26. Metamorphic rocks from hornfels facies grade through amphibolite to the pyroxene granulite of the inner ILG as shown. Except for an outward bulge in the shape of the amphibolite hornfels isograd seen to the distal side of the Schurwedraai Complex, the concentric progression was an effect of static metamorphism, caused by deep burial, before the impact event. According to the schematic diagram given in Figure 27, the rocks presently found at point G in Figure 25 may have been exhumed from deeper than 30 km. Interestingly, this means that the rocks now found at the centre of the structure were derived from a depth below the original surface much deeper than any borehole ever drilled, underlining the uniqueness of the structure. It is sufficiently well exposed for a person to walk over the deepest crustal rocks ever found on the surface of the earth.

The core segment of the astrobleme consists of granitoid rocks, basically comprising two distinct types (Figure 26), termed the Outer Granite-Gneiss (OGG) and Inlandsee Leucogranofels (ILG) by Stepto (1979). According to Stepto (1990), the OGG has been radiometrically dated at 3.05 Ga and the ILG at 3.5 Ga. The boundary between the two bodies (rather, in pre-impact terms, succeeding layers, is formed by the granulite facies isograd (Nel, 1827; Bisschoff, 2000), or more correctly perhaps, by the hornblende granulite subfacies transition to the pyroxene granulite facies. Hart and Andreoli (1986) and Hart et al. (1991) used the term "Vredefort Discontinuity" for the boundary line, seen as a migmatite, in the Schulpiespruit, south of Parys. However, due also to bad outcrop conditions, the continuity of the migmatite cannot be demonstrated. The fact that there is a lithological difference between the OGG and the ILG cannot be disputed. Within the ILG, inclusions ("relicts," Stepto, 1990) constituting the Steynskraal Formation (Stepto, 1979, 1990) are found. These consist mainly of metasediments, but also metabasites and metabasites (Bisschoff, 1988), as well as part of the migmatite.

Exposures in quarries such as those at Leeukop on the farm Koppieskraal 517 IQ and at Otavi 760, the field exposure between the Otavi Quarry and the old Dannhauser farmhouse, the exposure at Spitskop 1060 south of the Vaal River approximately 11 km west of Parys, and some exposures in the bed of the river (Daskop, Free State, southwest of Parys; the riverbed at Shand's (1918) pseudotachylite discovery site under the road bridge to Potchefstroom), indicate that the OGG can be described as a megabreccia. In this megabreccia, the clasts are rounded and the "breccia" is cemented by pseudotachylite. Willemse (1937) measured a great diversity in fabric orientations in various granite exposures, between 8 and 11 km east and 5 km southwest of Parys. Measurements of the foliation, evident in the OGG away from the ring boundary by the present authors, yielded orientations that may best be described as randomly distributed, but a parallel orientation may exist in proximity to the overlying Dominion lava. However, a credible fabric analysis of the OGG has yet to be done. Dykes found within the western sector of the OGG were overturned in sympathy with the overlying Witwatersrand beds (Bisschoff, 1972).

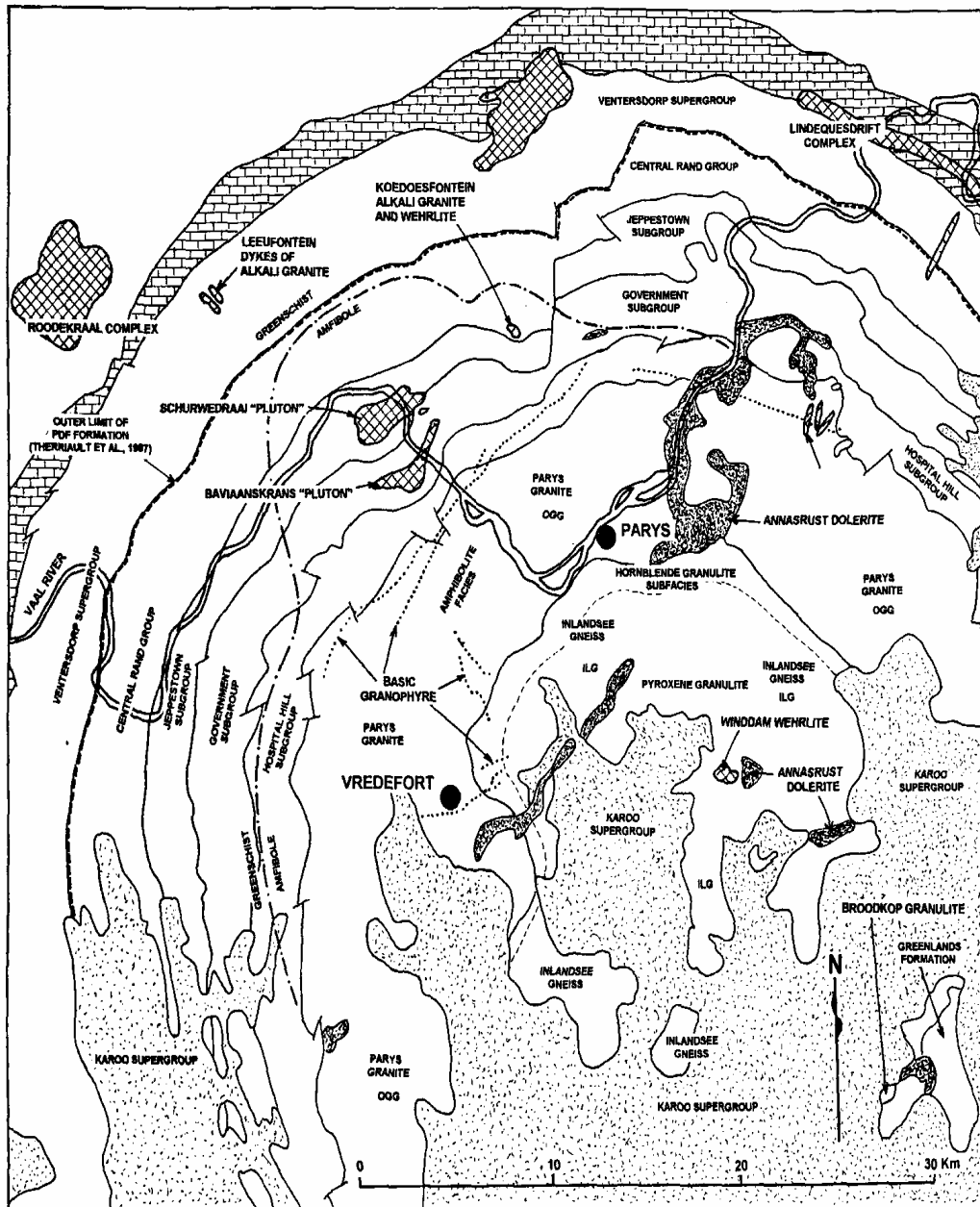


FIGURE 28.
THE CENTRAL PORTION OF THE ASTROBLEME, SHOWING THE DISTRIBUTION OF VARIOUS ROCK TYPES AND THE PROGRESSION OF METAMORPHIC MINERALISATION TOWARDS THE CENTRE OF THE STRUCTURE.

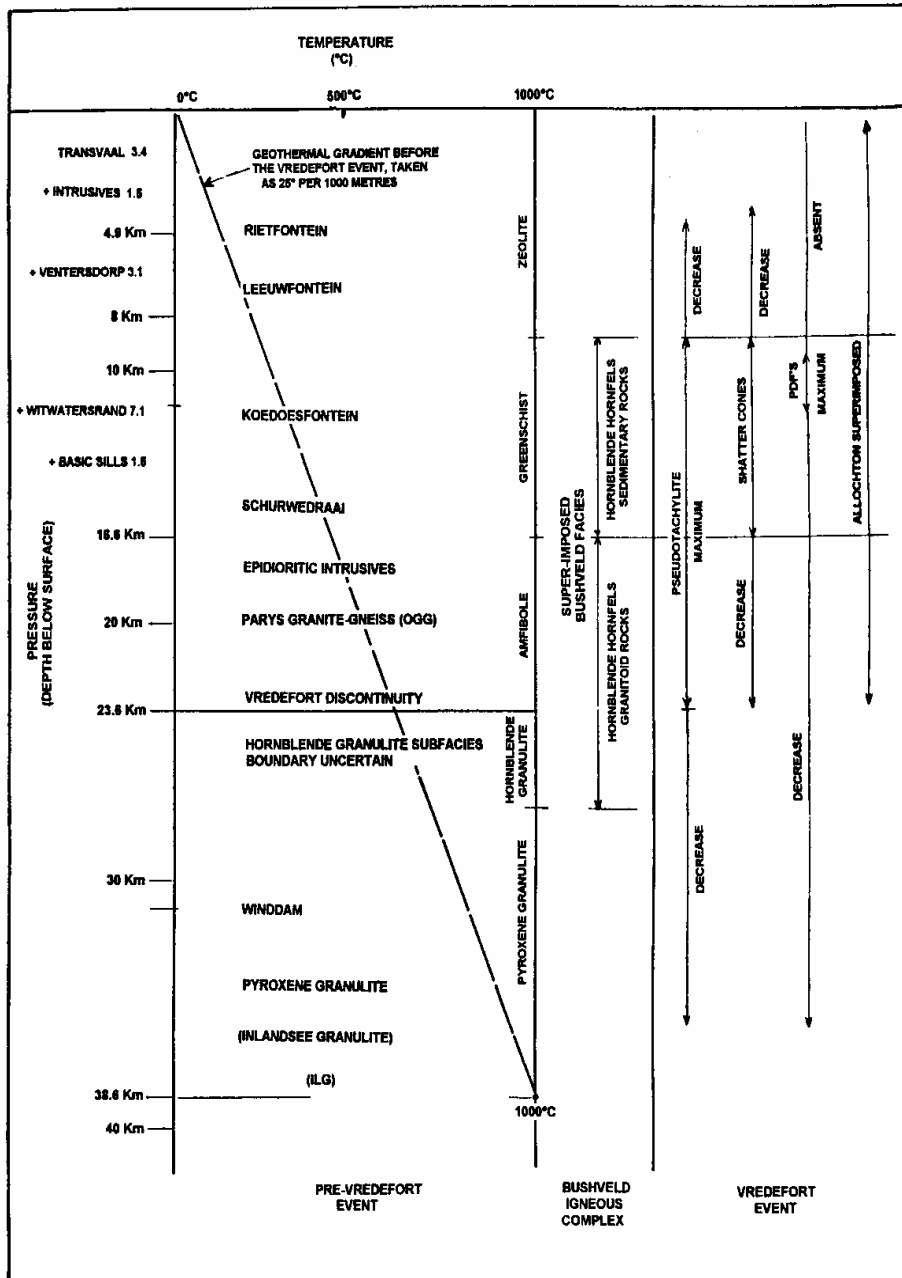


FIGURE 27. CONCEPTUAL P-T DIAGRAM, SHOWING DEPTHS OF BURIAL, DERIVED FROM THE VARIOUS METAMORPHIC MINERALS FOUND NEAR THE CENTRE OF THE STRUCTURE.

According to their strike orientations, intrusives of granophyre can be divided into two groups. One group strikes subparallel to the overturned basal Dominion lava and sediment/granite contact, approximately concentrically to the core. The strike directions of the second group, found in the vicinity of Vredefort Town (Figure 26), cross near the centre of the core. The intrusions can be divided into a radial group and a concentric group.

The compositions of all of the intrusives of basic granophyre are similar (Willemsse, 1937), irrespective of the rock type in which they are found (Bisschoff, 1962). Intrusions of basic granophyre contain large amounts of quartzitic and granitic clasts, but no pseudotachylite. They were emplaced after overturning and the formation of the pseudotachylite (Hall and Molengraaff, 1925; Nel, 1927; Bisschoff, 1962, 1972, 1996; Manton, 1962). None of the clasts came from strata younger than the Witwatersrand Supergroup and their origin remains obscure. Walraven et al. (1990) dated the granophyre (4 point Rb-Sr whole rock and mineral isocron) at 1931 ± 26 Ma, younger than their age for the Vredefort Event).

1.2.11. CONCLUSIONS

The structure of Vredefort is well enough exposed for mapping to depict its evolution. The northwestern sector has been mapped in reasonable detail and palinspastic sections were constructed that explain virtually every aspect.

Even in the southern half, covered by the Karoo Supergroup, the structure is sufficiently well known from prospecting boreholes, vibroseis sections, geophysical maps and gold mining tunnels for a credible structural map to be constructed. At least up to 80% of the circumference of the Rand Anticline, which may be regarded to be the outer rim of the ordered, inner structure is exposed in this manner. Beyond this, much of the outer system of lobate nappes can be identified by the intersections of their faults with the chert beds of the Malmani Subgroup. In these beds, the chert contained in the fault ramps exploded on detachment and sudden stress release, to form linear, fault pseudotachylite associated bodies displaying the effects of chocolate tablet-type boudinage. Some of the chert displaying this phenomenon is found in a uniquely voluminous body, where the Foch Thrust Fault detached over the ramp created by the steepening of the distal limb of an annular dent. The dent and central uplift evolved into the Potchefstroom Synclinorium. The exploded chert beds of the Malmani Subgroup now form the "Giant Chert" breccias, probably the largest body of cherty rock with a pseudotachylite-like matrix found on earth. The qualification ("pseudotachylite-like") is born out of humility! But then, considering that the body is intersected by a multitude of fault frictionally generated chert pseudotachylite, this occurrence must qualify to be the largest body of pseudotachylite on earth.

Structurally, the most significant characteristic is the great allochthonous body of highly disturbed material that once lay on the crater floor detachment of the structure. Although more than 25 kilometres wide, this ring bears much of a resemblance to the frilled collars of some centuries ago and it may rightly be called the collar of the structure. It is possibly the final, undeniable proof that the Vredefort Structure is an astrobleme.

2. REPRESENTATIVE FEATURES THAT IDENTIFY THE STRUCTURE TO BE AN ASTROBLEME

2.1. GENERAL DESCRIPTION OF THE "CLASSICAL SUITE" OF IMPACTITES

2.1.1. INTRODUCTION

The term "impactites" is used for all rocks formed during an impact event. These may include shock-metamorphosed target rocks, breccias and impact melts.

During the last 20 years, the preference in opinion for an endogenetic origin for the Vredefort Structure has shifted to an exogenetic one, i.e. from one that attributed the formation of the structure to volcanism, to one that accepted the cause to have been the impact of an extra-terrestrial body. At the root of the controversy was the fact that the inner portion of the structure resembles a lunar ring structure. Although Vredefort is clearly a ring structure, the most obvious ring-form element is the overturned collar. It was not until very recently recognised to be part of an extraordinary allochthonous body which had no known parallel in the lore and history of craters. Vredefort is also extraordinary in that it displayed the effects of intense deformation of strata, obviously related to a very great energy-release episode, that rocks which were exhumed from very great depths, now occur in the centre and that the structure, as mapped, was obviously made up of concentric shapes (but polygonal, in some opinions). In Section 1, the structure around Vredefort was described to be an astrobleme, with new evidence indicating the answer to previously unanswered problems such as the site and magnitude of the crater and how it evolved in the short time after impact.

A second part of the answer was made available some time ago, in the descriptions of some classical characteristics of impact zones, found around the inner structure also of Vredefort, that could only be attributed to an impact. It is now accepted that the planar features in quartz grains (PDF's; Grieve et al, 1990a and b; French and Short, 1968; Stöffler, 1972; Alexopoulos et al., 1998; shatter cones (distinctively curved, striated joint surfaces; Dietz, 1961) and the occurrence of pseudotachylite and the occurrence of coesite and stishovite (high pressure polymorphs of quartz; Stöffler, 1971, Martini, 1978, 1991) must be accepted to comprise conclusive evidence in support of an impact hypothesis. All of these could only have formed in the extremely high energy conditions generated by impact. Significantly, all of these features are present in the Vredefort Structure. In addition to this, the very morphology of the structure also indicates an impact origin.

Tables 1 and 2 (both from French, 1998) provide a distinction between shock metamorphism-related and other geological processes, and also shock pressures and the effects they create.

2.1.2. PLANAR DEFORMATION FEATURES

Planar features are closely spaced, parallel, microscopic planes, that occur in shock-metamorphosed minerals (particularly quartz and feldspars) and are regarded as unique and important indicators of shock-metamorphism, where pressures as high as 10-30 GPa may have been experienced. PDF's are not cleavage planes and they are invisible to the naked eye. In Vredefort, the quartz fragments and pebbles of pre-shock age that survived the impact have a cloudy, sintered appearance. Many of the clouded quartz clasts and crystals of Vredefort also display quartz lamellae, on a naked eye scale, which may constitute a hitherto unrecognised shock phenomenon.

PDF's are characteristically multiple and oriented parallel to specific planes in the host crystal lattice and are supposed to cut across cleavages. Because quartz possesses no cleavage and in feldspar, cleavages are parallel to (001) and (010), quartz is used preferentially in the study of PDF's. According to Carter (1968), PDF's that are partly healed or annealed and decorated with minute bubbles, voids or inclusions occur as two or more intersecting sets of lamellae. In quartz, the most numerous lamellae are parallel to (0001), and less in other crystallographic directions.

Characteristic	Regional and Contact Metamorphism; Igneous Petrogenesis		Shock Metamorphism
Geological setting	Widespread horizontal and vertical regions of Earth's crust, typically to depths of 10–50 km		Surface or near-surface regions of Earth's crust
Pressures	Typically < 1–3 GPa		100–400 GPa near impact point; 10–60 GPa in large volumes of surrounding rock
Temperatures	Generally ≤ 1000°C		Up to 10,000°C near impact point (vaporization); typically from 500° to 3000°C in much of surrounding rock
Strain rates	10 ⁻³ /s to 10 ⁻⁶ /s		10 ⁴ /s to 10 ⁶ /s
Time for completion of process	From 10 ⁵ –10 ⁷ yr		"Instantaneous": Shock-wave passage through 10-cm distance, < 10 ⁻⁵ s; formation of large (100-km-diameter) structure < 1 hr
Reaction times	Slow; minerals closely approach equilibrium		Rapid; abundant quenching and preservation of metastable minerals and glasses

TABLE 1. SHOCK METAMORPHISM: DISTINCTION FROM OTHER GEOLOGICAL PROCESSES.

Approximate Shock Pressure (GPa)	Estimated Postshock Temperature (°C)*	Effects
2–6	<100	Rock fracturing; breccia formation Shatter cones
5–7	100	Mineral fracturing: (0001) and {10 $\bar{1}$ 1} in quartz
8–10	100	Basal Brazil twins (0001)
10	100*	Quartz with PDFs {10 $\bar{1}$ 3}
12–15	150	Quartz → stishovite
13	150	Graphite → cubic diamond
20	170*	Quartz with PDFs {10 $\bar{1}$ 2}, etc. Quartz, feldspar with reduced refractive indexes, lowered birefringence
>30	275	Quartz → coesite
35	300	Diaplectic quartz, feldspar glasses
45	900	Normal (melted) feldspar glass (vesiculated)
60	>1500	Rock glasses, crystallized melt rocks (quenched from liquids)
80–100	>2500	Rock glasses (condensed from vapor)

* For dense nonporous rocks. For porous rocks (e.g., sandstones), postshock temperatures = 700°C (P = 10 GPa) and 1560°C (P = 20 GPa). Data from *Stöffler* (1984), Table 3; *Melosh* (1989), Table 3.2; *Stöffler and Langenhorst* (1994), Table 8, p. 175.

TABLE 2. SHOCK PRESSURES AND EFFECTS.

Most rock forming minerals, shocked at moderate to high pressures (> 10 GPa) exhibit straight and narrow optical contrasts, which are interpreted as thin transformation lamellae, composed of glass. They have been described by terms such as shock lamellae, planar elements, planar features, but the term planar deformation features or PDF's (Grieve et al., 1990a) is now accepted. The presence of PDF's is confined to within the outer limit of the Witwatersrand Supergroup rocks that ring the structure (Figure 26; from Thériault et al, 1997)

Grieve et al. (1990b) and Fricke et al. (1990) observed that most of the PDF's from Vredefort possess a basal (0001) orientation, but some are parallel to other PDF planes, e.g. (1012) and (1013), particularly in relict grains from close to the centre of the structure. Compared to those from other large impact structures, this was anomalous. In answer to the problem, it was proposed that post-shock thermal metamorphism had caused the wide-spread annealing of features, and a bias towards (0001) orientations. These authors then concluded that, although to be appearing anomalous, they were nevertheless consistent with a shock (impact) origin.

This, in conjunction with the results of previous deformation experiments reported by MacLaren et al. (1967), who indicated that deviatoric stresses in excess of 4 GPa are necessary to generate such twins, strongly supports the impact hypothesis. Brazil twinning was also observed in shocked quartz from sediments from the cretaceous boundary, but never from tectonically deformed quartz.

Leroux et al. (1994) used optical and transmission electron microscopy to investigate the defect microstructures in quartz grains from different rock types, found at various sites in the Vredefort Structure. In almost all cases observed by Leroux et al. (1994), the bubble trains decorate thin mechanical Brazil twin lamellae. In all of the samples analyzed, Leroux et al. (1994), found evidence of high-temperature annealing that overprints the microdeformation. However, the presence of Brazil twinning led them to conclude that their findings regarding microdeformations in quartz are consistent with an impact origin for the Vredefort Structure.

Only thin mechanical Brazil twin lamellae in the basal plane are observed by T.E.M. techniques. These are always associated with thin glass lamellae in rhombohedral planes (101 n) with $n = 1, 2, 3$ and 4. At optical microscope scale, Brazil twins in (0001) are easily detected in quartz grains from Vredefort, because they are decorated by numerous tiny fluid inclusions. Similar tiny fluid inclusions aligned parallel to other planes are also detected optically, but TEM imagery failed to detect specific shock effects along their traces. These may have originally have been shock features, but they are now severely altered by weathering and their identification as shock lamellae is ambiguous. The Vredefort event occurred 2000 Ma ago and it has a longer history of thermal resetting than most other such structures.

Because they only exist on microscopic scale, quartz shock lamellae must be identified under the microscope. However, co-ordinates for two sites, both with lamellae in crystalline vein quartz, probably formed during the middle Ventersdorp age of extensional faulting, are given.

2.1.3. COESITE AND STISHOVITE

Polymorphs of quartz (coesite and stishovite), formed under extremely high pressure conditions (stishovite, 12-15 GPa; coesite, > 30 GPa) were recognised by means of a SEM in veins formed in Vredefort Rocks by Martini (1978, 1991). White (1992) investigated one of Martini's (1978) specimens and confirmed the presence of these polymorphs. He also found PDF's in the quartz contained within a narrow pseudotachylite veinlet, but not outside it.

The occurrence of coesite in the vicinity of pseudotachylite veins indicates a minimum pressure of about 2 – 3 GPa, which supports the impact hypothesis.

Leroux et al. (1994) found fine-grained coesite in the vicinity of narrow pseudotachylite veinlets in a quartzite specimen, but no stishovite, even in areas where stishovite was previously reported. Stishovite has never yet been found in a non-impact site. Unfortunately, these minerals cannot be seen or found with the naked eye.

2.1.4. SHATTER CONES

"Shatter cones" or rocks displaying curved, striated joint surfaces occur ubiquitously in especially the Witwatersrand and some of the granitic rocks of Vredefort. Full cones are only very rarely found in the Vredefort Structure. According to French (1998), shatter cones are the only distinctive and unique shock-deformation features that develop on a hand specimen- to outcrop scale. They are generated at relatively low shock pressures of 2-10 GPa.

Commonly seen partial shatter cones are characterised by distinctively curved, "horsetailed" joint surfaces. Smaller cones may occur on the surfaces of partial cones, to form unique composite or "nested" structures. The surfaces form positive/negative features when fractured. The striations are directional, radiating along the faces of the curved joints to form a distinctive pattern in which the acute angle points towards the apex of the cone. Shatter cones form in all kinds of target rocks. In the Vredefort structure, they are found in shales, quartzites, igneous rocks such as the alkali granite but never in the OGG or in the ILG. Full cones seem to favour the Crown amygdaloidal lava of the Jeppestown Subgroup, but they have also been found in quartzites and the epidiorites. In coarse rocks they may be crude, with longer striations. At one site on Thabela Thabeng, they occur in a greyish, coarse grained mylonite, but also in an associated black pseudotachylite melt in the same fault zone of middle Ventersdorp age. At this stage, the site may be visited by appointment only.

Shatter cones may resemble similar structures, formed in other, non-impact rocks, such as the "cone-in-cone" structures produced by the lithification of carbonate-bearing clastic sediments. However, the axes of cones in these rocks are orientated normal to the bedding of the host rocks and their apexes point downward. Real shatter cones may lie at any angle to the bedding, depending on the pre-impact orientation of the target rock and its location relative to the impact point. The apex angles of "false" cones are small, while those of cones formed by shock are about 100°.

If related to an impact, shatter cones will be found in a variety of rock types in an area. Slickensides may sometimes resemble horsetailing, especially when developed on flat surfaces. However, slickenside striations are parallel and those of shatter cones are radial.

Shatter cones are now generally accepted as indicators of shock pressures and meteorite impact. In smaller astroblemes, they are well developed in the central uplifted zones. In Vredefort, they decrease towards the central ILG. For well-developed shatter cones, it is possible to measure the orientation of the cone axes throughout an impact structure and so to statistically determine the orientation of a master cone, which is a criterion for impact. Manton (1962, Figure 17) obtained a representative sample of shatter cone orientations from around the Dome. However, the beds in which cone-associated surfaces are found, are overturned and have first to be brought to their original orientations before any meaning can be given to the measurements. In a small quarry, as on the Crown Amygdaloidal Lava (Jeppestown Subgroup) at Reitzburg, many totally different orientations can be measured. A rule of the psychology of human perception states that one sees what one is motivated to see. One should therefore be wary of accepting any impact point so derived. Table 3 gives a table from French, 1998, for the distinction between shatter cones and other geological features.

2.1.5. PSEUDOTACHYLITE

In describing pseudotachylite, Shand (1916) stated that the name pseudotachylite has been adopted in recognition of the fact that these rocks have great similarity to tachylite and that they have been mistaken for trap and tachylite. Shand referred only to the matrix, excluding inclusions in the rock type into his definition. He did describe fragments of granite floating in pseudotachylite and he recognised petrographic series, consisting of mylonite→fritted mylonite or flinty crush rock→fused mylonite or pseudotachylite→recrystallised pseudotachylite. This series is temperature and composition-dependent.

It is doubtful that Shand ever implied that pseudotachylite should be the final, melted end member of a range of fault smears ranging through mylonite ("milled" rock flour) through ultramylonite to pseudotachylite, which should then be a melt rock. Shand never restricted the term to rocks that exhibited, exclusively, only the effects of melting. Amongst Vredefort geologists, the present usage of the term signifies a very special case of a breccia, of which the matrix may sometimes, but not always, exhibit characteristics that are indicative of melting. It should be remembered that the term was coined to apply to Vredefort, although similar rocks are found at other localities such as Sudbury in Canada, Rochechouart (France), Manicouagan (Canada), etc. At Vredefort, one of the most outstanding characteristics is that all fragments, including some of more than a metre in size, possess rounded outlines. Even the smallest fragments contained in the matrix are rounded. The fragments consist virtually exclusively of the country rock, but some may be derived from occurrences more than a hundred metres away. Megascopically, the matrix may resemble a dusty powder, which may be recrystallised. Crystallisation from a molten stage does occur.

In describing the granitic host rock characteristics, Shand stated that the absence of shearing and cataclastic phenomena in the granite can only be accounted for by supposing the fractures to have been produced by sudden yielding of the granite in response to a sudden stress. We hold that, because faulting of this type is made obvious by its total absence of discernable fault planes or fault fillings or anything that can be attributed to faulting, this type of fracturing can only be produced by a sudden stress release. Shand stated that the pseudotachylite has originated from the granite itself through melting, caused not by shearing but by shock, or alternatively, by gas fluxing.

In Vredefort, Shand-type pseudotachylite can be described in the following terms:

1. In the quarry at Otavi and its environs, the following characteristics are found:
 - a. Veins or gashes filled with pseudotachylitic material strike and dip in every conceivable direction.
 - b. Displacements measured over the gashes are seldom large. They are distensional, i.e. caused by the widening of the gash during the emplacement of the pseudotachylite.
 - c. The pseudotachylite zone is spread over an area of 0.5km by 0.75km. It does not occupy a linear area, as could be expected, should it be associated with any obvious faulting. The Martin quarry at Leeukop, west of Parys in the Northwest Province, displays very similar characteristics.
 - d. Pseudotachylite is older than the basic granophyre
2. In the central structure, Vredefort type pseudotachylite is found in all rocks of pre-Waterberg age, except for the basic granophyres.
3. Pseudotachylite is found as far out as the Roodekraal Igneous Complex. It occurs in all of the rock types that make up the Roodekraal assemblage. Except for the Roodekraal rocks and associated igneous complexes such as Rietfontein and Schurwedraai, it is virtually absent from the floor rocks below the Ensels Allochton.

4. Pseudotachylite is older than the basic granophyre. The granophyre is intrusive into pseudotachylite and glassy selvages of granophyre are found against the pseudotachylite.
5. Pseudotachylite is younger than the "shatter cones," which are never found in pseudotachylite of the Vredefort type, but only in inclusions contained within the pseudotachylite. Shatter cones do occur in frictionally derived "pseudotachylite" within the collar rocks, but this type was generated on an old fault, which conforms in attitude to an offshoot of the old, middle Ventersdorp age extensional fault postulated by Brink et al. (1997). This fault zone is up to several metres thick, frictionally generated, containing mylonite, ultramylonite and black flows of a melt product which could be termed pseudotachylite, but is clearly not a Vredefort type of the rock type. Both the black melt rock and the mylonitic components display "shatter cone" surfaces.
6. Larger bodies of pseudotachylite contain an abundance of rounded inclusions of every conceivable size, up to a metre in diameter, derived from the adjacent country rock.
7. It may contain exotic inclusions, not related to the immediate country rock contacts and up to 30 to 40 metres away from the nearest rock types from which they may have been derived.
8. In Otavi, basic inclusions occur at the intersection of 2 to 3 pseudotachylite veins, with a larger diameter than the width of the veins that in which the inclusions are enclosed.
9. In both the Otavi and Marlin quarries, indications of sidewall stoping, possibly by mobile pseudotachylite can be observed.
10. Gravitational sinking and settling of rounded inclusions towards the bottom of a body indicates that the pseudotachylite was in a stable state, immediately after its emplacement (the "Marlin spirit level"). Had the Marlin granite been overturned, overturning must have taken place before the emplacement of the pseudotachylite.
 NB: To repeat the conclusion: this is an indication that the OGG, in which it was emplaced, was not overturned during or after the generation of the pseudotachylite. Should the OGG have been overturned, overturning must have taken place before the emplacement of the pseudotachylite. This may be an indication that the pseudotachylite was generated during a very late stage in the evolution of the structure.
11. Strikes, dips and thicknesses of the same vein may vary greatly with distance. Veins may suddenly terminate.
12. In some instances, pseudotachylite may form networks of thin veinlets in a coarsely crystallised rock, with the brecciated fragments not displaying signs of having been displaced for more than the thickness of the separating veins (compare Nel, 1927, plate VII, p 92). This is a prime example of fracturing by chocolate tablet boudinage. The rock exploded, and the matrix now consists of pseudotachylite. It seems that this type of boudinage will develop in a rock type with a jointless fabric, when a massive compressive hydrostatic stress field is suddenly inverted into a tensile one equal to the cohesive stresses that hold the particles together (Ramsay, 1967). The result is that the rock will break apart with explosive violence. We submit that rocks found near the core, such as the epidiorite in Nel's (1927) example, exploded in this manner upon the release of confining stress caused by the emplacement of the impactor of Vredefort. The release of confining stress and the consequential, rebound associated explosive expansion of the near-core rocks of Vredefort, caused a multitude of gashes to form, below surface. The process implies the concurrent formation of a vacuum, into which dust and even large rock fragments were sucked, and the sides were abraded. Rock fragments were immediately rounded, but not frictionally smeared, as when two moving rock masses are in frictional, heat generating contact. Dust particles merely filled all of the openings. Larger fragments and even dust-size particles were

rounded by abrasion as they were suctionally transported in the system.

13. Flow structures may sometimes be observed in some of the veins. Others display distinct selvages or chill zones along their boundaries. However, in most instances pseudotachylite possesses a homogeneous, "isotropic" texture.
14. Especially where a granitic composition is evident, some of the veins may consist of a lighter coloured, mylonite fraction (usually in the border zones) and a darker, mobile, "molten" core that displays an intrusive relationship into the mylonitic portion. In its fine-grained fraction, this mylonitic portion usually displays spherulitic feldspar crystallisation.

2.1.6. PSEUDOTACHYLITE, RELATED TO THE RAMPS OF THRUST FAULTING, IN THE VREDEFORT EVENT CONTEXT

Outside the Ventersdorp Supergroup of the collar, rocks, especially those consisting of the cherts of the Malmani Subgroup that were associated with the first components of centrifugal movement, exhibit a type of brecciation peculiar to this part of the astrobleme. Breccias were formed within the ramps, up against which material was transported by thrust faulting. Particularly, the boudinage affects chert beds thicker than about 1 metre, ubiquitously found interbedded within the Malmani dolomite, where these are overlain by the faults. The brecciation is typically of the "chocolate tablet brecciation" type (Wegman, 1932), characteristic of stress release in a hard rock type, with angular shapes rather than the round ones seen as inclusions in the Shand-type of pseudotachylite. The mechanism can be attributed to the release of very high stresses that occur in ramp zones, immediately prior to failure and the propagation of thrust faulting over the ramp. Upon stress release, chert cannot behave elastically and the stress, now tensile, eventually exceeds the internal cohesion of the chert, causing it to explode.

The breccias so formed, are spatially related to frictionally generated "pseudotachylite" on the planes of some of the ring faults of the astrobleme, but they were not generated by fault-friction. There is no reason not to accept that the matrix of the breccia beds, although consisting of recrystallised chert, is not of an origin similar to that of the Shand-type pseudotachylites. The chocolate tablet-type chert-pseudotachylite cemented breccias with fragmented inclusions still exhibiting the effects of chocolate tablet-type boudinage may attain a thickness of more than a hundred metres. Because of their close association with impact-related ring faults that intersect the dolomites, the distinct brecciation affords a very good criterion for the recognition of Vredefort-related faults. They are a prime tool for the deciphering of the relative ages of tectonic movement in the outer sectors of the astrobleme.

2.1.7. REPRESENTATIVE FEATURES FOUND WITHIN THE PROPOSED WORLD HERITAGE SITE

PRE-IMPACT	Supergroup	Feature Description	Location	Coordinates	
PRE-IMPACT	Witwatersrand Supergroup	Gold reef-type conglomerates	1. Rooderand	S 26°53.981 E 27°14.592	
	Ventersdorp Supergroup	Old fault, broken up during the impact event extensional, cut by shatter cones in mylonite/pseudotachylite	2. Thabela Thabeng	S 26°51.016 E 27°16.117	
	Transvaal Supergroup	Stromatolites in dolomite	3. Grootedrift	S 26°53.581 E 27°07.904	
	Intrusions of the Bushveld Igneous Complex	Alkali granite	4. Lookout point at Koedoeslaagte	S 26°51.172 E 27°20.330	
	Hornfelses	Various types	5. Parson's Rust		
			6. Vaal River below Donkervliet	S 26°52.785 E 27°21.465	
			7. Klein Buffelskloof	S 26°49.44 E 27°19.019	
	POST-IMPACT	Shock-related	Shatter cones	8. Thabela Thabeng	S 26°50.780 E 27°16.58
				9. Road through Rooderand	S 26°52.594 E 27°15.120
			The Breaker Fault	10. Western boundary road from the Potchefstroom-Parys road South to Nootgedacht	About 20 km
		Fault movement-related	The Ensels Fault Plane	4. Lookout point at Koedoeslaagte	S 26°51.172 E 27°20.330
			Blocks shifted above the old crater floor, in the allochthon	Ubiquitously	
				11. Dampoort	S 26°54.540 E 27°18.427
				12. Koedoesfontein	S 26°49.005 E 27°20.382
			13. Bakenkop	S 26°49.244 E 27°19.358	
			1. Rooderand	S 26°53.981 E 27°14.592	
		Overturned dip slopes of Hospital Hill quartzites	14. Kommandonek (Free State)	S 26°53.360 E 27°21.701	
		11. Dampoort	S 26°54.540 E 27°18.427		

**2.1.8. REPRESENTATIVE FEATURES FOUND OUTSIDE, BUT ADJACENT TO THE PROPOSED
WORLD HERITAGE SITE**

PRE-IMPACT EVENT

Old life forms – stromatolites	15. Rooipootje	S 26°26.450 E 27°16.178
--------------------------------	----------------	----------------------------

POST-IMPACT EVENT

Shock-related

Pseudotachylite	16. Old Marlin Quarry	S 26°53.787 E 27°24.451
	17. Shand's discovery site below road bridge In Parys	S 26°54.030 E 27°26.775

Fault movement related

Chocolate tablet-type boudinage	19. Grootedrift	S 26°55.138 E 27°08.090
	18. Feesdrift	S 26°56.128 E 27°07.678

Post Shock

**Basic Granophyre intrusives
Around inner zone of collar**

20. Lesothoskraal/Daskop	S 26°56.568 E 27°23.47
--------------------------	---------------------------

RECENT

Caves in dolomite	3. Grootedrift	S 26°55.138 E 27°08.090
	18. Feesdrift	S 26°56.128 E 27°07.678

3. A COMPARISON: EARTH'S COMPLEX IMPACT STRUCTURES

COMPLEX METEORITE IMPACT STRUCTURES	DIAMETER (km)	ESTIMATED ENERGY RELEASE	SOME SURFACE EXPOSURE	TOTALLY BURIED	SUBSEQUENT DEFORMATION	LINK TO MAJOR EVENTS	EVIDENCE OF METEORITE IMPACT
BOSUMTWI GHANA	10.5	11000 MT	X				MELT GLASSES PSEUDOTACHYLITE SHOCKED MINERALS
ROCHECHOUART	23	87 000 MT	X			LATE TRIASSIC	PSEUDOTACHYLITE BRECCIA DYKES PDF's
RIES GERMANY	24	87000 MT +	X				ALLOCHTON/AUTOCHTON RING SUEVITE CHONDRULES BUNTE BRECCIE COESITE SILICON CARBIDE & DIAMONDS
CHAR.EVOIX CANADA	54	1 300 000 MT	X				SHOCKED MINERALS
MANICOUAGAN CANADA	100	11 000 000 MT	X				SHOCKED MINERALS DIAPLECTIC GLASS
POPGAI RUSSIA	100		X			EOCENE/OLIGOCENE	SHOCKED MINERALS DIAMONDS
SUDBURY CANADA	140 (MELOSH, P 170)	87 000 000 MT			HIGHLY		IMPACT MELT POLYMICT BRECCIAS FULLERINES SHATTER CONES PSEUDOTACHYLITE RINGS
CHICXULUB MEXICO	1807	87 000 000+ MT				C/T EXTINCTION	MULTI RINGS EJECTA, WITH QUARTZ PDF's DIAMONDS
VREDEFORT SOUTH AFRICA	380	87 000 000+ MT				POST-2Ga ASCENT OF EUKARYOTIC LIFE FORMS	ALLOCHTON RING SYNCLINE RING FAULTS COESITE, STISHOVITE PDF's SHATTER CONES PSEUDOTACHYLITE SPHERULES

TABLE 3.

Diagram comparing characteristics of some of the larger astroblemes found on earth.

Note that the Bosumtwi structure, Ghana, (the Ashanti crater) may not be a complex astrobleme.

The following points are valid for Vredefort:

1. There is a high degree of preserved evidence for a meteorite impact event.
2. The overturned beds that form the hills were eroded to their present morphology. These now provide a substantial quantity of geomorphological evidence, for the characteristics of near-crater floor remnants.
3. Since its formation, Vredefort was not affected by any substantial tectonic deformation, except for the strike-extension of the Homestead Fault in the south.
4. The astrobleme was exposed to extensive erosion and partly covered by subsequent sedimentation. However, erosional incision exposed some features that would not have been visible in the pristine state.

Evidence of impact present:

1. Circular ring faults and annular syncline
2. Central uplift.
3. Planar deformation features(microscopic).
4. 12. Many detachment fault surfaces.
5. Stishovite and coesite – quartz polymorphs.
6. Impact related breccia (pseudotachylite)
7. Chocolate tablet boudinage
8. Shatter cones
9. Impact melting (granophyre).
10. No crater-fill breccias (but megabreccias)
11. No ejecta deposits (eroded)
12. Many detachment surfaces
13. Much evidence of multiple faulting
14. Except for synclines, no real folding.
No overfolding.

4. LANDOWNER AND COMMUNITY SUPPORT

Since the start of the project by the Free State Department of Tourism Environmental and Economic Affairs (DTEEA-FS) in the year 2000, the community has been involved through various initiatives.

In early 2001, an official from DTEEA-FS had physically visited each farm on the Free State side of the nominated site and communicated the intention of declaring the site a World Heritage Site to the landowners, as well as exploring the possibilities to establish a conservancy similar to the existing one in the bordering North West Province. This was followed, during the following two years, by several meetings with the landowners to communicate progress to them and to establish the conservancy. To this effect, DTEEA-FS delegated an official, who is currently still working in the area and acts as the eyes and ears of the Department.

The proposed site straddles the provincial border between the Free State – and North West Provinces.

On the North West side of the nominated site, the Bergland Conservancy has existed since 1997. It is active, with an updated address list. Members of this conservancy are kept up to date regarding the progress of the process on a regular basis.

Prior the evaluation from Mr Graeme Worboys, an intensive campaign was embarked on to inform all relevant role players about the coming evaluation and to make all role players aware that the evaluation will include visits to schools, landowners, shop owners, etc. Mr Worboys was taken to the role players and interact with them. He also visited the relevant government departments and municipalities. This initiative was carried out on both sides of the proposed site.

One of the affected municipalities, namely Potchefstroom, had initiated, funded and provided a secretariat for a forum which incorporates all role players. This forum is in existence since 2002 with meetings held regularly every three months.

The general consensus in the area is positive, with everyone excited about the listing. Of the total number of landowners in the area (about 146 - property is bought and sold continuously), of which about 84 reside in the NorthWest province, only four were found to be against the listing. Their main concern centers around the possible expropriation of their land and their being removed from it. These farmers inherited their farms from their ancestors and have a sentimental value attached to the land.

It can therefore be categorically stated, with no uncertainty, that the vast majority of role players in the proposed site are positive, and would wish the process of listing the site to be successful.

5. MANAGEMENT

This section should be read in conjunction with Points 4, a to e in the nomination dossier following from page 14 to 22, as well as the relevant appendixes, which describe the management structures and acts relevant to the management of the site.

Since the submission of the nomination dossier during January 2004, the following has happened as far as the management of the proposed site is concerned:

The two provincial departments (NorthWest - DACET and Free State – DTEEA-FS) have established the following structures for the effective and efficient management of the proposed site, until a management authority is declared or established according to the terms of sections 8 and 9 of the World Heritage Convention Act:

- Interim Management Task Team – consisting of representatives from DACET, DTEEA-FS and SAHRA (South African Heritage Resources Agency)

- A Steering Committee – consisting of representatives of the local and district municipalities, provincial Tourism Departments, national Department of Environmental Affairs and Tourism and the NorthWest Parks and Tourism Board
- A Development Forum – as described above
- A Political Forum – where the provincial Members of the Executive Council (MEC or provincial ministers) sits with the mayors of the relevant municipalities affected. This forum represents the political perspective.

Efforts are currently under way from the Interim Management Task Team to appoint consultants to draw up a Strategic Environmental Assessment (SEA) for the site from which will flow an Integrated Management Plan (IMP) for the proposed site. The terms of reference have already been compiled. The estimated time for completion of the SEA is to be April 2005, with the finalisation of the IMP six months later. Funding has already been allocated.

SAHRA is finalising a Cultural Management Plan to be completed by December 2005 for the management of the existing cultural resources in the proposed site

Funding, responsibilities, etc. for the drawing up of regulations to manage the site have already been discussed with the national Department of Environmental Affairs and Tourism. Arrangements for the management of the site are incorporated in the new departmental structure of DTEEA-FS. The North West provincial department (DACET) has delegated the management of the site to the Executive Manager: Regulatory Services and has identified officials within their structure to attend to the conservation, awareness raising, empowerment and capacity building, and tourism responsibilities pertaining to the management of the site

A fact finding mission by the Interim Management Task Team to three existing World Heritage Sites in South Africa (Cradle of Human Kind, St Lucia and Ukahlamba/Drakensberg) took place during early November 2004. The aim of the fact finding was to determine existing management structures currently in use in these areas and deduced from that the most appropriate model to be used in managing the Vredefort Dome. The Task Team is currently evaluating this information.

6. LANDSCAPE CONSERVATION

The proposed site has unique biophysical features, and as such it had been investigated during the mid –1980's by the National Parks Board to be included in the chain of national parks in South Africa. It did not become a national park then, only because the acquiring of the land would have been prohibitively expensive, but the fact remains that it is a unique area. This fact also motivates the present initiative to list the area as a World Heritage Site.

To protect landscape, various institutional and legislative measures exist. The different pieces of legislation are contained in the nomination dossier starting from annexure 7a, the details of which can be gathered from the document. However a short summary of the most important mechanisms to protect the landscape are stated below.

Although the area is situated in two provinces (NorthWest and the Free State), national legislation applies. Examples of this legislation are the Environmental Conservation Act (ECA), National Environmental Management Act (NEMA), National Resources Act, Physical Planning Act, etc. All of these acts are administered by populated national – and provincial government departments. For example, the protection of the biophysical environment is regulated by ECA and NEMA. These two acts are enforced by the national Department of Environmental Affairs and Tourism (DEAT) through the nine provincial departments of Environmental Affairs, in this case DACET and DTEEA-FS. These acts list certain activities which would be illegal if an Environmental Impact Assessment (EIA) with an

accompanying Environmental Management Plan (EMP) is not done and submitted to the provincial and national environmental departments. These acts also provide for Strategic Environmental Assessments to be done. NEMA also provides for the integrated management of the environment, meaning that all legislation from other government departments needs to support the protection of the environment.

Through the Physical Planning Act, the provincial departments can promote the orderly physical development of an area, such as, for example, a province. In the case of the proposed site, physical development can only take place with a permit from the provincial Department of Local Government and Housing. This provincial department draws up national and regional development plans for an area, and all stake-holders as well as government departments are involved in the process. These plans are then used as guidelines in developing the area. All development not conforming to these plans have only a slim chance of succeeding.

Since the proposed site is of high conservation value, the area had been accepted by the environmental departments as a high priority project. To this effect, and Strategic Management and Development plan had been finalized during February 2002. A situation report of the area had also been done during this time, to gain insight into the area and provide development and protection guidelines. Currently an extensive SEA will be produced which, will feed into a extensive Integrated Management Plan for the area by the end of 2005. Regulations to protect the area will also be drawn up by the national Department of Environmental Affairs and Tourism (DEAT) after the listing of the site. These regulations will be according to the National Heritage Resources Act. The main aim of these regulations will be to protect the site's environment.

The inhabitants on the NorthWest side have organized themselves into a conservancy, namely the Dome Bergland Conservancy, which exists since 1997, to protect the area from being exploited. This conservancy is a voluntary organization which has evolved into a section 21 Company according to the Companies Act. It is a non-profit organization which aims to conserve the area. A similar process is being followed on the Free State side.

7. GEOLOGICAL SITE CONSERVATION AND ACCESS

The proposed Vredefort World Heritage site is not an single small site or outcrop, but a region comprising about 47 000 ha. After the identification of the key geological (outcrop) sites in the nomination area, which have only now been identified by means of the geotechnical study presented here, procedures will be put in place to safeguard the sites. The legislation discussed above under point 6 above also applies currently to the site. The protection of the key sites will be addressed in the Integrated Management Plan to be drawn up by the end of 2005. The planned regulations will also cater for the sites and spell out the details out of how the sites will be accessed by public. About all land in the area is privately owned and therefore well controlled by the owners.

Furthermore, the sites are currently not disturbed because they are not generally known. Not even the land owners on whose properties they occur know what the unique features are. This fact had contributed greatly to the good conservation state of the sites and the fact that they have existed for so long without being disturbed. Three of the four sites identified by Mr. Worboys are substantial outcrops that cannot easily be damaged. Of these, the stromatolite site is the exception.

8. PRESENTATION

Please see the discussion above under points 6 and 7 pertaining to the security of the sites.

Planning has already been started to present the grand meteorite story to the public at large. And inter-departmental plans are in the process of being compiled to do a fact finding tour on how World Heritage Sites the world over are presented.

The current thinking is to have an easily assessable site where the Vredefort impact story told through a interpretation centre. Smaller points of significance will then be constructed around the site area, where the details of the event can be displayed and explained. The stromatolite site is a good example of such a smaller site. Its development will also contribute to the its protection. Guided tours will also be instituted to different sites, to enlighten the public as well as to regulate access and thereby contribute to their security.

BIBLIOGRAPHY

- Alexopoulos, J.S., Grieve, R.A.F., and Robertson, P.B. 1988. Microscopic lamellar deformation features in quartz: discriminative characteristics of shock-generated varieties. *Geology*, 16: 796 – 799.
- Bisschoff, A.A. (1962). The pseudotachylite of the Vredefort Dome. *Trans. Geol. Soc. S. Afr.*, 85, 207-225.
- Bisschoff, A.A. (1969). The petrology of the igneous and metamorphic rocks in the Vredefort Dome and the adjoining parts of the Potchefstroom Syncline. D. Sc. Thesis, (unpubl.), University of Pretoria, South Africa. 230 pp.
- Bisschoff, A.A. (1972) Tholeiitic intrusions in the Vredefort Dome. *Trans. Geol. Soc. S. Afr.* 75, 31 – 45.
- Bisschoff, A.A. (1982). Thermal metamorphism in the Vredefort Dome. *Trans. Geol. Soc. S. Afr.*, 85, 43-57.
- Bisschoff, A.A. (1996). Note on the relative ages of the pseudotachylite and the basic granophyre in the Vredefort Dome. *S. Afr. J. Geol.*, 99, 89-92.
- Bisschoff, A.A. (2000) The geology of the Vredefort Dome (Explanation of Geological Sheets 2627CA, CB, CC, CD, DA, DC and 2727AA, AB, Ba; 1:50 000 scale). Council for Geoscience, Pretoria, 49 pp. and map.
- Bisschoff, A.A., Brink, M.C., Waanders, F.B. and Coetzee, M.S. (in preparation). The post-Archaean igneous and metamorphic rocks of the Vredefort Dome.
- Boon, J.D. and Albritton, C.C. Jr., (1938): Established and supposed examples of meteoritic craters. *Field and Lab.* 6: 44-56.
- Brink, M.C. (1986). Tektoniese en stratigrafiese ontwikkeling van die Witwatersrand Supergroep en verwante gesteentes in die gebied noord en oos van Klerksdorp. Ph.D. Thesis (unpublished), Rand Afrikaans University, Johannesburg, South Africa. 317 pp.
- Brink, M.C., Waanders, F.B. and Bisschoff, A.A. and Gay, N.C. (2000a). The Foch Thrust-Potchefstroom Fault structural system, Vredefort, South Africa: a model for impact-related tectonic movement over a pre-existing barrier. *Jour. Afr. Earth. Sci.*, 30, 99-117.
- Brink, M.C. Waanders, F.B. and Bisschoff, A.A. (2000b). The Katdoornbosch-Witpoortjie Fault: a ring thrust of Vredefort Event age. *S. Afr. Jour. Geol.*, 103, 15-31.
- Bucher, W.H. (1963) Cryptoexplosion structures caused from without or from within the earth? *A. J. Sci.*, 261, 1963, 597-649.
- Carter, N.L. 1965. Basal quartz deformation lamellae – a criterion for the recognition of impactites. *Am. J. Sci.*, 263: 786 – 807.
- Carter, N.L. 1968. Dynamic deformation of quartz. In: B.M. French and N.M. Short (Editors), *Shock Metamorphism of Natural Materials*. Mono Book Corp., Baltimore. Pp.453 – 474.
- Cornier, B., Durrheim, B.J., Rodney, B.C., Wilsher, W.A. and Steenkamp, W.B. (1986) Aeromagnetic Coverage of the Witwatersrand Basin and Techniques used in its Interpretation. *Extended Abstracts, Geocongress'86, Johannesburg. Geol. Soc. S. Afr.*, 211-214
- Coward, M.P. (1988) Interpretation of the Gencor V-01-87 Vibroseis line. Gencor Ltd., unpublished.
- De Kock, W.P. (1964). The geology and economic significance of the West Wits Line. In: Houghton, S.H. (Ed.), *The geology of some ore deposits in Southern Africa*. *Geol. Soc. S. Afr.*, Johannesburg, 1. 323-384.
- Dietz, R.S. (1961). Vredefort ring structure: meteorite impact scar? *J. Geol.*, 69: 169-183
- Durrheim, R.B., Cornier, B. and Wilsher, W.A. (1986). The gravity field of the Witwatersrand basin and techniques used in its interpretation. *Extended Abstracts, Geocongress 86. Geol. Soc. S. Afr.*, Johannesburg. 215-218.

- Durrheim, R.B., Nicolaysen, L.O. and Corner, B. (1991). A deep seismic reflection profile across the Archaean-Proterozoic Witwatersrand Basin, South Africa. *American Geophysical Union Geodynamics Series* 22, 213 – 224.
- Fletcher, P. and Reimold, W.U. (1989): Some notes and speculations on the pseudotachylites in the Witwatersrand Basin and the Vredefort Dome. *S. Afr. J. Geol.* 92, pp 223-234.
- Fletcher, P and Gay, N.C. (1972) Analysis of Gravity Sliding and Orogenic Translation: Discussion. *Geol. Soc. Am. Bull.*, 82, 2677-2682.
- French, B.M. and Short N.M. (Editors), 1968. Shock metamorphism of natural materials. Mono Book Corp., Baltimore, 644pp.
- French, B.M.(1998). Traces of catastrophe. A Handbook of Shock-Metamorphic Effects in Terrestrial Impact Structures. LPI Contribution No. 954, Lunar and Planetary Institute, Houston. 120pp.
- Fricke, A., Medenbach, O. and Schreyer, W. (1990). Fluid inclusions, planar elements, and pseudotachylites in the basement of the Vredefort structure, South Africa. *Tectonophysics*, 171: 169-183.
- Friese, A.E.W., Charlesworth, E.G. and McCarthy, T.S. 1995). Tectonic processes within the Kaapvaal Craton during the Kibaran (Grenville) Orogeny: Structural, Geophysical and Isotopic Constraints from the Witwatersrand basin and Environs. *Econ. Geol. Res. Unit Information Circular*, University of the Witwatersrand, Johannesburg. 67 pp.
- Gault, D.E., Guest, J.E., Murray, J.B. Dzurisin, D. and Malin, M.C. (1975). Some comparisons of impact craters on Mercury and the Moon: *J. Geophys. Res.*, 80 (17), 2444-2460.
- Gibson, R.L. and Reimold, W.U. (2001). The Vredefort impact structure, South Africa. *S. Afr. Council for Geoscience Memoir* 92. 111pp.
- Grieve, R.A.F. and Head, J.W. III, (1981). Impact cratering: a geological process on the planets. *Episodes*, 1981(2), 3 – 9.
- Grieve, R.A.F., Sharpton, V.L. and Stöfler, D. (1990a). Shocked minerals and the K/T controversy. *Eos*. 71(46): 1972.
- Grieve, R.A.F., Coderre, J.M., Robertson, P.B. and Alexopoulos, J. (1990b). Microscopic planar deformation features in quartz of the Vredefort Structure: anomalous but still suggestive of an impact origin. *Tectonophysics* 171, pp185 – 200.
- Grieve, R.A.F., Pilkington, M., and Parmentier, E. (1990c). Large impact basins on the early earth. In: *Workshop on meteorite impact on the early earth (Abstract)*; Perth Australia; pp 18-19.
- Hall, A.L. and Molengraaff, G.A.F. (1925): The Vredefort Mountain Land in the southern Transvaal and northern Orange Free State. *Verhandelingen der Koninklijke Akademie van Wetenschappen te Amsterdam*. XXIV,(3). 189pp + Plates.
- Hart, R.J. and Andreoli, M.A.G. (1986): A geological traverse of the Vredefort Structure: the natural equivalent of a 15 km borehole into the Archaean Kaapvaal Craton, South Africa. *Ext. Abst Geocongr.* 86. *Geol. Soc. S. Afr.*, Johannesburg. pp 822-826.
- Hart, R.J., Andreoli, M.A.G., Reimold, W.U. and Tredoux, M. (1991): Aspects of the dynamic and thermal history of the Vredefort cryptoexplosion structure: implications for its origin. *Tectonophysics*, 192: 313-331.
- Henkel, H. and Reimold, W.U. (1998). Integrated and magnetic modelling of the Vredefort Impact Structure. *Economic Geology Research Unit., Witwatersrand Univ., Johannesburg. Information Circ.* 299, 89pp.

- Kamo, S.L., Reimold, W.U., Krogh, T.E. and Colliston, W.P. (1996): A 2.023 Ga age for the Vredefort impact event and a first report of shock metamorphosed zircons in pseudotachylite breccias and granophyre. *Earth and Planetary Science Letters* 144, pp369-388.
- Killick, A.M. and Roering, C. (1995). Movement indicators for pseudotachylite-bearing faults. *S. Afr. J. Geol.*, 98. 382-385.
- Kirk, J., Ruiz, J., Chesley, J. Walshe, J. and England, G. (2002). A Major Archaean, Gold- and Crust-Forming Event in the Kaapvaal Craton, South Africa. *Science* 297, 1856 – 1858.
- Lana, C., Gibson, R.L., Reimold, W.U. and Minnitt, R.C.A. (2003) *Geology and Geochemistry of a granite-greenstone association in the southeastern Vredefort dome, South Africa.* *S. Afr. J. Geol.*, 106, 291-314.
- Leroux, H., Reimold, W.U. and Douhan, J-C. (1994). A T.E.M. investigation of shock metamorphism in quartz from the Vredefort Dome, South Africa. *Tectonophysics*, 230. 223-234.
- Manton, W.I., 1962. The orientation and implication of the shatter cones in the Vredefort ring structure. M.Sc. Thesis (unpubl.) Univ. of the Witwatersrand, Johannesburg., 167 pp.
- McHone, J.F. and Nieman, R.A. (1988) Vredefort stishovite confirmed using solid-state silicon-29 nuclear magnetic resonance. *Meteoritics* 23, p 289.
- McLaren, A.C., Retchford, J.A., Griggs, D.T. and Christie, J.M. 1967. Transmission electron microscope study of Brazil twins and dislocations experimentally produced in natural quartz. *Phys. Status Solidi*, 19: 631 – 644.
- Manton, W.I. (19162) The orientation and implications of shatter cones in the Vredefort Structure. M. Sc. Thesis, Univ. Witwatersrand, Johannesburg (177pp. Unpublished.
- Maree, B.D. (1944). The Vredefort Structure as revealed by a gravimetric survey. *Trans. Geol. Soc S. Afr.*, 48, 71-72.
- Martini, J.E.J., 1978. Coesite and stishovite in the Vredefort Dome, South Africa. *Nature*, 272: 715 – 717.
- Martini, J.E.J., 1991. The nature, distribution and genesis of coesite and stishovite associated with the pseudotachylite of the Vredefort Dome, South Africa. *Earth Planet. Sci. Lett.*, 10: 285 – 300. .
- Melosh, H.J. (1989): *Impact cratering – A Geologic Process.* Oxford Univ. Press. New York. 245 pp. 1989
- Molengraaff, G.A.F. (1891): *De geologische gesteldheid van de goudveldes op het Hoogeveld in de Transvaal.* Hand. 3e Ned. Nat. en Geneesk. Congress, pp 340-345.
- Nel, L.T. (1927). *The geology of the country around Vredefort.* Spec. Publ. Geol. Surv. S. Afr., 6, 134 pp.
- Ramsay, J.G. *Folding and fracturing of Rocks.*(1967). McGraw-Hill, Inc., New York. 568pp
- Shand, S.H. (1916). The pseudotachylite of Parijs (Orange Free State) and its relations to "trapshottengneiss" and "flinty-crush-rock." *Geol. Soc. London, Quarterly Journal*, 72, 198 – 220.
- Sibson, R.H. (1975). Generation of pseudotachylite by ancient seismic faulting. *Royal Astronomical Society, Geophysical Journal* 43, 775 – 794
- Sibson, R.H. (1977). *Fault rocks and fault mechanisms.* Jour. Geol. Soc. London. 133. 191 – 213.
- Slawson, W.F. (1976). Vredefort core: a cross-section of the upper crust? *Geochim. Cosmochim. Acta*, 40: pp117-121.
- South African Council for Geoscience (1984). *Geological map of South Africa. 1 000 000 scale.*
- South African Council for Geoscience (1986). *West Rand Geological Map. Scale: 1:250 000.*
- South African Council for Geoscience (1987). *Trans Witwatersrand Basin Vibroseis line.*
- Spray, J.G. (1992) A physical basis for the frictional melting of some rock-forming minerals. *Tectonophysics*, 204. 205-221.

- Spray, J. G. and Thompson, Lucy M., (1995): Friction melt distribution in a multi-ring impact basin. *Nature*, 373, 130-132.
- Stepto, D. (1979): A Geological and Geophysical Study of the Central Portion of the Vredefort Structure. Ph.D. dissertation. Univ. Witwatersrand, Johannesburg (unpubl.). 378 pp.
- Stepto, D. (1990). The geology and gravity field in the central core of the Vredefort Structure. *Tectonophysics*, 171, 75-103.
- Stöffler, D. 1971 Coesite and stishovite in shocked crystalline rocks. *J. Geophys. Res.*, 76: 5474 – 5488.
- Stöffler, D., 1972. Deformation and transformation of rock-forming minerals by natural and experimental shock processes, 1. Behaviour of minerals under shock compression. *Fortschr. Miner.*, 49: 50 – 113.
- Therriault, A.M., Grieve, R.A.F. and Reimold, W.U. (1997). Original size of the Vredefort Structure, South Africa. *Meteoritics and Planetary Science* 32. pp 71-77.
- Thompson, L.M. and Spray, J.G. (1996) Pseudotachylite petrogenesis: constraints from the Sudbury Impact Structure. *Contrib. Mineral. Petrol.*, 125, 359–324.
- Trieloff, M., Reimold, W.U., Kunz, J., Boer, R.H. and Jessberger, E.K. (1994): 40Ar-39Ar thermochronology of pseudotachylites at the Ventersdorp Contact Reef, Witwatersrand basin. *S. Afr. Jour. Geol.*, 97, pp 365-384.
- Truter, F.C. (1936). Observations on the geology and tectonics of a portion of the Potchefstroom District. *Trans. Geol. Soc. S. Afr.*, 39, 441-456.
- Walraven, F., Armstrong, R.A. and Kruger, F.J. (1990). A chronostratigraphic framework for the north-central Kaapvaal Craton, the Bushveld Complex and the Vredefort Structure. *Tectonophysics*, 171, 7-22. (1990).
- Wegman, C.E. (1932). Note sur le Badinage. *Oc. Geol. France*, 471-491.
- White, J.C. (1993). Shock-induced melting and silica polymorph formation, Vredefort Structure, South Africa. In: Boland, J.N. and FitzGerald, J.G., Eds., *Defects and processes in the solid state: Geoscience applications; The McLaren volume* Elsevier Science Publishers, Amsterdam. 69-84.
- Willemse, J. (1937). On the Old Granite of the Vredefort region and some of its associated rocks. *Trans. Geol. Soc. S. Afr.*, 40, 43-119.

Free State



Province

Enquiries: Coenie Erasmus

Date: 23rd February 2005

Mr Ntsizi November

Deputy Director: Cultural Resource Management

Department of Environmental Affairs and Tourism

Private Bag: X447

Pretoria, 0001

South Africa

Re: Addendum to the Supplementary Information document to list the Vredefort Dome as World Heritage Site

The original nomination document to list the Vredefort Dome as a World Heritage Site was forwarded to UNESCO during January 2004. Additional geotechnical information was required and provided in the Supplementary Information document during November 2004.

This document is in response to the request from David Shepard, Head: IUCN Program on Protected Areas, for clarification on certain aspects of the Supplementary Information document on the Vredefort Dome meteorite impact site.

This document (Addendum to the Supplementary Information document) follows the question line as found in the document received from IUCN, dated 10 January 2005 (attached for convenience)

.....

Coenie Erasmus

Department of Tourism, Environmental and Economic Affairs

34 Markgraaff Street – Bloemfontein – 9301 – Private Bag X20801 – Bloemfontein – 9300

Tel: 051-400 4781 – Fax: 051-400 4811 – Call Centre: 086 110 2185

Web Site: www.freestatetourism.gov.za

AN ADDENDUM TO THE SUPPLEMENTARY INFORMATION DOCUMENT OF THE
VREDEFORT DOME

23rd February 2005

COMPILED BY:
DEPARTMENT OF TOURISM, ENVIRONMENTAL AND ECONOMIC AFFAIRS – FREE
STATE
PRIVATE BAG X 20801
BLOEMFONTEIN, 9300
SOUTH AFRICA

M.C.BRINK, A.A.BISCHOFF, F.B.WAANDERS AND A.E.SCHOCH
P.O.BOX 6308
BAILLIE PARK, 2526
SOUTH AFRICA

1. Technical Description

The revised technical description had been accepted and therefore nothing more was done

2. Nomination Area

The four key geological (outcrop) sites, which includes

- The stromatolite/basal fault plane
- The chocolate tablet breccia site
- The granophyre dyke site (possible melt rock) and
- The pseudotachylite (quarry) site

were discovered/identified after the initial nomination document had been submitted to UNESCO. This can be ascribed to the fact that the provincial authorities encourage ongoing assessment and studies on the site. Therefore the knowledge of the site is being expanded on a weekly basis as new information is gained and projected on the existing knowledge.

During the preparation for the IUCN (Mr Graeme Worboys) inspection August/Sept 2004, many days had been spent in the structure to be able to present the unique characteristics of the site. During these preparations, a number of unique phenomena had been “discovered” and would need to be analyzed to determine their worth. The above-mentioned four sites fell in this category and had been shown to Mr Worboys. He also found them to be worthy of inclusion in the nomination document.

The next step was to assess these sites and compare them to similar sites in the proposed World Heritage Site (core area). Except for the granophyre dyke, no better examples could be found of these phenomena in the core area. Therefore the Department of Tourism, Environmental and Economic Affairs of the Free State (DTEEA-FS) province embarked on a process to contact the landowners and enter into discussions with them to include these sites in the nomination. Investigation on site was also done to determine the extent of each site to be protected, in accordance with the land owner. This was done after the landowners have been satisfied that only small parts of these rocky outcrops or cliff face (quarry) would be needed.

Written statements were obtained from the landowners, attached as appendix 1 to show their willingness for the sites to be protected.

Three of the four geological sites, namely

- The stromatolite/basal fault plane site
- The chocolate tablet breccia site and
- The pseudotachylite (quarry) site

can now be included in the nomination dossier, as satellite sites, to satisfy the necessary conditions of integrity outlined in the Operational Guidelines for the implementation of the World Heritage Convention (July 2002).

The fourth geological site mentioned, namely

- The granophyre dyke site

need not be included since it occurs widely in the proposed site. This fact had been verified after the inspection of Mr Graeme Worboys. Granophyre dykes can be found at several places in the core area

To include the three geological sites, it had been decided to go for a serial nomination and include the sites as satellite sites to the original nomination, instead of expanding the borders of the proposed site. The reasons are that these sites are comparative small (about a hectare each) and separated from the proposed site by several farms (landowners). These landowners/farms do not contribute anything of significance to the proposed core area but will add a few additional landowners to the existing landowners list (already about 140).

The serial nomination had been accepted by this Department (DTEEA-FS) as well the national Department of Environmental Affairs and Tourism (DEAT), as well as the three relevant landowners.

The three sites will have the same status as the proposed core area and will fall under the same legislation as set out in the Nomination Dossier and Supplementary Information documents already submitted. The only envisaged difference will be that these three sites will be fenced to protect the features. These satellite sites are not known. Even the landowners

were not aware of the importance of them. They are also not known by the public at large either. These sites are also unknown as it is situated away from public areas (roads) and as such had survived undisturbed until now. All three are also rocky outcrops, which will not be damaged easily. The owners are now aware of the uniqueness of these sites and had agreed to protection. In the compilation of the Integrated Management Plan, the protection of the satellites sites will be investigated in detail and measures for their protection put forward. The process to compile an Integrated Management Plan is currently in process.

The border of the proposed World Heritage Site (core area) will stay the same as presented in the original nomination dossier, as well as the buffer area. The satellites sites will be added to the he proposed World Heritage Site as in the nomination dossier, to form a serial nomination. The revised map, attached as appendix 2, shows the border of the proposed World Heritage Site as indicated in the Nomination Dossier with the surrounding buffer area, as well as the three new satellite sites. The three satellite sites are shown as dots on the map.

The detail of these three sites can be found in the comparative analysis that follows (point 3 underneath, Comparative Analysis)

3. Comparative Analysis

Pertaining to the comparative analysis as requested, the full document received from Dr. M.C. Brink, Prof. A.A. Bisschoff, and Prof. F.B. Waanders from the School for Chemical and Minerals Engineering, North-West University, Potchefstroom follows. This document had been refereed by Prof. A.F. Schoch from the Department of Geology, University of the Free State. His report follows directly after the comparative analysis.

ADDENDUM

**THE VREDEFORT ASTROBLEME AND SIMILAR TERRESTRIAL
STRUCTURES:**

A COMPARATIVE ANALYSIS

M.C. BRINK*, A.A. BISSCHOFF*, F.B. WAANDERS* AND A.E. SCHOCH**

*School for Chemical and Minerals Engineering; North-West University, Potchefstroom Campus, Potchefstroom 2520, South Africa

**Department of Geology, University of the Free State, Boemfontein, South Africa.

8 FEBRUARY, 2005

Contents	
Executive summary	4
Chapter 1	
Introduction	6
Chapter 2	
Unique characteristics of the Vredefort Structure	7
2.1. Vredefort is a mappable and structurally restorable, unique exposure of the basement of a very large astrobleme	7
2.2. The age and erosional modification of the Vredefort Structure	15
2.3. Magnitude of the crater of Vredefort, before erosion	16
2.4. The Vredefort structure provides a deep stratigraphic section, with unique remanent (“super”) magnetic effects	19
2.5. Structure of the deep-crustal ILG	20
2.6. Domed mantle	20
2.7. The structural geology evident on the remnant crater floor	20
Chapter 3.	
The classical attributes of impact structures	21
3.1. Pseudotachylite: “Spray-type”	21
3.2. Pseudotachylite: “Shand-type”	21
3.3. Characteristics associated with impact-induced shock	22
3.3.1. Shatter cones	22
3.3.2. Planar deformation features	23
3.3.3. High pressure mineral polymorphs: coesite and stishovite	25
3.3.4. Diaplectic glass melting, impact melts and vapourisation	26
Chapter 4.	
Satellite sites	26
4.1. “Shand”-type pseudotachylite	26
4.2. “Spray”-type pseudotachylite, chocolate tablet boudinage, cave formation	27
4.3. Large stromatolites	27
Chapter 5.	

Summary	28
Bibliography	29

Figures

Photos

Impact structures listed by diameter

EXECUTIVE SUMMARY

The impact structure of Vredefort is unique.

This is a fact that cannot be overemphasized. Because a significant portion of the crater was removed by erosion, the Vredefort Structure (“Vredefort”) provides us with the only structurally intact exposure of the basement, below the crater floor, of a very large astrobleme. As such, it affords the only mappable and restorable profile that illustrates the genesis and development of an astrobleme during the very short period of time after impact. There is no other large astrobleme which was exposed in this manner, with which comparisons can be drawn. Others may have pristinely preserved craters, in which all of the rocks that overlie the crater floor are found. Others may be deeply exposed, but so broken and displaced by faulting that only disjointed remnants are left. Vredefort shows a section that reaches from the rocks that once covered the crater floor, through the floor and down into the basement.

Certain of the unique aspects of the structure need to be highlighted because of their significance. These are:

- It is the oldest astrobleme so far found on earth (~2023 Ma). Fossil remains of pre-impact stromatolites (~ 2200 – 2400 Ma old) are found within the rocks once situated within the crater. During the 1990 Meteoritic Society world congress held in Johannesburg, Prof. Philip Tobias, world famous also from work done on fossils at Sterkfontein, read a paper on the possibility that the energy released by the Vredefort event may have contributed to the transition from prokaryotic to eukaryotic life, which occurred in the period from ~2000 to 1400 Ma ago.
- It is the largest: crater diameter ~380 km.
- The crater floor is formed by a discrete displacement surface, called the Ensels Fault. Above the floor, allochthonous rocks range stratigraphically from the annular Outer Granite-Gneiss in the basement to the middle Pretoria Group of the Transvaal Supergroup. Most of the beds below the Ventersdorp Supergroup, and some of the overlying ones, were overturned, with overturning hinging on the Ensels Fault surface.

Vredefort thus provides a definitive exposure of the rocks and structures found on the floor of a large impact crater. Because a sizeable part of the allochthonous strata that originally covered the deep floor of the crater is still intact, it provides a unique window into this important part of an astrobleme. Exposures in mapping and boreholes can now make an end to the conjectural models of overfolding that bedevilled previous interpretations of the structure and provide a new avenue of thinking to what happened in other astroblemes.

- Vredefort provides the only coherent section of the basement below the floor of a large crater. Here, the structural geology was dominated by centrifugally orientated thrust faulting, an effect of the acceleration of crustal material, away from the point of impact. Structural models of astroblemes, based on the pristine ones seen in the solar system, especially on Venus, where only the craters are seen but never their basements, all emphasize that rings are formed by the craterward collapse of the crater, during the stage of modification. In the Vredefort astrobleme, this may well be partly so, but at Vredefort, the basement of the crater is exposed, telling an additional story – before the full development of the crater, fault movement was away from the point of impact. Ring thrusts developed in the basement of the crater-in-formation, and possibly influenced its morphology. The formation of a dent around the point of impact provided a deep, central zone into which the deep central part of the crater was excavated, with most of the subsequently formed modificational faulting eventually moving down its sides.
- There are indications that the central cone of the crater (with the top now cut off and the rest flattened by erosion) rose by approximately 38 km, to give
 - i. a crater diameter of about 380 km.
 - ii. the outcrop equivalent of the deepest borehole ever drilled on earth. Deep crustal rocks (~3500 Ma) to surface. Metamorphic rocks of the pyroxene granulite facies were brought to surface.
 - iii. the consequences of the greatest single energy release event ever to occur on the surface of the earth. Amongst these are shock wave effects seen in quartz and other minerals, and also the stoichiometric arrangement of magnetite molecules.
- Vredefort was not deformed by any tectonism subsequent to its formation, except for the Homestead Fault extension in the southern sector, which is not visible, being buried under the Karoo Supergroup. Sudbury is the only visibly exposed structure of which the original astrobleme was of a comparable age, size and complexity. The basement of Sudbury is not as well exposed and it was broken by younger faulting to the extent that it is impossible to restore the structure to its original morphology.

Some of the “classical” characteristics that accompany high energy impact that are found around virtually all astroblemes are also present at Vredefort. Because these are common, they are of no special significance. However, Vredefort can reveal evidence regarding their genesis that were not previously observed, such as factors concerning the petrogenesis of two types of pseudotachylite and the rocks affected by boudinage that form such an important part of the astrobleme.

Because of its uniquely exposed structure, field research at Vredefort must be a priority. Research into the crater basement will provide further, as yet unsuspected insights. Because of this, its preservation must be an imperative. Even only the fact that it is the world’s largest astrobleme makes it one of the world’s great geological sites, one that belongs to the heritage of all human beings.

The point to make is that Vredefort is incomparable.

THE VREDEFORT ASTROBLEME AND SIMILAR TERRESTRIAL STRUCTURES: A COMPARATIVE ANALYSIS

Chapter 1. Introduction

This part of the report, which highlights aspects of the uniqueness of the Vredefort Structure, (“Vredefort”) should be regarded as an addendum to the original, which was submitted as a geotechnical description.

In reviewing the value of Vredefort as an impact site against other complex impact structures in the world, selection criteria should be derived on which to base its relative importance. Descriptions of general characteristics are easy to find in literature and a comparative list from J.G. Spray’s website is attached as an appendix.

Statistics from the five largest impact craters appearing on the list are as follows:

Manicouagan	Canada	Diameter: 100 Km	Age: 214 ± 1 Ma.
Popigai	Russia	Diameter: 100 Km	Age: 35.7 ± 0.2 Ma
Chicxulub	Mexico	Diameter: 170 Km	Age: 64.98 ± 0.05 Ma
Sudbury	Canada	Diameter: 250 Km	Age: 1 850 ± 3 Ma
Vredefort	South Africa	Diameter: 300 Km	Age: 2 023 ± 4 Ma

From this list, it is evident that Vredefort is accepted to be the largest and the oldest of similar structures found on the surface of the earth. However, to astrobleme scientists these figures do not lead to any greater understanding of the subject of impact structures and they may therefore be regarded to be irrelevant.

The present authors would submit that Vredefort is not substantially comparable to other terrestrial structures, simply because there is very little similarity between Vredefort and the others. “Substantial” must mean the concrete aspects that define an impact event, but that are different in and unique to Vredefort. Such points of difference possess the potential to make an enormous contribution to our knowledge of what happened in the moments after impact. For instance, the uniquely different structural geology evident in Vredefort, but hardly ever mentioned in publications, can make an immense and unique contribution to the understanding of the formation, magnitude and form of these structures. **No comparison can be drawn, because, in this respect, Vredefort is unique and obviously, unique things cannot be compared. The title of this section of the report is therefore probably misstated – what we wish to do is to describe the uniqueness of Vredefort, but unfortunately, not in a strictly comparative manner.** Because the full importance of the exposure at Vredefort is only now being fully realised, the potential unique contribution from the Vredefort Structure was never even expected by authors on classical attributes such as shatter cones or the contents of the deep, near-floor section of a very large crater.

Classical characteristics

About 30 years ago, geologists working on meteorite craters of undisputable origin, identified a set of unique features, suggestive of the conditions of extreme stress that were thought to be indicative of impact-associated explosions. Similar characteristics were subsequently identified in many structures of doubtful origin, which led to a large measure of controversy (e.g. Baldwin, 1949, impact explosion, versus Bucher, 1963, crypto-volcanic). Since then, scientific progress found, firstly, that most, if not all of these features can now be accepted as bona fide evidence of the massive amounts of energy that only accompanies hypersonic impact events in nature, not attainable by any endogenetic process (French,

1998); and secondly, that, being found in all of the structures that are now accepted to be astroblemes, most of these features are not unique.

They are now accepted to be “classical” and those found in Vredefort will be mentioned in Chapter 3 of this part of the report. **Because they are common and not unique, a comparative analysis may seem to be fruitless; however, certain characteristics do exist even in the occurrences termed classical that are unique to the Vredefort Structure and being so, these serve to make the structure unique. These will be named and discussed in Chapter 2.**

Chapter 2. Unique characteristics of the Vredefort Structure

2.1. Vredefort is a mappable and structurally restorable, unique exposure of the basement of a very large astrobleme

It is only now fully realised that the mapping presented in Geotechnical Description reveals only the existence of the crater basement of a dissected astrobleme, with much of the original crater removed by at least 1600 Ma of erosion, prior to the deposition of the Karoo Supergroup. As such, the basement exposure is unique on earth and probably also in our solar system and its importance to the future understanding of astrobleme formation cannot be overstated. Vredefort constitutes the type exposure of the basement architecture of a very large impact structure.

Evolutional differences between Vredefort and other astroblemes may exist. Not all impacting projectiles find a target underlain by layered sediments containing fortuitously placed, with weak surfaces along which detachments can easily propagate. However, in virtually all of the other known astroblemes, basement features are buried and they will probably remain so. Vredefort is uniquely mappable.

It will be shown that, in providing access to the virtually full basement structure, nowhere else seen or mapped in this class of exposure, Vredefort provides an empirical means to amend the philosophy concerning the formation and development of the structural geology that deformed the rocks found below the craters of large astroblemes. French (1998, p 62) mentioned that parautochthonous target rocks remain relatively coherent during impact. Current theory then proposes models for the formation of complex impact structures that result in what may be termed “cow’s-head” profiles such as those shown by Melosh (1989, Figure 8.14) and French (1998, Figure 3.10; but probably not proposed or supported by these authors), similar to those so beloved by the past proponents of buried, theoretical “bulls-head” profiles for subsiding sedimentary basins. It was apparently never considered that these structures could possess supporting substructures, and that, in large astroblemes, the faults that collapsed during transient crater modification may have been a reflection of “inversion” of the crater basement’s “tectonic” system. Although essentially ring-shaped and annular, the faults that shape the rest of an astrobleme cannot be very different from those in a “normal” tectonic system, in which orogenesis is followed by taphrogenesis.

Vredefort (uniquely!) allows an empirical approach to the structural geology of the basement of a crater. An aspect revealed by the decyphering of the structure’s evolution is the domination by an initial, centrifugally directed stress field, operational from the first moments after impact. The magnitude and orientation of this stress component caused the relatively densely spaced manifestations of brittle failure, such as thrust faults, initially directed over the fortuitously placed Black Reef horizon (a near-horizontal, regional unconformity, containing beds of graphitic shale, situated below the floor of the crater-in-development). During the following step, concentric folds developed, with later “thrusts” moving over the ramps so provided.

Based on the mapping, sections and structural restorations from the sources quoted in the Geotechnical Description, a full deformational history can be given in the following terms:

1. Contact and the generation of a shock wave. Shock effects created distinctive forms such as shatter cones, planar deformation features (PDFs) and Martini's A type of penetrative shock melting (Martini, 1991, 1992). This type contains high pressure polymorphs of quartz (coesite and stishovite), now found in thin veinlets of the shock-affected material. All of these elements are found in the rocks overlying the Ensels detachment surface (Figure A1 and A2), which formed the basal component of the original crater.
2. In the following sections of this discussion, mention will be made of the directional stress field generated by impact. This approach needs to be qualified. In an impact event, the concept of a centrifugally-directed stress field means one in which the impact collision caused sufficient mechanical stress for blocks of crustal rock to be accelerated centrifugally away from the point of collision. Delamination and the centrifugal displacement of material took place, in the form of large sheet-like nappes, initially over flat, near-horizontal surfaces provided by the Black Reef (Figure A2 and A3) and subsequently over deeper-seated fracture zones. Obstructions such as ramps locally caused increased confining stress components, that would be released at the moment when detachment took place.
3. The main, relatively shallow detachment zone is now known as the Black Reef Decollement Zone or BRDZ (Fletcher and Reimold, 1989). From this zone, "thrust-like" faults ramped up to form nappe tip lines in the distal areas (Figures A1 and A2). Subsequently, as stress conditions increased in magnitude with deeper penetration, concentric folds were formed. The limbs of the faults facing ground zero acted as ramps over which outward-accelerated material was propelled. Detachment surfaces are now evident as thrust faults. Where thrust detachment took place in the chert-rich beds of the Malmani Subgroup (Figure A3), the chert of the ramp zones underlying the thrusts were deformed by the process of chocolate-tablet boudinage (Photo 1 and 2).

Chocolate-tablet type boudinage (Wegman, 1932) is a process during which rock is fragmented by the sudden release of confining stress, large enough to exceed its internal cohesion. Detachment implies a sudden stress release mechanism, during which the released ramp rocks will expand to their previous state, should it be accepted that expansion can proceed elastically; however, chert cannot expand in this manner. The interbedded dolomite will be plastically deformed. In chert beds, the result is the formation of a "stretch" breccia, in which the beds are fragmented in situ (Photo 2), with fragments still retaining their orientations to the adjacent ones, picture puzzle-style.

In places, near contemporary thrust faults, the "puzzle-like" arrangement of chert fragments formed by boudinage may have been disturbed by continued fault movement to form a randomly organised, matrix-supported, monomict chert breccia. The fragments were not rounded, probably because chert is more brittle and less susceptible to abrasional rounding than the granitic country rock found in the centre of the structure.

The matrix of the breccias (Photos 1 and 2) consists of finely comminuted, recrystallised cherty matter. The origin of the matrix is problematic, because an emplacement mechanism whereby the material is spontaneously formed in situ or intruded into the openings under pressure can hardly be imagined. The fragmentation was caused by stress release in the first place.

As an alternative, we propose that, at depth, partial vacuum conditions prevailed in the newly-formed fracture gashes between the fragments. Dust, containing comminuted rock fragments, was emplaced by suction into the interstices of the breccia so formed (Photo 2), later to be cemented and subjected to recrystallisation. In

the brecciated chert beds of the Malmani Subgroup contained within the ramps of the ring thrusts of Vredefort, the chert fragments retained their angular shapes, to form a peculiar breccia with fragments broken and separated, but not displaced (Photos 1 and 2). The result is a “picture-puzzle” type of “stretch” breccia. Subsequent fault movement often broke this texture to produce a mixed but monomineralic breccia (Photo 13), in which the clasts and matrix all consist of siliceous material. Ferruginous or manganiferous coatings, derived from the weathering of the interbedded dolomite, serve to make the whitish chert clasts of the cherts conspicuous (Photos 1 and 2).

The fault surfaces contain “smears” of ultramylonite and pseudotachylite, generated by fault friction (Photos 9 and 10; note the embayments in the country rock adjacent to the pseudotachylite on Photo 10). Similar cherty pseudotachylite occurrences, related to the early stages of acceleration of material away from the centre of the astrobleme, several metres thick and associated with brecciation, were also observed within the overturned, chert-containing Malmani rocks of the allochthon (Figure A1, refer also to the Geotechnical Description). Overturning occurred after the solidification of the fault-generated smears. Faults with similar cherty smears also characterize the faults situated beyond the Rand Anticline, in the far distal areas of the astrobleme’s root rocks, exposed by erosion (Figures A1 and A2). The most distal of these was seen in the area north of Lichtenburg, almost 200 km from ground zero. The distally situated faults (Figure A1) occur along lineaments that characterize the surface traces of the faults, seen even on satellite imagery and easily found and mapped in the field.

The recognition of chocolate tablet-type boudinage in the cherts thus provides a unique aid to the recognition and confirmation of distally situated ring thrusts of the Vredefort astrobleme. A similar aspect may still be found by mapping beyond the outer limits of other astroblemes of similar morphology and magnitude.

We prefer to use the term “Spray-type” for the smeared, pseudotachylitic rock (Spray, 1992; Spray and Thompson, 1995), because it was generated by fault-friction, whereas no fault movement parameters are to be found associated or within occurrences of pseudotachylite of the “Shand”-type (Shand, 1916), described below.

We have found no references to this type of boudinage/fault association in the literature on astroblemes. As such, it is probably unique to Vredefort.

4. Shand-type pseudotachylite. No characteristics indicative of fault-generated friction can be demonstrated to exist in black, “Shand-type” pseudotachylite matrix (Shand, 1916) of the large pseudotachylitic bodies (Photos 4 and 6; “breccias,” as used in literature, is a total misnomer. The fragments are rounded and matrix supported. If no genetic connotation with deposition in water is implied, “conglomerates” may be even be more appropriate). Disturbances of the country rock encountered in close association with the Shand-type pseudotachylite are almost always related to displacements of the order of magnitude of the width of the pseudotachylite “dykes” and veins only, and wrench-type displacements, measured across linear occurrences, are virtually unknown. Some of the rounded inclusions can be demonstrated to have been transported over distances of up to 100m. This type of pseudotachylite was formed at a later stage in the development of the astrobleme, but in the same manner as that proposed for the matrix of the chocolate tablet boudinage-type described above (see also Reynolds, 1954, in which the author proposed that pseudotachylite was formed as dust under fluidisation conditions and then solidified). The difference is that, in the method of emplacement proposed by Reynolds, the unconsolidated material was “fluidised” under sufficient pressure to emplace it as matrix, while, in the manner described here, it was emplaced into the openings under vacuum conditions. Both methods would then form the rounded fragments seen in “Shand-type” pseudotachylite-bearing bodies, ascribed to frictional shape-rounding associated with the

movement of fragments within the unconsolidated matrix and against the sides of the opening into which it was emplaced.

An example of rounded chert fragments contained in a chert-matrix pseudotachylite occurs at Buffelsfontein Gold Mine in the Klerksdorp area as the “6 Level Dyke,” emplaced into the Central Rand Group. This 3m thick, dyke-like body can be followed over a distance of several kilometres and vertically over about 700 metres. It follows a perfectly flat, near-vertical plane and its future occurrence in mine excavations could be predicted with great accuracy. Its origin baffled generations of geologists.

The matrix of pseudotachylite as first described by Shand (1918) in Vredefort can only seldom be termed a meltrock. Most of Shand’s pseudotachylite (he also specifically named gradations and deviations) essentially consists of a mass of fragments, mostly sufficiently comminuted to be likened to rock flour, now solidified (Photo 4) and therefore best described as “mylonitic.” The scale of the large, rounded “boulders” found in the central, granitoid zone is much larger than that of the fragments found in the cherts (Photos 1 and 6). Chert is brittle and extremely hard, susceptible to brecciation into angular fragments. Granite can be more readily abraded into rounded shapes. The fine-ground matrix fraction of both rock types sometimes displays flow banding.

One point deserves emphasis: even very good descriptions, such as those given by French (1998), may create problematic impressions, as variations in the composition of any rock body may exist and temperatures will differ from site to site. French (1998, Figure 5.6) showed feldspar microlites, 50 – 100 μm long, crystallised in meltrock from Shand-type pseudotachylite from within the granitic gneisses of the centre of the structure. Pseudotachylite may display melt characteristics, but these are rare. In the occurrences observed by the present authors, small bodies of melt-rock were found in the centres of veinlets, with sides parallel to the sides of the veinlets (Photos 15 and 16). Dietz (1961) proposed that melting occurred as an effect of shock, quoting Johnson and Violet (1958) in stating that nuclear bomb experiments showed that rocks will fuse at shock pressures greater than 10^5 bars. The problem is that true melting occurs in the central portions of some of the bodies of pseudotachylite only, i.e. after the emplacement of most of the (mylonitic) pseudotachylite that forms the outer zone of the body. Photos 15 and 16 show that the material that would at a later stage solidify to become pseudotachylite progressively built up as a coating along the sides of the opening, with coarse grains first, along the walls of the opening. Grain sizes progressively decrease in layers towards the centre of the body, and only the central zone was molten, although flow lines are seen in the adjacent, fine-grained matter. The central zone contains a magnitude of microscopic scale crystallites (see also French, 1998, Figure 5.6). If the large scale fracturing into which the pseudotachylitic material was emplaced, was formed under release wave conditions, emplacement and the melting of the core of an occurrence must have occurred even later, after the passage of the shock wave – release after the passage of the shock wave caused the formation of the fractures in which the pseudotachylite was emplaced.. The shock wave occurred too early to have caused the melting. Feldspar microlites that crystallized from the melt and the fine-grained texture of these rocks are indicative of rapid quenching: the centres of some of the bodies only attained, for a short period, a temperature high enough to cause melting.

The morphology and texture of the bodies of pseudotachylite emplaced in the sedimentary rocks of the Witwatersrand Supergroup and alkali granite intrusives found in the overturned collar differ somewhat from those found in the granites. Flow structures and crystallization from a molten stage may be more in evidence (Photos 15 and 16). In many instances, emplacement followed dilations formed along bedding planes. Even here, Shand-type pseudotachylite cannot be demonstrated to have formed by fault friction. In the overturned beds of the allochthon,

where fault and shear displacements, related to movement within the displaced zone of the crater (Geotechnical Description), are found to occur ubiquitously, the fault surfaces carry no pseudotachylite. The exception is an old, Ventersdorp age extensional fault, that has nothing to do with the Vredefort episode.

5. A large crustal dent developed in the zone around the impact point. In the centre of the dent, the surface was penetrated, to initiate the formation of the transient crater. Below the outward-propagating crater floor, outward-directed brittle deformation assumed the form of thrust faulting, with thrust faults detaching over folded ramp surfaces. Palinspastic reconstructions of movement episodes over two such ramp zones were presented in the Geotechnical Description, based on Brink et al. (2000a and b). The dent zone of the Vredefort Structure is unique. No such a zone has been recorded to have existed in other astroblemes. The reason is obvious: nowhere is the basement of a large astrobleme as exposed and available for reconstruction as at Vredefort.
6. Because a crater magnitude scaling exercise, described later, revealed that the size of the crater proposed in Figure 25 of the Geotechnical Description (Figure A4 of the present discussion) was incomplete and much too small, the zoned contents of the crater fill shown in Figure A4 were drawn grossly out of proportion. However, it remains valid that, in the presently remaining basal portion of the allochthonous displaced zone, near the crater floor, beds that were deformed but not greatly displaced were overturned by outward-directed stress. These beds presently dip (overturned; hinging on the detachment floor surface) at about 60° towards the crater centre, presently flattened by uplift of the central zone, followed by erosion. In situ overturning of the near-floor beds of the crater (no folding; all of the deformation was brittle) was accompanied also by an internal “thrust”-dominated stage, during which beds that were already overturned were further intersected by outward-directed thrusting. (This was later followed by inversion and a stage, probably related to the modification of the crater, during which the transport movement direction was reversed towards the centre of the structure).

This exposure of the rocks overlying the floor of the crater of a large astrobleme is unique to Vredefort. In no other crater can the floor of the displaced zone be observed and mapped as at Vredefort. Although glacially eroded and modified, the ring of allochthonous sedimentary rocks probably provides some of the most beautiful and interesting structural geology-related scenery in the world (Photos 5 and 12).

7. The formation of the transient crater continued to its ultimate depth, during which the mass and kinetic energy of the impactor were totally absorbed, leaving a rubble-filled, but zoned crater (Section 1 of Figure A4; the scale was much larger), surrounded by the newly-formed astrobleme.
8. The prevailing stress system was inverted from a compressional one to one dominated by extensional stress release, that produced a centripetal displacement component within the crater contents and also along its walls. Displacement of the distally situated crater zone during this “modification stage” of the transient crater is not seen at Vredefort, because the distal portion of the crater bowl was removed by erosion.

Results of the stage of modificational stress release:

- In the centre of the Vredefort Structure, away from fault surfaces, Shand-type pseudotachylite (Shand, 1916; see the discussion in the Geotechnical Description and under point 4 above) was emplaced into openings formed by extensional fracturing, under conditions of stress release that caused the country rock to expand explosively. In the granitoid rocks, fractures occurred randomly. Fragments transported within the openings, so created, were then abrasion-modified to rounded forms, and the extensive pseudotachylite bodies so formed now characterize the centre of the structure (Photo 6).

- Gravitationally-driven craterward movement, from the rim zone of the crater, caused faults such as the Potchefstroom-Master Bedding Plane Fault (Brink et al. (2000a) to be reactivated and to detach down the flanks of the dent, below the transient crater floor, i.e. in the strata found below the Ensels fault. These faults moved centripetally and assumed lystric shapes at depth, with movement directed towards the transient crater. In the gold mines of the Witwatersrand, unexpected “losses of ground” were caused by faults such as these, which possessed long movement histories before being reactivated in sympathy with the distal slopes of the dent. This much younger fault age component makes mine planning very difficult, necessitating much exploration diamond drilling. Similarly orientated and situated faults below to the crater floors of astroblemes have never been recorded.
- Sympathetic movement also took place within the allochthon, above the floor of the crater. Still evident in the central, preserved part that contains the overturned rocks, a new generation of faults assumed centripetal movement directions, opposite to the centrifugally directed ones that were described in point 7 above. A second movement component, now towards the centre, thus developed to create indications of to-and-fro movement within the allochthonous beds overlying the crater floor (Photo 5). The number of faults that can be identified to belong to this generation is much smaller than those belonging to the first, centrifugally-directed generation. The problem is further intensified by the fact that, in the first, outward-directed stage, “acceleration faulting” (Brink et al., 2000b: discussion of the Fakawi Fault, p 25) may have created many of the observed displacements. In an astrobleme, “nappes” may be moved by impact-related acceleration, as opposed to normal crustal movement. It is then conceivable that the leading edge may “run away” from the trailing edge of such a nappe, creating extensional faults within its body. These faults may be called “retardational,” because they were caused by the relative retardation of the trailing, rearmost section of the nappe, and they are probably peculiar to impact structures.
- The repetition of the steeply-dipping main Hospital Hill quartzite (HQ3) shown in the photo was caused by a flatter dipping, “extensional” fault that displaced the bed from left to right, as shown on the photograph. Displacement of the overturned bed was therefore towards the centre of the crater. In the far distance (Photo 5), a right-side-up block overlies a fault plane, over a flat-dipping, but overturned block of the same quartzite. When viewed from the opposite side of the photo, this assemblage resembles a recumbent fold. Beyond all of this, the curved hills of the Mountain Land goes on to provide scenery that can only be described as beautiful and probably the most spectacular astrobleme scenery on earth.
- The previously compressed rock below the crater floor, around ground zero, now under conditions of stress release, rebounded to form a central, uplifted zone as shown in Figure A4, Section 2. The central peak, composed of rocks belonging to the Inlandsee gneiss-granulite (ILG), rose during this period, to bring deep-crustal rocks to surface (Photo 8). The peak rose through the transient crater floor, producing a constriction of the bordering Outer Granite-Gneiss (OGG)-Dominion-Witwatersrand strata around its sides, evident as a series of fault-repeated, concentrically orientated fault lenses (Hall and Molengraaff, 1925). Unfortunately, the peak has now been removed by erosion and all that is left is its basement, reduced to a near-flat floor. Within this remnant, however, are indications of a great age (~ 3 500 Ma) and previous deep burial (~ 38 km) for the rocks now exposed. An exposure of this age and type, dissected by erosion to the inferred depth, may be unique to Vredefort.

9. In the penultimate stage, the rock termed basic granophyre intruded into the central granitoid hub (Top of p 44 of the Geotechnical Description). The group of ring dykes intersects the basal ring of Witwatersrand preserved in the allochthon. Their origin is obscure, but this stage represents the final stages of the development of the “dome.” This is a unique rock type, named “Vredefortite” by the late Prof. Niggli of Zurich.
10. The final stage was one in which equilibrium was attained, at least partly caused by isostatic movement. During this stage, which lasted up to the present, almost all of the crater fill and sides and most of the central uplift were removed by erosion.

As shown here, and with data from beyond the axis of the Potchefstroom Synclinorium, given in the Geotechnical description, a full, restorable structural evolution can be derived empirically, virtually from field mapping alone. This is the most unique aspect of Vredefort. By comparison, there simply is no other structure in which the development of the basement of an astrobleme can be followed with the detail available at Vredefort.

The present authors can only speculate on the influence of the impact on possible life forms existing at the time. Large stromatolitic growth skeletons (Photo 7) are found in one small area adjacent to the proclaimed conservancies that form the subject of the present application, but to be included as a satellite site. Although many stromatolitic remains are found in the cherts of the Malmani Subgroup, the size and form of these make them unique in South Africa, and steps must be taken to preserve them.

Stromatolites of a comparable size still grow in places such as Shark Bay, off the coast of Australia. Their South African counterparts were not all made extinct by the impact. It is interesting to note that the time of the impact co-incide with the commencement of eukariotic life, placed at 2.0 to 1.4 Ga ago. Some South African scientists seem to believe that the energy released by the Vredefort Event may have triggered this transition.

Evidence of modern life forms, including early humanoid life, are found in the caves in places such as the proclaimed Cradle of Humankind around Sterkfontein, west of Johannesburg. The Sterkfontein area was intersected by several of the thrust faults, associated with the Vredefort Impact. A cave is found on De Wets Drift (Photo 14), in a zone spectacularly affected by fault pseudotachylite formation, overtuning and chocolate tablet-type boudinage. Other caves in the district of Potchefstroom contain huts built by the Tswana nation, built underground to hide black families in the 1820's, when Zulu raiders roamed the Transvaal. Because of the close association between the dolomitic caves and the ring faults of Vredefort, we propose that cave formation took place along weak zones caused by the ring faults of Vredefort and low-pH rain water found openings to penetrate and dissolved the carbonate rock to form the caves.

2.2. The age and erosional modification of the Vredefort Structure

Of the known impact structures found on the surface of the earth, Vredefort is the oldest. Since its formation about 2.0 Ga ago, it was not significantly deformed by tectonism, but it was subjected to about 1.6 Ga of pre-Karoo erosional dissection. The stratigraphically highest rocks of the Pretoria Group that are presently found in the area belong to the Magaliesberg Quartzite Formation (Figure A3). In the adjoining central Transvaal, these are covered by at least 1 200m of stratigraphically higher rocks, with a substantially thicker mass found in the eastern Transvaal. In the distal areas of the structure, northwest of Potchefstroom, the basement granites are exposed below the Witwatersrand, indicating that a total stratigraphic thickness of substantially more than 15 kilometres was lost to erosion.

2.3. Magnitude of the crater of Vredefort, before erosion

According to scaling exercises done to estimate the original diameter of the Vredefort crater, it is obvious that it was omitted, in the Geotechnical Description, to mention that the crater must have been very much larger than that described. The reason for this omission is entirely due to the fact that the present authors, having spent many years of mapping in the structure, still had enormous difficulties in even conceiving a crater with a diameter of more than 300 km, as mentioned in the introduction. Only after becoming aware, very recently, of the results of believable scaling exercises, did it become evident that the crater may have been much larger than indicated.

The Ensels Fault forms the base of the crater (Figure A2), but only a relatively small portion of the original extent of the Ensels Fault surface remains intact. No part of the structure found beyond the present outer limit of the Ensels Fault outcrop, is overlain by the disturbed rocks that display the unique characteristics of those found on the floor of the original crater. It must therefore be assumed that (i) any projections of the original crater size must take into consideration that the upper units of the stratigraphy and structure of the Malmani Subgroup and the Pretoria Group, presently found beyond the axis of the Potchefstroom Synclinorium, had to be situated below the base of the crater even in the distal areas of the structure; and (ii) that, especially in the distal part of the structure, much of the basement succession below the crater floor must have been removed by erosion.

The Magaliesberg Quartzite is accepted to be the uppermost division of the stratigraphy of the Transvaal Supergroup in the Vredefort area. However, when the crater was formed, it had to be situated still below the surface of the extended crater floor. Because the distal continuation of the crater floor surface which has once overlain these beds, is not seen anymore, progressively outward cratering had to affect beds progressively higher in the succession than the Magaliesberg Quartzite. Since then, the high portion of the succession as well as the crater rim have been truncated by erosion (Figure A2) and estimates of the original crater size can only be based on factors known from relationships measured in other craters.

Estimates of the original crater diameter vary considerably and with many unknown factors, the validity of any estimate must be viewed with caution. The following estimates were made by various authors:

Daly (1947): Larger than 50 km.

Dietz (1961): 40 km.

Corner et al. (1990) estimated the central uplift to have been 100 km. Based on this, Reimold and Wallmach (1991) calculated the diameter to be between 300 and 400 km. However, mantle rocks, typically occurring at a depth of ~ 50 km are not exposed, even in the central structure.

Rondot (1994): 160 km.

Grieve and Masaitis (1994): 335 km, based on an estimate of 36 km for the central uplift calculated by Hart et al., (1991).

Henkel and Reimold (1996): 250 km.

Therriault et al., (1997): between 270 and 300 km.

Using observed locations of shock features from around the structure with predictions from numerical simulations, together with factors such as Schmidt and Housen's (1987) empirical relation for the transient crater size as a function of projectile and target parameters, as well as various other parameters, Turtle and Pierazzo (1997) arrived at a diameter of 120 – 160 km for the transient crater, and 120 – 200 km for the diameter of the final crater. For instance, a 10 km diameter projectile will create a transient crater with a diameter of 80 km and a final crater ranging from 120 to 200 km in diameter. According to Turtle and Pierazzo, this is consistent with the observed location of the outer limits of PDF-formation at a radius of about 38 km from the centre of the structure.

Figure A4 indicates a 38 km total uplift for Point G, situated at the centre of the astrobleme. Included in the thickness calculated are the many sills of Bushveld and Ventersdorp age, intruded mainly into the Witwatersrand and Transvaal Supergroups. This amount of uplift refers to the stratigraphic thickness and its magnitude is similar to that given by Hart et al. (1991) of 34 km.

French (1988) quoted formulae for the calculation of the diameter from the stratigraphic uplift:

$$\text{From Grieve et al., (1981, p 44): } SU = 0.06D^{1.1}$$

(where SU = stratigraphic uplift and D = diameter of the crater)

$$\text{From Grieve and Pilkington (1996, p 408): } SU = 0.086D^{1.03}$$

Being an approximation, French then stated that the value of $SU = 0.1D$ must be reasonable, giving diameters for Vredefort of between 340 and 360 km (after Hart et al., 1991).

The uplift of 38 km calculated by the present authors thus equates to a crater diameter of 380 km, which differs by less than 10% from the diameter of between 340 and 360 km quoted above.

The shape of the deeper part of the crater floor was already shown in Figure A4. To fit a 380 km wide upper portion into the space allowed by the known Transvaal stratigraphy (the major upper stratigraphic unit at the time) above the central portion with the shape given in Figure A4, means that the outer 70 km of the cavity could have had a maximum depth of only about 10 km, which seems very thin and near-horizontal. The assumption of a deeper crustal dent cannot solve this problem. The reason is that, as proposed in the Geotechnical Description, the dent defined the distal slopes of the annular Potchefstroom Synclinorium, with the rim formed by the Rand Anticline (Figure A2). The distal limb of the dent thus hinged down from the fold axis of the Rand Anticline, and deepening of the dent would not have affected the shape of the distal portion of the crater beyond the axis of the Anticline. To provide more depth to the outer sector implies that the Transvaal Supergroup must have been substantially thicker and that the shallow distal portion of the crater and its floor must have been removed by erosion. This may be possible, if the following arguments are accepted as valid:

- The stratigraphic column presented in Figure A3 shows that, in the astrobleme area, the stratigraphic top of the Transvaal Supergroup is presently formed by the Magaliesberg Formation.
- In the central and eastern Transvaal, substantial thicknesses of Transvaal Supergroup strata are now found above the Magaliesberg Quartzite (Figure A3). Combined with the beds now missing from above the Magaliesberg and the Bushveld intrusives, the original Transvaal Supergroup thickness in the Vredefort area may have been 2500m more than presently inferred (reaching to 6260 m above the base of the Black Reef).
- A crater size of 380 km is plotted in Figure A2, Section A, using the possible original thickness of the Transvaal Supergroup below the crater floor in the distal areas. In Section B, the thick zone and the crater floor have been truncated by erosion. However, an implication still evident in the figure is that, in order to obtain a diameter of this magnitude, the outer reaches of the crater floor still had to be almost horizontal. This may be a problem inherent to the assumption of an uplift to width ratio of 1:10 for a complex crater.

A striking aspect of the structure is the near-parallelism between the crater floor and the Black Reef, evident from the proximal limb of the synclinorium outwards (Figure A2). This signifies that, before the uplift of the central zone, even the distal limb of the synclinorium must have subsided sympathetically with, or immediately prior to the developing crater. The crater floor may then have followed the morphology of the dent.

The solution to the flat distal shape of the crater cavity is possibly to be found in the structural evolution of the floor rocks. In Chapter 2 a history of the evolution of the rocks below the crater floor was given, in which it was stated that the first stage was the development of shallow detachments over the BRDZ (Black Reef Decollement Zone; Fletcher and

Reimold, 1989), resulting in the “distally-situated” faults shown in Figure A1. The structural morphology found in the distally situated sector of the astrobleme was thus essentially near-horizontal, formed in the very small time period when penetration by the impactor was still shallow. It was also shown that, with deeper penetration and the development of the dent, progressively deeper structures were created in the basement of the forming crater. Following this morphology as a possible reason for the shallow depth of the excavation in the distal zone, it is therefore proposed that the shape could be related to the depth of penetration of the projectile, in time: during the initial period of penetration, a shallow, very wide excavation formed, which deepened and acquired steeper walls with deeper penetration of the impactor. With penetration, the impactor grew progressively smaller, also aiding deeper penetration into the floor of the dent.

Indications thus are that the dent and the crater were formed in near-sympathy. Both indicate, individually and together, that the crater and the dent may have formed in two stages, one that resulted in a flat, wide hole, followed by one that deepened and steepened the centre of the first hole. From the surface expressions of craters such as Klenova and Lise Meitner on Venus, it seems that this type of dual cratering development may typify astroblemes of the type of Vredefort. The inner crater of these astroblemes may contain melt rock, now displaying what can be interpreted as cooling cracks. Beyond the inner crater the relatively undisturbed surface of an annular zone may denote the outer, shallowing element of the crater.

It may be that, during the stage of modification of the crater, collapse faulting could have followed the sides of the deeper, steepened central section of the crater walls to possibly propagate into the basal rocks of the allochthon. This may mean that, eventually, the sides of the dent determined placing of the detachments associated with a future, inner, ring-shaped collapse zone.

Although conjectural considerations have played a large part in the arguments put forward in this chapter, the main aim was to illustrate that, in containing a well-dissected exposure of the basement rocks of a large astrobleme, Vredefort affords tremendous new and plausible insights on which future research can be based. Such research is far from complete and the structure uniquely has the potential to become the prime site for future research into the evolution of complex astroblemes.

2.4. The Vredefort Structure provides a deep stratigraphic section, with unique remanent (“super”)magnetic effects:

It was pointed out by Slawson (1976) that the Vredefort rocks, progressively exposed towards the centre of the core display a “bulls-eye” isochemical contour pattern. Stepto (1979) subsequently found that the core also possesses a concentric petrographic zonation, equivalent to a cross-section the deep crust of the earth. Uniquely, therefore, one can, by travelling over a distance of say, 50 km, traverse a crustal intersection that reflects a range of rocks, altered through deep burial, ranging from the greenschist down through the amphibolite to granulite gneisses (Stepto, 1979; Bisschoff, 2000), buried to a depth of 38 km or 50 Kbar. The section can also be viewed to progress from rock types aged 2.1 Ga to 3.5 Ga, the age of the Steynskraal Formation (iron bearing) rocks exposed at the centre of the ILG (Inlansee Granulite). The Steynskraal Formation can be described to consist of “floaters” in the more granitic ILG of large (several kilometres in diameter), old, altered bodies of rock, now altered to garnet-granulites, but deposited as ferruginous sediments under atmospheric conditions of low-oxygen content.

In 1999, at the 62nd Annual Meeting of the Meteoritical Society, Hart (1999) proposed the existence of a magnetic anomaly near the centre of the Vredefort Structure, which he attributed to remanent magnetism, caused by the

impact. As mentioned above, amongst other rocks, ferruginous, now metamorphosed Steynskraal sediments occur as “floaters” in the more granitic ILG. According to Hart, the nature of the minerals involved in the observed remanence may be related to minute crystals of magnetite, emplaced in shock-related planar deformation features in quartz and perfectly orientated. In recent Mössbauer studies, the present authors found that the magnetite found in the ferruginous rocks of the Steynskraal Formation display a stoichiometric composition ordering, which in turn, could lead to the remanent magnetism.

Magnetite (Fe_3O_4), is the only iron oxide that contains both divalent and trivalent iron. The structure is that of an inverse spinel, where the tetrahedral, or A sites, are occupied by 8 Fe^{3+} ions, while the 16 octahedral, or B sites, are occupied by iron ions that can undergo dynamic electron hopping between Fe^{2+} and Fe^{3+} , giving a chemical formula as $\text{Fe}^{3+}[\text{Fe}^{2+}, \text{Fe}^{3+}]\text{O}_4$. The different populations of the A and B sites lead to ferromagnetic behaviour in a magnetically ordered magnetite, but in nature, a continuous mixed crystal series exists between magnetite and its oxidised counterpart, and thus most of the natural magnetites are non-stoichiometric.

In a Mössbauer spectrum, the area of the subspectrum for the B-sites should be twice that of the A-site contribution when the magnetite is stoichiometric, but for non-stoichiometric magnetite this is not the case. The magnetite found in the ferruginous sediments shows perfect ordering, with the area of the B-sites twice that of the A-sites.

This occurrence may indicate a unique new type of metamorphism found only in conditions of very high energy release, where suitable ferruginous rocks were affected. In this instance, magnetite-bearing rocks occurred in the basement of the astrobleme, immediately below ground zero. Implications of the ordering of the magnetite particles may imply a sizeable loss of volume of the target rock, not to be regained during release wave conditions. Further research is in progress.

2.5. Structure of the deep-crustal ILG

The structure of the central, deep-crustal ILG zone does not display the overturned, mafic sills of pre-impact age mapped by Bisschoff (1972) within the OGG, and also confirmed by the overturning of the Dominion and basal Witwatersrand beds around the base of the collar rocks. Observed, but not yet properly mapped strike trends in the Steynskraal Formation follow a NW/SE direction (almost east/west near Skietkop, east of Parys), not overturned sympathetically to the collar rocks. The uplifted central zone was therefore not affected by overturning and it rose from below the crater floor.

2.6. Domed mantle

Below the central portion of the “Core” of the “Dome,” gravity surveys by Maree (1944) and Stepto (1979) indicate the existence of a high gravity zone, consistent with a basic dome, risen from the mantle. The central uplift shown in Figure A2 therefore resembles a diapiric plug, risen in conjunction with much deeper mantle material. Mantle domes are not found under Sudbury, Chicxulub or any of the Venusian multiring basins, but lunar multiring basins do seem to have mantle plugs (Melosh, 1997, personal communication).

2.7. The structural geology evident on the crater floor, within the remnant allochthon

Within the allochthonous collar overlying the crater floor, a virtually fully preserved stratigraphic succession, ranging from the base of the Witwatersrand Supergroup to the lower Pretoria Group, representing almost 17 km of strata (true thickness), was overturned to dip at about 60° to 70° towards the centre of the structure (Figure 11 of the

Geotechnical Description). No other similar terrestrial phenomenon of this nature, of a comparable magnitude, has probably ever been observed. The strata were overturned as nappe-like blocks that hinged on the crater floor surface..

Chapter 3. The classical attributes of impact structures

3.1. Pseudotachylite: “Spray-type”

In the Geotechnical Description and in Chapter 2.1., fault generated “Spray-type” pseudotachylite was described when referring to the fault fillings associated with chocolate tablet boudinage-affected chert brecciation (Photos 1 and 2), found in the cherts of the Malmani Subgroup of both the allochthon and crater basement zones. A body of chert affected by chocolate tablet-type boudinage, with fault-generated pseudotachylite, intersected by exploration boreholes below the Fochville Hills, was described in Figures 8 and 16 of the Geotechnical Description. This body is very extensive and it must be the largest of its kind known on earth. It does not stop in the area illustrated by the figures, but it was also intersected in the Klerksdorp and Potchefstroom areas. This is by far the largest known body of its kind ever found.

The copious amounts of pseudotachylite, generated by friction on some of the associated thrust fault planes, seem not be confined to the Vredefort Astrobleme only, but similar occurrences were described also from Sudbury by authors such as Spray and Thompson (1995). An outcrop of the Fochville Hills occurrence can be seen on the farm Gerhardminnebron, about 15 km north of Potchefstroom (Photos 3, 9 and 10).

3.2. Pseudotachylite: “Shand-type”

Shand-type pseudotachylite was first described and studied in Vredefort (Shand, 1916). This type of pseudotachylite occurs as the matrix of abundant, irregular, anastomosing and dyke-like bodies that contain numerous large and small inclusions of country rock. It was described in the Geotechnical Description, and it is not unique to Vredefort, occurring in craters such as Rochechouart (France), Manicouagan (Canada) and Slate Islands (French, 1998) and possibly in Sudbury as the “Sudbury Breccia” (French, 1998, Figure 5.2). It is difficult to give a comparative analysis of occurrences of this rock type, because it seems that there is a great measure of confusion concerning the semantics involved in the usage of the term. Descriptions are poor substitutes for the real thing, but we include photographs of Shand-type pseudotachylite. The rock type is very well exposed on the eastern side of the old Marlin Quarry, west of Parys (Photos 4 and 6), which contains the matrix type typical of 99% of Vredefort, Shand-type pseudotachylite, found within the allochthon. The matrix consists of a mass of fragments, mostly sufficiently comminuted to be termed rock flour, now solidified. It only seldom displays any characteristics of melting, but on a microscopic scale, recrystallisation took place to form spherulitic (stellate) feldspar crystal aggregates. These possibly occur in zones, of which the extent is not known.

As stated above, the pseudotachylite of Vredefort cannot be attributed to shock. The exception is the “A”-type of Martini (1978, 1991), which also contains high pressure polymorphs of quartz (see 3.3.3. below).

3.3. Characteristics associated with impact-induced shock

Peculiar effects are attributed to the shock deformation associated with impact. Prominent amongst these are the forms described as shatter cones (Bucher, 1963; Dietz, 1947, 1961) and many other authors since.

3.3.1. Shatter cones

“Shatter cones” or rocks displaying curved, striated joint surfaces (Photo 11) occur ubiquitously, in especially the Witwatersrand and some of the granitic rocks of Vredefort. Full cones are only very rarely found in the Vredefort Structure. According to French (1998), shatter cones are the only distinctive and unique shock-deformation features, visible on a hand specimen- to outcrop scale. They are generated at relatively low shock pressures of 2-10 GPa.

Commonly seen partial shatter cones are characterised by distinctively curved, “horsetailed” joint surfaces. Smaller cones may occur on the surfaces of partial cones, to form unique composite or “nested” structures. The surfaces form positive/negative features when the rock in which they are contained, is broken open. The striations are directional, radiating along the faces of the curved joints to form a distinctive pattern in which the acute angle points towards the apex of the cone. Shatter cones form in all kinds of target rocks. In the Vredefort structure, they are found in slates, quartzites, igneous rocks such as the alkali granite but never in the OGG or in the ILG, although they can be observed in the sills intruded into the OGG. Full cones seem to favour the Crown amygdaloidal lava of the Jeppetown Subgroup, but they have also been found in quartzites and the epidiorites. In coarse rocks they may be crude, with longer striations. At one site on Thabela Thabeng, large segments of cones are to be found in a quartzite of the Turffontein Subgroup, which was earlier subjected to kyanite/andalusite metamorphism. The striated surface cuts through the crystalloblasts so formed.

Shatter cones may resemble similar structures, formed in other, non-impact rocks, such as the “cone-in-cone” structures produced by the lithification of carbonate-bearing clastic sediments. The axes of cones in these rocks are orientated normal to the bedding of the host rocks and their apexes point downward. Real shatter cones may lie at any angle to the the bedding, depending on the pre-impact orientation of the target rock and its location relative to the impact point. The apex angles of “false” cones are small, while those of cones formed by shock are about 100°. Slickensides may sometimes resemble horsetailing, especially when developed on flat surfaces. However, slickenside striations are parallel and those of shatter cones are radial.

Shatter cones are now generally accepted as indicators of shock pressures and meteorite impact. In smaller astroblemes, they are well developed in the central uplifted zones. In Vredefort, they decrease towards the central ILG. For well-developed shatter cones, it is possible to measure the orientation of the cone axes throughout an impact structure and so to statistically determine the orientation of a master cone, which is a criterion for impact. Manton (1962, Figure 17) obtained a representative sample of shatter cone orientations from around the Dome. However, the beds in which cone-associated surfaces are found are overturned and have first to be brought to their original orientations before any meaning can be given to the measurements. In a small quarry, as on the Crown Amygdaloidal Lava (Jeppetown Subgroup) at Reitzburg, many totally different orientations can be measured. However, restorations of apex directions must consider not only the overturning of the rocks in which they are found, but also the change in dip of the floor of the allochthon, subsequent to impact crater formation and uplift. In Vredefort, this has not yet been done.

The shatter cone segments found around the Vredefort Astrobleme are probably no different from those of other, similar structures.

3.3.2. Planar deformation features (PDFs)

Planar features are closely spaced, parallel, microscopic planes, that occur in shock-metamorphosed minerals (particularly quartz and feldspar), which are regarded as unique and important indicators of shock-metamorphism. They have been described by terms such as shock lamellae, planar elements, planar features, but the term planar deformation features or PDFs (Grieve et al., 1990a) is now accepted.

PDFs are characteristically multiple and oriented parallel to specific planes in the host crystal lattice and are supposed to cut across cleavage surfaces. Because quartz possesses no cleavage and in feldspar, cleavages are parallel to (001) and (010), quartz is used preferentially in the study of PDFs. According to Carter (1968), PDFs that are partly healed or annealed and decorated with minute bubbles, voids or inclusions occur as two or more intersecting sets of lamellae. In quartz, the most numerous lamellae are parallel to (0001), and less frequently in other crystallographic directions.

Grieve et al. (1990b) and Fricke et al. (1990) observed that most of the PDFs from Vredefort possess a basal (0001) orientation, but some are parallel to other PDF planes, e.g. (1012) and (1013), particularly in relict grains from close to the centre of the structure. Compared to those from other large impact structures, this was anomalous. In answer to the problem, it was proposed that post-shock thermal metamorphism had caused the wide-spread annealing of features and a bias towards (0001) orientations. These authors then concluded that, although appearing to be anomalous, they were nevertheless consistent with a shock (impact) origin.

Planar deformation features (PDFs) are $\sim 1\mu\text{m}$ wide lamellae of amorphous silica that form in quartz grains during the rapid application of high deviatoric stresses during impact events (Turtle and Pierazzo, 1997). They have not been observed to be formed by tectonic deformation and are believed to be diagnostic of a hypervelocity meteorite impact (Stöffler and Langenhorst, 1994). The features typically form in sets of parallel, 1-2 μm wide lamellae spaced 2-5 μm apart (e.g. Hörz, 1968) with crystallographic orientations parallel to the basal plane {0001} (type A), {10 13} (type B), {10 11}, {01 11} (type C), and {10 12} {type D} with increasing shock pressure (Grieve et al., 1990; Robertson et al., 1968). There are two formation mechanisms: PDFs parallel to the basal plane {0001} are mechanical twins, which are generated by high deviatoric stresses, while PDFs in the rhombohedral plane {10 1n} are associated with the high pressure of the shock wave (Leroux et al., 1994).

Around Vredefort, the predominant type of PDFs are the Brazil twin lamellae parallel to {0001}, regardless of their radial distance from the crater centre. Relatively few rhombohedral PDFs have been detected. In this respect, Vredefort is different from other impact structures at which the orientation of the PDFs vary with radial distance, i.e., orientations associated with higher shock pressures occur closer to the centre of the structure (e.g. Grieve and Robertson, 1976). Leroux et al. (1994) hypothesize that this lack of higher shock pressure PDFs is due to preferential post-shock thermal annealing of the PDFs with rhombohedral orientations; to destroy basal twin lamellae it may be necessary to completely recrystallise or apply a deviatoric stress large enough to cause opposite twinning.

At Vredefort, PDFs have been observed in quartz throughout the exposure of the Witwatersrand Supergroup, which extends out to a radius of about 38 km from the centre of the granite core (Figure A5). However, it is possible that this distance does not accurately represent the outer limit of pressures large enough to form planar deformation features; the next exposed group, the Ventersdorp Supergroup, (which extends radially from ~ 38 km to ~ 48 km) consists primarily of lavas and therefore contains essentially no quartz. The Ventersdorp rocks contain feldspars in which PDFs can also form, but when Grieve and coworkers looked for PDFs in the Ventersdorp, they found none (Therriault, personal communication, 1997). This is consistent with Reimold's observation that feldspars in the Ventersdorp have been extensively altered since

the impact, erasing information about its shock history (Reimold, personal communication, 1997). Reimold has also looked for PDFs in quartzite rocks beyond the Ventersdorp, but found none. Consequently, the outermost extent of the Ventersdorp Supergroup, ~ 48 km, was considered to be an upper limit on the maximum distance at which PDFs formed.

The shock pressures at which PDFs form have been studied experimentally. McLaren et al. (1967) give formation pressures of 3 – 4 GPa for basal mechanical Brazil twins. Grieve et al. (1990) give a value of 8.8 GPa for the formation of basal PDFs, which is consistent with their later estimate of >5 GPa (Grieve et al., 1996). The onset of PDFs parallel to rhombohedral directions has (i) generally been found to be greater than 10 GPa: (ii) {10 12} were seen to form at shock pressures between 10 and 12 GPa and (iii) {10 13} were seen to form between 16 and 20 GPa by Hörz (1968). In their study, Turtle and Pierazzo (1997) have used a lower limit of 5 GPa for the onset of basal PDF formation, but also included the minimum shock pressure for PDFs with rhombohedral orientations (10-12 GPa) as an upper limit on the minimum shock pressure necessary to form PDFs. The authors found final craters 120 – 200 km in diameter to be consistent with the observed locations of planar deformation features.

A problem with the arguments of Turtle and Pierazzo (1997) is that their outer limit of PDF formation is a stratigraphic/petrological one, i.e. the boundary between overturned quartzose Witwatersrand sediments and Ventersdorp volcanic rocks, with arguments presented that such deformation features may have existed in the radially more distant volcanics, but were since lost. In the structural model proposed in the present report, all of the Vredefort PDFs have so far been found within the allochthonous rocks overlying the Ensels Fault plane. Sections given in the Geotechnical Description show that, below the Ensels Fault, the Witwatersrand will continue, right-side-up, to a much greater distance from the centre of the structure than the limit shown in Figure A5. It can be reasonably accepted that, within the Witwatersrand, PDF formation may therefore have continued to beyond the limits set by Turtle and Pierazzo (1997). Even an “overfold” model for the Witwatersrand collar rocks will alter the distance to the outer limit for PDF formation, if it is considered that the shock wave must have preceded the “tectonic” features seen in Vredefort. The structure of the astrobleme is, after all, important in any discussion of “characteristic features.”

Leroux et al. (1994) used optical and transmission electron microscopy to investigate the defect microstructures in quartz grains from different rock types, found at various sites in the Vredefort Structure. In almost all cases observed by Leroux et al. (1994), bubble trains decorate thin mechanical Brazil twin lamellae. In all of the samples analyzed, Leroux et al. (1994), found evidence of high-temperature annealing that overprints the micro-deformation. However, the presence of Brazil twinning led them to conclude that their findings regarding micro-deformations in quartz are consistent with an impact origin for the Vredefort Structure. Only thin mechanical Brazil twin lamellae in the basal plane are observed by T.E.M. techniques. These are always associated with thin glass lamellae in rhombohedral planes (101 n) with $n = 1, 2, 3$ and 4. At optical microscope scale, Brazil twins in (0001) are easily detected in quartz grains from Vredefort, because they are decorated by numerous tiny fluid inclusions. Similar tiny fluid inclusions aligned parallel to other planes are also detected optically, but TEM imagery failed to detect specific shock effects along their traces. These may have originally have been shock features, but they are now severely altered by weathering and their identification as shock lamellae is ambiguous. The Vredefort event occurred 2000 Ma ago and it has a longer history of thermal resetting than most other such structures.

The PDF's found at Vredefort were formed and modified during conditions that were probably more complex than those usually encountered at other sites, partly also because of the long deformational history of the structure.

3.3.3. High pressure mineral polymorphs: coesite and stishovite

Polymorphs of quartz (coesite and stishovite), formed under extremely high pressure conditions (stishovite, 12-15 GPa; coesite, > 30 GPa) were recognised by Martini (1978; 1991) by means of SEM analyses in veins formed in Vredefort rocks. White (1993) investigated one of Martini's (1978) specimens and confirmed the presence of these polymorphs. He also found PDF's in the quartz contained within a narrow pseudotachylite veinlet, but not outside it. The occurrence of coesite in the vicinity of pseudotachylite veins indicates a minimum pressure of about 2 – 3 GPa, which supports the impact hypothesis.

Leroux et al. (1994) found fine-grained coesite in the vicinity of narrow pseudotachylite veinlets in a quartzite specimen, but no stishovite, even in areas where stishovite was previously reported. Stishovite has never yet been found in a non-impact site. Unfortunately, these minerals cannot be seen or found with the naked eye. Occurrences of coesite and stishovite are common to virtually all impact structures.

3.3.4. Diaplectic glass melting, impact melts and vapourisation

The Vredefort structure has very few, if any, of this type of classical attributes to display. The reason is simply that these are features formed in close vicinity to the impactor in the process of making contact and penetration, and that such features were confined to the shallower areas of the crater fill, long since removed by erosion.

At Vredefort, present manifestations of shock-related melting are confined to minute occurrences, such as pseudotachylite veinlets containing coesite and stishovite and possibly the spherules described by Gay et al. (1978). No large scale crater melts are found, but such occurrences may possibly have been eradicated by erosion.

Chapter 4. Satellite sites

In order to accommodate three geological phenomena falling outside the proposed World Heritage Site area, but immediately adjacent to it, it is proposed to include three additional sites that are of great geological interest. These sites are unique even in the Vredefort area and vulnerable to damage. The owners have been approached with the aim of possible inclusion, and they are amenable. The sites are listed and described below:

4.1. Shand-type pseudotachylite

Probably the best exposure of Shand-type pseudotachylite is found in the eastern wall and benches of the old Marlin Granite quarry at Leeukop (Kopieskraal 517 IQ), west of Parys. Here, a westward-dipping sill-like body contains pseudotachylite. The one-time top of the exposure contains a concentration of pseudotachylite, with large rounded boulders occupying what was once the basal portion. In one site, a large fragment was frozen in the process of detachment from the roof of the body. All fragments are rounded. While not unique, this exposure is probably the best and most voluminous in the area.

GPS coordinates are as follows:

S: 26° 53.871'

E: 27° 29.569' Elevation: 1434m a.s.l.

S: 26° 53.764'

E: 27° 24.543' Elevation: 1423m a.s.l.

S: 26° 53.762'

E: 27° 24.345' Elevation: 1402m a.s.l.

S: 26° 53.906'

E: 27° 24.183' Elevation: 1403m a.s.l.

S: 26° 53.992'

E: 27° 24.198' Elevation: 1399m a.s.l.

4.2. “Spray”-type pseudotachylite, chocolate tablet boudinage, cave formation:

All of these phenomena are combined at a single site at Grootedrift 499 IQ, west of the proposed World heritage site. The site contains both the chocolate tablet type of chert brecciation, as well as the type containing subsequently disturbed, randomly dispersed fragments. A dolomitic cave was formed in a zone with “smears” of mylonite/pseudotachylite, of the type that sometimes display the requirements listed by Spray to be designated a pseudotachylite. The fault formed at an early stage in the development of the astrobleme, and was eventually taken up in the overturned zone overlying the crater floor. GPS co-ordinates:

SE corner:

S: 26° 55.197'

E: 27° 07.986' Elevation: 1322m a.s.l.

NE corner:

S: 26° 55.133'

E: 27° 08.035' Elevation: 1320m a.s.l.

NW corner:

S: 26° 55.155'

E: 27° 07.989' Elevation: 132.5m a.s.l.

SW corner:

S: 26° 55.187'

E: 27° 07.956' Elevation: 1317m a.s.l.

4.3. Large stromatolites:

A zone of large stromatolitic fossils is found in a narrow, elongated zone on Rooipoortje 453. These fossil algae colonies pre-date the impact event and they are now found above the remnant crater floor. The growths are up to about a metre in diameter and no other occurrence with similar growths has been reported in South Africa. The occurrence is relatively small, but unique and also vulnerable. It occurs in the same outcrop of the Malmani Subgroup as Grootedrift, but several kilometres to the north.

Co-ordinates are as follows:

S: 26° 46.425'

E: 27° 16.206'

S: 26° 46.444'

E: 27° 26.187'

S: 26° 46.455'

E: 27° 16.107' Elevation: 1440m a.s.l.

Chapter 5. Summary

The Vredefort structure contains most of the typical features of a large astrobleme. However, these are now commonly recognised to exist in all astroblemes and it is pointless to make up lists in which common attributes, such as shatter cones or PDFs are compared.

Impact occurred towards the centre of the Central Rand Group of the Witwatersrand Basin, still the richest gold deposit on earth, and conglomerate reefs were brought to surface in the inner crater ring. The roll played by Vredefort in preserving the portion of the depositional basin of the Central Rand Group that was found to be viable for gold mining, or even bringing it to surface, is debateable. It certainly did not contribute to gold deposition.

Two forms of uniquely exposed rocks, related to the impact structure, are now found on surface. The first is the normal outcrop exposure, sufficiently dissected by erosion to have exposed a full structural section from the central astrobleme, through the crater floor and down into the distal sections of the crater basement. The amount of mapped data from surface, with the insight gained in the past few years, is what really makes the Vredefort Structure unique amongst astroblemes. Basement structural effects are nowhere else in the solar system so explored, exposed, visible, mappable and open to interpretation as they are at Vredefort. Apart from this, the Vredefort scenery must also be matchless amongst the impact structures of the world, easily accessible, healthy and therefore also vulnerable. In a world where distance becomes more and more meaningless, the preservation of an irreplaceable part of our common heritage, such as the Vredefort Structure, becomes extremely important.

The second unique form of exposure is found in the results of the prospecting for gold. The placement of the point of impact, and therefore centre of the structure, to coincide with the middle of the basin is of extreme importance. Prospecting boreholes and vibroseis sections were probably never sited as densely as they were over the deeper parts of the astrobleme, and the amount of data available to research is enormous. Giving official recognition to the astrobleme as a heritage site will be the motivation for many of the gold mining houses in South Africa to make this data available, as ecologically responsible mining companies have already done. This is reflected in many of the interpretations given in the Geotechnical Description.

The site proposed for World Heritage status contains a representative collection of all of the aspects that must be conserved. In the form of preserved cultural sites, it also contains much of the heritage of all South Africans. The unique contribution that Vredefort can and will make to science, will be to our knowledge and understanding of what really happened in the few seconds after a hypervelocity impact.

We wish to thank the Department of Environmental Affairs of the Free State, and especially Coenie Erasmus, for their support in this project, and also the land owners of the two conservancies, who allowed us free access to their land. We also thank the owners of land identified as potential satellite sites, for allowing us repeated visits and much appreciated assistance.

M.C. BRINK*, A.A. BISSCHOFF*, F.B. WAANDERS* AND A.E.SCHOCH**

*School for Chemical and Minerals Engineering; North-West University, Potchefstroom Campus, Potchefstroom 2520, South Africa

**Department of Geology, University of the Free State, Boemfontein, South Africa.

8 FEBRUARY, 2005

Bibliography

- Baldwin, R.B. (1949). The face of the Moon. Univ. of Chicago, Chicago. 239pp.
- Bisschoff, A.A. (1972) Tholeiitic intrusions in the Vredefort Dome. *Trans. Geol. Soc S. Afr.* 75, 31 – 45.
- Bisschoff, A.A. (2000) The geology of the Vredefort Dome (Explanation of Geological Sheets 2627CA, CB, CC, CD, DA, DC and 2727AA, AB, Ba; 1:50 000 scale). Council for Geoscience, Pretoria, 49 pp. and map.
- Brink, M.C., Waanders, F.B. and Bisschoff, A.A. and Gay, N.C. (2000a). The Foch Thrust- Potchefstroom Fault structural system, Vredefort, South Africa: a model for impact-related tectonic movement over a pre-existing barrier. *Jour. Afr. Earth. Sci.*, 30, 99-117.
- Brink, M.C. Waanders, F.B. and Bisschoff, A.A. (2000b). The Katdoornbosch-Witpoortjie Fault: a ring thrust of Vredefort Event age. *S. Afr. Jour. Geol.*, 103, 15-31.
- Bucher, W.H. (1963) Cryptoexplosion structures caused from without or from within the earth? *A. J. Sci.*, 261, 1963, 597-649.
- Carter, N.L. 1968. Dynamic deformation of quartz. In: B.M. French and N.M. Short (Editors), *Shock Metamorphism of Natural Materials*. Mono Book Corp., Baltimore. Pp.453 – 474.
- Corner, B., Durrheim, B.J., Rodney, B.C., Wilsher, W.A. and Steenkamp, W.B. (1986) Aeromagnetic Coverage of the Witwatersrand Basin and Techniques used in its Interpretation Extended Abstracts, Geocongress'86, Johannesburg. *Geol. Soc. S. Afr.*, 211-214
- Daly, R.A. (1947) The Vredefort ring structure of South Africa. *J. Geol.* 55. 125-145.
- Dietz, R.S. (1947) Meteorite impact suggested by the orientation of shatter cones at the Kentland, Indiana disturbance. *J. Geol.* 67. 486-505.
- Dietz, R.S. (1961). Vredefort ring structure: meteorite impact scar? *J. Geol.*, 69: 499-516.
- Fletcher, P. and Reimold, W.U. (1989): Some notes and speculations on the pseudotachylites in the Witwatersrand Basin and the Vredefort Dome. *S. Afr. J. Geol.* 92, pp 223-234.
- French, B.M.(1998). *Traces of catastrophe. A Handbook of Shock-Metamorphic Effects in Terrestrial Impact Structures*. LPI Contribution No. 954, Lunar and Planetary Institute, Houston. 120pp.
- Fricke, A., Medenbach, O. and Schreyer, W. (1990). Fluid inclusions, planar elements, and pseudotachylites in the basement of the Vredefort structure, South Africa. *Tectonophysics*, 171: 169-183.
- Grieve, R.A.F., Robertson, P.B. and Dence, M.R. (1981). Constraints on the formation of ring impact structures, based on terrestrial data. In: *Multi-ring basins: Formation and evolution*. *Proc.Lunar. Planet. Sci.*, 12A (Schultz, P.H. and Merrill, R.B. (Eds.), Pergamon, N.Y. 37-57.
- Grieve, R.A.F., Sharpton, V.L. and Stöffler, D. (1990a). Shocked minerals and the K/T controversy. *Eos.* 71(46): 1972.
- Grieve, R.A.F., Coderre, J.M., Robertson, P.B. and Alexopoulos, J. (1990b). Microscopic planar deformation features in quartz of the Vredefort Structure: anomalous but still suggestive of an impact origin. *Tectonophysics* 171, pp185 – 200.
- Grieve, R.A.F. and Masaitis, V.L. (1994).The economic potential of terrestrial impact craters. *Int. Geol. Rev.* 36. 105-151.
- Grieve, R.A.F., Langenhorst, F and Stöffler, D. (1996). Shock metamorphism in nature and experiment, II. Significance in Geoscience. *Meteoritics and Planetary Science.*, 31. 6-35.

Grieve, R.A.F. and Pilkington, M. (1996). The signature of terrestrial impacts. *AGSOJ. Austral. Geol. Geophys.*, 16. 399-420.

Hall, A.L. and Molengraaff, G.A.F. (1925): The Vredefort Mountain Land in the southern Transvaal and northern Orange Free State. *Verhandelingen der Koninklijke Akademie van Wetenschappen te Amsterdam*. XXIV,(3). 189pp + Plates.

Hart, R.J., Andreoli, M.A.G., Reimold, W.U. and Tredoux, M. (1991): Aspects of the dynamic and thermal history of the Vredefort cryptoexplosion structure: implications for its origin. *Tectonophysics*, 192: 313-331

Hart, R.J. and Cloete, M. (1999). Impact-related magnetic rocks from the Vredefort impact structure. *Meteoritics and Planetary Science*, 34 (4). Supplement, P. A50.

Henkel, H. and Reimold, W.U. (1998). Integrated and magnetic modelling of the Vredefort Impact Structure. *Economic Geology Research Unit., Witwatersrand Univ., Johannesburg. Information Circ.* 299, 89pp.

Hörz, F. (1968). Statistical measurements of deformation structures and refractive indices in experimentally shock loaded quartz In: B.M. French and N.M. Short (Editors), *Shock Metamorphism of Natural Materials. Mono Book Corp., Baltimore.* 243-253.

Johnson, G.W. and Violet, C.E. (1958). Phenomenology of contained nuclear explosions. *Univ. Calif. Rad. Lab. Rev.*, 1, 27pp.

Leroux, H., Reimold, W.U. and Douhan, J-C. (1994). A T.E.M. investigation of shock metamorphism in quartz from the Vredefort Dome, South Africa. *Tectonophysics*, 230. 223-234.

Manton, W.I., 1962. The orientation and implication of the shatter cones in the Vredefort ring structure. M.Sc. Thesis (unpubl.) Univ. of the Witwatersrand, Johannesburg., 167 pp.

Maree, B.D. (1944). The Vredefort structure as revealed by a gravimetric survey. *Trans. Geol. Soc. S. Afr.*, 47, 183-196.

Martini, J.E.J. (1991). The nature, distribution and genesis of coesite and stishovite associated with the pseudotachylite of the Vredefort Dome, South Africa. *Earth Planet. Sci. Lett.*, 103: 285 – 300.

Martini, J.E.J. (1992). The metamorphic history of the Vredefort Dome at approximately 2 Ga as revealed by coesite-stishovite-bearing pseudotachylites. *J. metamorph. Geol.*, 10: 517 – 527.

Melosh, H.J. (1989): *Impact cratering – A Geologic Process.* Oxford Univ. Press. New York. 245 pp. 1989

Robertson, P.B., Dence, M.R. and Vos, M.A. (1968). Deformation in rock-forming minerals from Canadian craters. In: B.M. French and N.M. Short (Editors), *Shock Metamorphism of Natural Materials. Mono Book Corp., Baltimore.* 433-452.

Rondot, T. (1994). Recognition of eroded astroblemes of the earth. *Sci. Rev.* 35., 331-365.

Reimold, W.U. and Wallmach, T. (1996). The Vredefort structure under discussion. *S. Afr. J. Sci.*, 87, 412-417.

Reynolds, D.L. (1954). Fluidisation as a geological process and its bearing on the problem of intrusive granites. *Am. Jour. Sci.*, 577-613.

Schmidt, R.M. and Housen, K.R. (1987). Some recent advances in the scaling of impact and explosion cratering. *Int. J. Impact Engng.* 5. 543-560.

Shand, S.H. (1916). The pseudotachylite of Parijs (Orange Free State) and its relations to “trapshotten-gneiss” and “flinty-crush-rock.” *Geol. Soc. London, Quarterly Journal*, 72, 198 – 220.

Slawson, W.F. (1976). Vredefort core: a cross-section of the upper crust? *Geochim. Cosmochim. Acta*, 40: pp117-121.

Spray, J.G. (1992) A physical basis for the frictional melting of some rock-forming minerals. *Tectonophysics*, 204. 205-221.

Spray, J. G. and Thompson, Lucy M., (1995): Friction melt distribution in a multi-ring impact basin. *Nature*, 373, 130-132.

Stepo, D. (1979): A Geological and Geophysical Study of the Central Portion of the Vredefort Structure. Ph.D. dissertation. Univ. Witwatersrand, Johannesburg (unpubl.). 378 pp.

Stöffler, D. and Langenhorst, F. (1994) Shock metamorphism of quartz in nature and experiment: 1. Basic observations and theory. *Meteoritics* 29. 155-181.

Therriault, A.M., Grieve, R.A.F. and Reimold, W.U. (1997). Original size of the Vredefort Structure, South Africa. *Meteoritics and Planetary Science* 32. pp 71-77.

Turtle, E.P. and Pierazzo, E. (1998). Constraints on the size of the Vredefort impact crater from numerical modelling. *Meteoritics and Planetary Science*, 33, 483 – 490.

Wegman, C.E. (1932). Note sur le Badinage. *Oc. Geol. France*, 471-491.

White, J.C. (1993). Shock-induced melting and silica polymorph formation, Vredefort Structure, South Africa. In: Boland, J.N. and FitzGerald, J.G., Eds., *Defects and processes in the solid state: Geoscience applications; The McLaren Volume* Elsevier Science Publishers, Amsterdam. 69-84.

4. Landowner and Community Support

It is true that almost all of the land, encompassing the proposed World Heritage Site is individually owned. This is true for the core area, the surrounding buffer, as well as the three satellite (discussed above) sites to be included.

The process to list the area as a World Heritage Site, commenced in 1998. To start the process of listing the site, officials from this Department of Tourism, Environmental and Economic Affairs (DTEEA-FS) spend weeks in the proposed site visiting each landowner on the ground. The aim was to make landowners aware of the initiative, allay fears of expropriations, determine a representative sample of land to be proposed for listing and to compile a detailed address list of all landowners. This address list would form the basis of communications with landowners. The latest update of the address list was completed during January 2005 and can be found in appendix 4. Numerous meetings took place during this process with all relevant stakeholders, including local councils/municipalities around the area.

This initiative was boosted by 2000 to 2002 by an initiative from one of the local councils (Potchefstroom Local Municipality) who established a forum under their auspices to help drive the process of listing the area as a World Heritage Site.

The proposed World Heritage Site falls in two provinces, namely North-West and the Free State. An existing conservancy (Bergland Dome Conservancy) in the North-West Province who represent about 80% of landowners (covering 90% of the land in the North-West Province to be included in the World Heritage site) were actively part of the process to list the area from 1998 till currently. Their support for the listing is attached in appendix 3.

A similar conservancy as above (which is a voluntary organization striving to protect their environment) was established recently in the Free State Province (Vredefort Dome Conservancy – Free State) following the IUCN Inspection of Mr Graeme Worboys. Attached in appendix 3 is their support for the initiative. They represent about 2/3 of the landowners in the area.

Feedback from the conservancy chairs indicates that many more people are positive and would like to be included in the conservancy but is unable to attend their meetings during the week. They work in the Johannesburg metropolitan area about one and a half hours drive away and utilize their land only on weekends for recreational purposes. These landowners bought their land especially for recreational purpose and the tranquility of the area.

The support from the landowners of the three satellite sites can be found in appendix 1.

Running parallel with the effort to list the area as a World Heritage Site is a national initiative to declare the same area as a National Heritage Site. This initiative is governed by the National Heritage Resources Act, Act 25 of 1999, as submitted in the nomination dossier. The board of the South African Heritage Resource Agency, which manage this act in South Africa, had already during December 2002 decided in principal (by way of a Board Meeting) to list the area as a National Heritage Site, provided a cultural management plan is being done. This Cultural Heritage Survey and Management Plan had been completed (a copy of the front page as well as other relevant documentation) is attached in appendix 4.

During all the above-mentioned initiatives, public participation and public involvement had been prerequisite. The same can be said for the preparation for the IUCN inspection of Mr Graeme Worboys. He was taken around the site during his weeklong inspection during Aug/Sept 2004 and visited schools, landowners, conservancy management, etc. to enable him to determine public support.

During this process of listing the site as a National – and World Heritage Site, lots of publicity in the printed and electronic media was received. Numerous national publications (magazines and newspapers) carried articles. The site is also included in a national tourism route. Some relevant documentation can be found in appendix 4.

By way of summarizing the landowner and community support, it can be safely state that the listing of the area as a National- and World Heritage Site is general knowledge on a local and national basis. And that the majority of stakeholders (90%) is aware and in favor of the listings process.

5. Management

Following on point 5 of the Supplementary Information document submitted November 2004, documentation is attached in appendix 5 to indicate progress with the management issues of the proposed site.

Although an Integrated Management Plan (IMP) does not exist yet, the compilation of the IMP (also including the three satellite sites) is still on track through a process which started by the compilation of Strategic Development and Management Plan, dated February 2002 (Cover page attached in appendix 5 with the whole document attached in the nomination dossier). This document determines broad guidelines to be followed in managing the site. Documentation is also attached that shows that funding of R12 million is programmed to be utilised for the management of the site. Business plans to access this money is called for by the office of the Premier of the North-West Province and will be drawn up during the course of the next three years. About R3 million is earmarked for this (2005/6) financial year. Discussions between the two provinces (North-West and Free State) and national Department of Environmental Affairs and Tourism (DEAT) resulted in a agreement that DEAT will provide funding to draw up regulations, required by the World Heritage Convention Act, Act 49 of 1999, after the listing of the site as a World Heritage Site. This will offer protection for the site and would be enforceable by law

Also attached is the newspaper advert for proposals for the compilation of a Strategic Environmental Assessment (SEA), which will identify issues to be addressed in the IMP to follow.

The South African World Heritage Convention Act, Act 49 of 1999 provides in Chapter 4, Section 25(1) for a six-month period after listing to compile a Management Plan. A copy of the complete act is provided in the Nomination Dossier. Therefore the state parties are committed by law to develop an IMP within six months after the listing. Funding from the state parties are also earmarked for the process. See attached some documentation in this regard in appendix 5.

Also attached in appendix 5 are the minutes of the monthly Interprovincial Vredefort Dome Task Team. Point 7.1 of the minutes refers to the funds allocated for the 2005/6 financial years to establish a Management Authority for the site and point 7.4 to the appointment of consultants to do the SEA. The tender committee had already sat on the evaluation of the proposals, but a technicality is delaying the process temporally. Point 7.6.2 refers to the existing political forum established to manage the site politically.

Also attached is a copy of the Cultural Heritage Survey and Conservation Management Plan done for South African Heritage Resource Agency to manage cultural resources in the site. Also see the discussion pertaining to this issue under point 4.

The following is the timetable and work program for the management of the site in chronological (dates) order.

Output	Activity	Time frames	Responsibility
Preparatory work	Compile address list and do public awareness raising	November 2000 to December 2001	FS-DTEEA
	Compile and submit Nomination Dossier	December 2003	FS-DTEEA
Institutional arrangements	Establishment of a task team constituting North-West and Free State Environmental Departments	June 2004	FS-DTEEA and NW-DACET
	Inclusion of Dept. of Arts &	March 2005	FS-DTEEA and

	<p>Culture in Task Team</p> <p>Establishment of a Steering Committee constituting of relevant role players, departments and municipalities</p> <p>Establishment of a political forum constituting Members of the Executive Councils of the provinces and relevant mayors of municipalities</p> <p>Establishment of a management authority</p>	<p>March 2005</p> <p>August 2004</p> <p>April/May 2005</p>	<p>NW-DACET</p> <p>FS-DTEEA and NW-DACET</p> <p>FS-DTEEA and NW-DACET</p> <p>FS-DTEEA and NW-DACET</p>
<p>Compilation of management documents</p>	<p>Compilation of a Strategic Development and Management Plan to identify strategic management issues to be addressed</p> <p>Public Participation process</p> <p>Presentation to South African Heritage Resource Agency Board (SAHRA) to list area as National Heritage site</p> <p>Decision in principal to list site. On condition to do Cultural Study of site</p> <p>Applied for funding, do Terms of References for cultural study</p>	<p>February 2002</p> <p>Up to February 2002</p> <p>November/ December 2002</p> <p>November/ December 2002</p> <p>August 2003</p>	<p>FS-DTEEA</p> <p>FS-DTEEA</p> <p>FS-DTEEA</p> <p>FS-DTEEA & SAHRA</p> <p>FS-DTEEA & SAHRA</p>
<p>Compilation of management documents</p>	<p>Compilation of Vredefort Dome Cultural Heritage Survey and Conservation Management Plan</p> <p>Public Participation</p> <p>Following process in act to inform relevant role players about listing site as National Heritage Site (Sending letters, newspapers articles, electronic media)</p> <p>Prepare for IUCN inspection</p>	<p>December 2005</p> <p>Up to December 2005</p> <p>January 2005 – June 2005</p> <p>August /</p>	<p>FS-DTEEA & SAHRA</p> <p>FS-DTEEA & SAHRA</p> <p>FS-DTEEA and NW-DACET & SAHRA</p> <p>FS-DTEEA and</p>

Compilation of management documents	Public participation	September 2004	NW-DACET
		Up to Aug/Sept 2004	FS-DTEEA and NW-DACET
	Drafting of Terms of Reference for compilation of Strategic Environmental Assessment (SEA) to identify issues to be addressed in Integrated Management Plan (IMP) including the following issues from the Strategic Development and Management Plan (February 2002):	October 2004	FS-DTEEA and NW-DACET
	<ul style="list-style-type: none"> ➤ Natural- and Cultural conservation issues ➤ All tourism related issues ➤ All Development related issues ➤ Institutional arrangements ➤ All Communication related issues ➤ All Marketing, branding and interpretation issues ➤ All Socio-Economic development issues and ➤ All funding issues 		
	Development of protocol to manage existing illegal development in the site	March 2005	FS-DTEEA and NW-DACET
	Sifting of tender documents/allocation	December 2004	FS-DTEEA and NW-DACET
	Public Participation process	Up to accepting SEA – June 2005	FS-DTEEA and NW-DACET
	Accepting SEA	June 2005	FS-DTEEA and NW-DACET
	Listing of Site as World Heritage Site	June/July 2005	DEAT & FS-DTEEA and NW-DACET
	Drafting regulations for managing site according to act	September 2005	DEAT, FS-DTEEA and NW-DACET
Develop Terms of Reference for	June 2005	FS-DTEEA and	

	consultants		NW-DACET
	Compilation of Terms of References of Integrated Management Plan according to the act.	December 2005	FS-DTEEA and NW-DACET
	Institute process to plan according to Integrated Management Plan and present site to public at large	January 2006	FS-DTEEA and NW-DACET & SAHRA (DAC)

To summarize, it is clear that the authorities are committed to a process to manage the proposed World Heritage Site through a process to complete management documents. These documents are essential, to align all stakeholders involved with the site, towards the protection of the site.

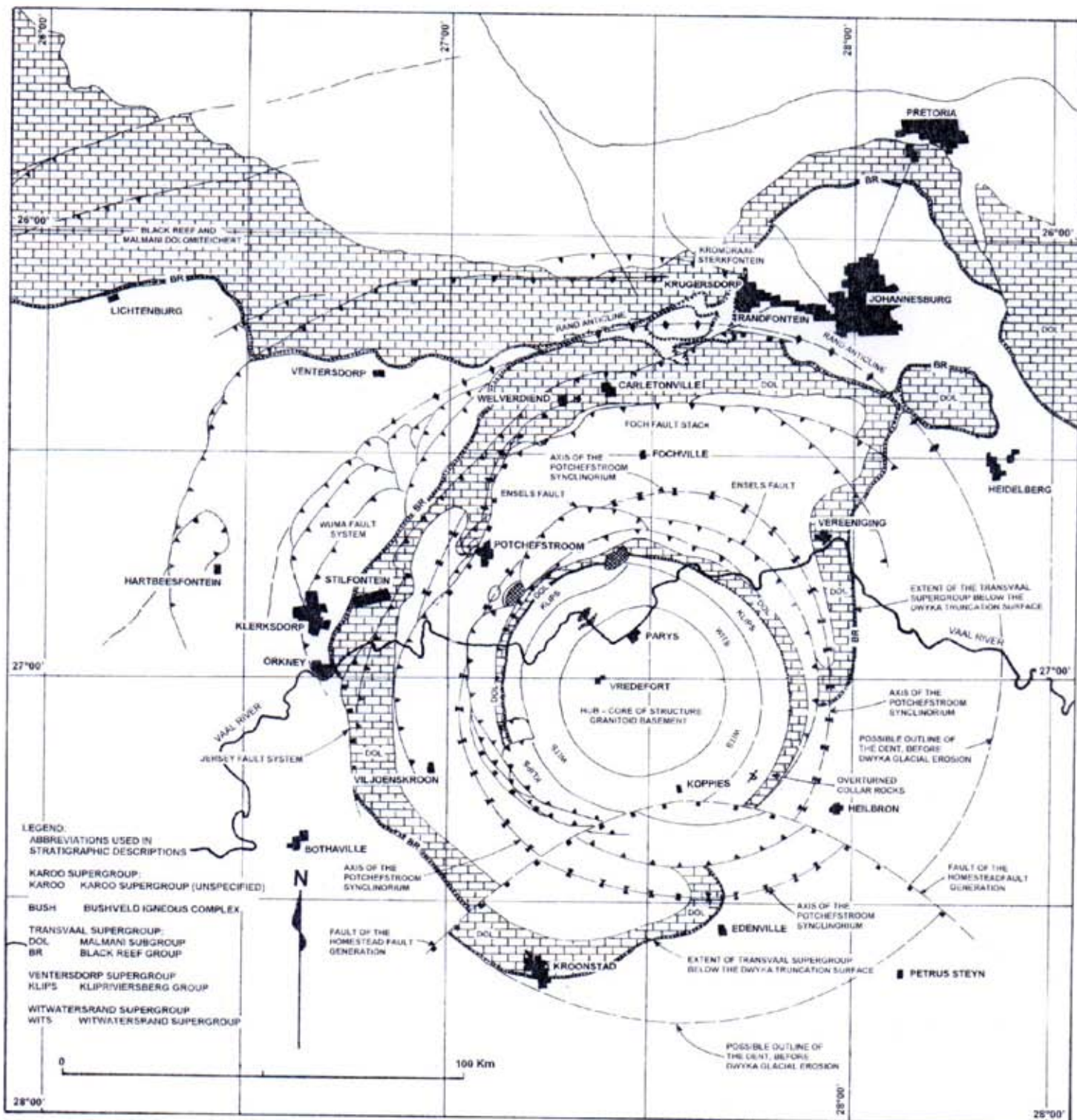


FIGURE A1
THE EXPOSED VREDEFORT ASTROBLEME. THE SOUTHERN HALF IS KNOWN FROM
NUMEROUS GOLD EXPLORATION BOREHOLES, VIBROSEIS SECTIONS AND MINING
TUNNELS, EMPLACED IN THE SEARCH FOR THE AURIFEROUS BEDS OF THE CENTRAL
RAND GROUP OF THE WITWATERSRAND.

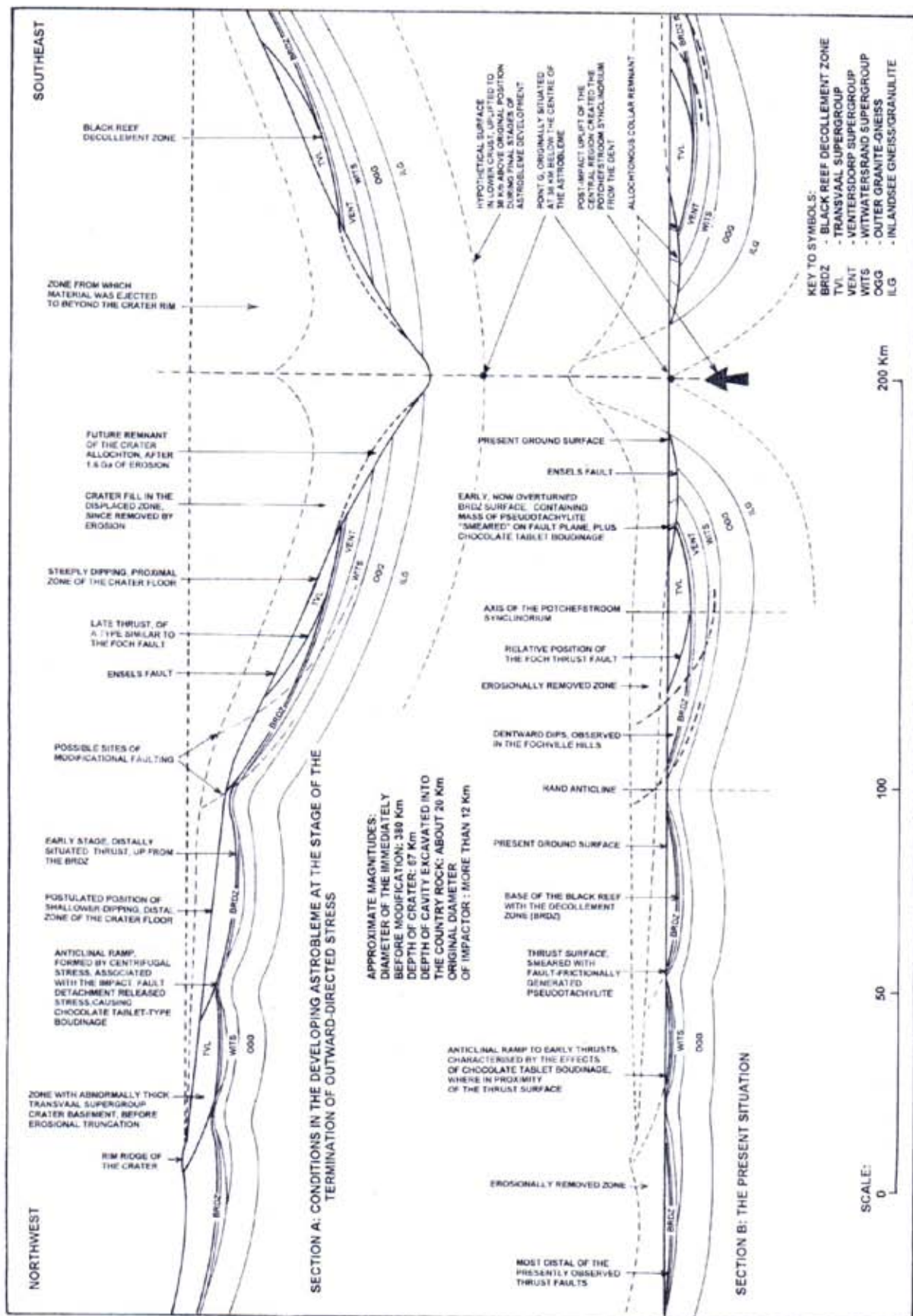


FIGURE A2
 SCHEMATIC SECTIONS COMPARING THE STRUCTURAL GEOLOGY OF THE VREDEFORT ASTROBLEME, DURING AND AFTER IMPACT. DETAILED SECTIONS WERE PRESENTED AND RESTORED IN THE FIRST PART OF THE REPORT. NOTE THAT LITTLE IS KNOWN REGARDING THE CRATER MORPHOLOGY, BUT THAT THE BASEMENT OF THE CRATER IS UNIQUELY EXPOSED. THE ULTIMATE WIDTH ATTAINED BY THE CRATER IS FROM FRENCH (1988: 0.1 DIAMETER = STRATIGRAPHIC UPLIFT)
 EVEN IN THE SOLAR SYSTEM, VREDEFORT IS A PRIME AND UNIQUE SITE FOR THE STUDYING OF STRUCTURAL PHENOMENA FOUND IN THE CRATER BASEMENT OF A LARGE, COMPLEX ASTROBLEME.

TRANSVAAL SUPERGROUP		C	DULLSTROOM FORMATION	MAFIC AND INTERMEDIATE LAVA, FELSITE, PYROCLASTICS GRANITE AND HORNFELS	7205							
					7000							
					6000							
					5905							
					5650							
					5020							
					5000							
					B	PRETORIA GROUP	NEDERHORST FORMATION	ARGILLACEOUS QUARTZITE, ARKOSE, HORNFELS	B	4270		
										LAKENVALLEI FORMATION	QUARTZITE, FELSPATHIC QUARTZITE, ARKOSE	4000
												3920
VERMONT FORMATION	HORNFELS, MINOR QUARTZITE DOLOMITE, CHERT	A	3320									
			MAGALIESBERG FORMATION	QUARTZITE						3120		
A	CHUNIESPOORT GROUP	MALMANI SUBGROUP	SILVERTON FORMATION	HORNFELS AND GRAPHITIC SHALE						3000		
										DASPOORT	2725	
										STRUBENKOP	2540	
										HEKPOORT FORMATION	AMYGDALOIDAL, ANDESITIC LAVA	2000
					TIMBALL HILL FORMATION	SHALE QUARTZITE SHALE AND SILTSTONE	1415					
					ROOHOOGTE	QUARTZITE, SHALE, BEVETS CONGLOMERATE	1370					
					ECCLES FORMATION	CHERT-RICH DOLOMITE	1000					
								LYTTTELTON FORMATION	CHERT-FREE DOLOMITE			
										MONTE CHRISTO FORMATION	CHERT-RICH DOLOMITE	
GAK TREE FORMATION	DARK-COLOURED DOLOMITE											
BLACK REEF FORMATION	SHALE, OFTEN GRAPHITIC, WITH BASAL CONGLOMERATE	BASE										
VENTERSDORP SUPERGROUP												

FIGURE A3 STRATIGRAPHIC COLUMN FOR THE TRANSVAAL SUPERGROUP. NOTE THAT THE DOTTED LINES A-A AND B-B INDICATE THE TOPS OF THE COLUMNS PRESENTLY FOUND IN THE WESTERN (THE ASTROBLEME AREA) AND THE CENTRAL TRANSVAAL, REPECTIVELY. THE FULL, UNTRUNCATED COLUMN (C-C) IS ONLY FOUND IN THE EASTERN TRANSVAAL.

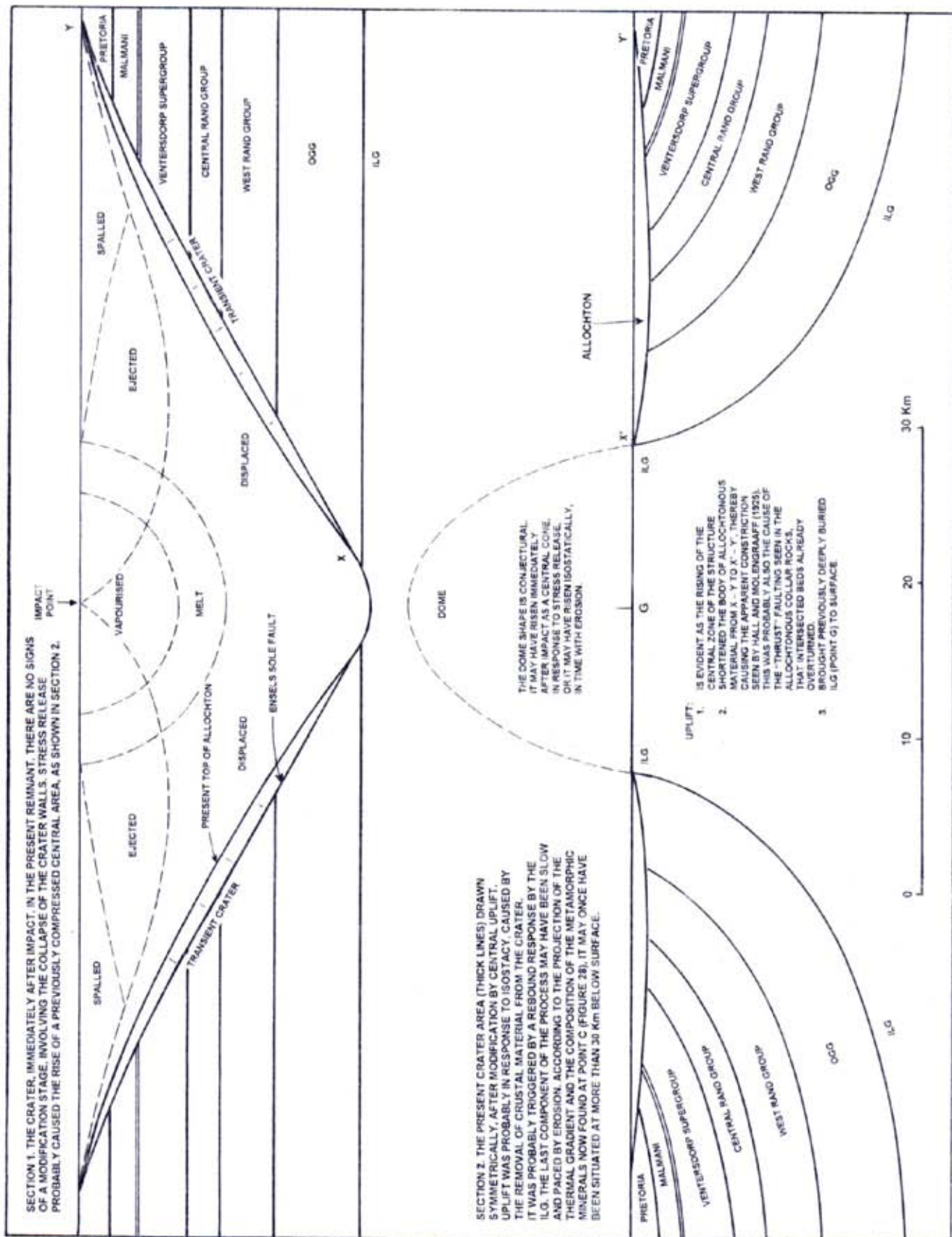


FIGURE A4

SECTION 1 SHOWS THE LOCATION OF SHOCK-METAMORPHOSED MATERIALS WITHIN THE TRANSIENT CRATER. THE CONCEPTION DEPICTED HERE IS BASED ON THE ONE BY MELOSH (1989). IN SECTION 2, NOTHING IS LEFT OF THE CENTRAL CRATER, I.E. OF THE MELT, EJECTED AND UPPER DISPLACED ZONES. THERE IS NO REMNANT CRATER MELT, AND MOST OF THE SHOCK-METAMORPHOSED MATERIALS ARE NOW FOUND WITHIN THE ALLOCHTON AND THE ILG.

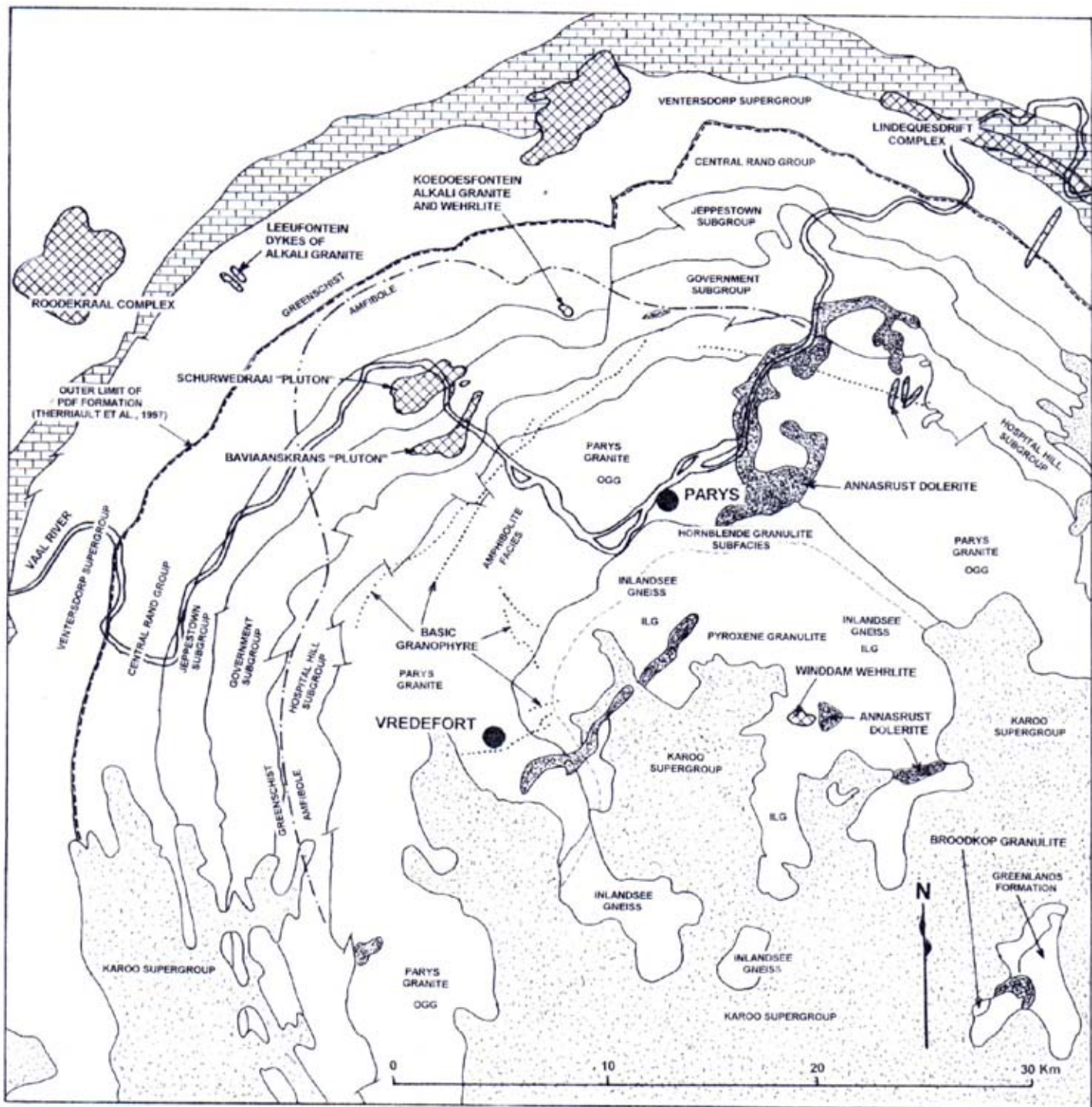


FIGURE A5
 THE CENTRAL PORTION OF THE ASTROBLEME, SHOWING THE DISTRIBUTION OF VARIOUS ROCK TYPES AND THE PROGRESSION OF METAMORPHIC MINERALISATION TOWARDS THE CENTRE OF THE STRUCTURE.

Impact Structures listed by Diameter
Last Updated November 2, 2004
Current total number of confirmed impact structures: 171

CRATER NAME	LOCATION	LATITUDE	LONGITUDE	DIAMETER (km)	Age (Ma)*	EXPOSED	DRILLED
Haviland	Kansas, U.S.A.	N 37° 35'	W 99° 10'	0.015	< 0.001	Y	N
Dalgaranga	Western Australia, Australia	S 27° 38'	E 117° 17'	0.024	~ 0.27	Y	N
Sikhote Alin	Russia	N 46° 7'	E 134° 40'	0.027	0.000055	Y	N
Campo Del Cielo	Argentina	S 27° 38'	W 61° 42'	0.05	< 0.004	Y	Y
Sobolev	Russia	N 46° 18'	E 137° 52'	0.053	< 0.001	Y	Y
Veevers	Western Australia, Australia	S 22° 58'	E 125° 22'	0.08	< 1	Y	N
Ilumetsä	Estonia	N 57° 58'	E 27° 25'	0.08	> 0.002	Y	Y
Morasko	Poland	N 52° 29'	E 16° 54'	0.1	< 0.01	Y	N
Kaalijärv	Estonia	N 58° 24'	E 22° 40'	0.11	0.004 ± 0.001	Y	N
Wabar	Saudi Arabia	N 21° 30'	E 50° 28'	0.116	0.00014	Y	N
Henbury	Northern Territory, Australia	S 24° 34'	E 133° 8'	0.157	.0042 ± 0.0019	Y	N
Odessa	Texas, U.S.A.	N 31° 45'	W 102° 29'	0.168	< 0.05	Y	Y
Boxhole	Northern Territory, Australia	S 22° 37'	E 135° 12'	0.17	.0540 ± 0.0015	Y	N
Macha	Russia	N 60° 6'	E 117° 35'	0.3	< 0.007	Y	N
Aouelloul	Mauritania	N 20° 15'	W 12° 41'	0.39	3.0 ± 0.3	Y	N
Amguid	Algeria	N 26° 5'	E 4° 23'	0.45	< 0.1	Y	N
Monturaqui	Chile	S 23° 56'	W 68° 17'	0.46	< 1	Y	N
Kalkkop	South Africa	S 32° 43'	E 24° 34'	0.64	< 1.8	Y	Y
Wolfe Creek	Western Australia, Australia	S 19° 10'	E 127° 48'	0.875	< 0.3	Y	N
Tswaing (formerly Pretoria Saltpan)	South Africa	S 25° 24'	E 28° 5'	1.13	0.220 ± 0.052	Y	Y
Barringer	Arizona, U.S.A.	N 35° 2'	W 111° 1'	1.186	0.049 ± 0.003	Y	Y
Tabun-Khara-Obo	Mongolia	N 44° 6'	E 109° 36'	1.3	150 ± 20	Y	N
Saarjärvi	Finland	N 65° 17'	E 28° 23'	1.5	> 600		Y
Karikkoselkä	Finland	N 62° 13'	E 25° 15'	1.5	< 1.88	Y	
Liverpool	Northern Territory, Australia	S 12° 24'	E 134° 3'	1.6	150 ± 70	Y	N
Talemzane	Algeria	N 33° 19'	E 4° 2'	1.75	< 3	N	Y
Lonar	India	N 19° 58'	E 76° 31'	1.83	0.052 ± 0.006	Y	Y
Tenoumer	Mauritania	N 22° 55'	W 10° 24'	1.9	0.0214 ± 0.0097	Y	N
B.P. Structure	Libya	N 25° 19'	E 24° 20'	2	< 120	Y	N
Tvären	Sweden	N 58° 46'	E 17° 25'	2	~ 455	N	Y
Holleford	Ontario, Canada	N 44° 28'	W 76° 38'	2.35	550 ± 100	N	Y
West Hawk	Manitoba, Canada	N 49° 46'	W 95° 11'	2.44	351 ± 20	N	Y
Roter Kamm	Namibia	S 27° 46'	E 16° 18'	2.5	3.7 ± 0.3	Y	N
Viewfield	Saskatchewan, Canada	N 49° 35'	W 103° 4'	2.5	190 ± 20	N	Y
Zeleny Gai	Ukraine	N 48° 4'	E 32° 45'	2.5	80 ± 20	N	Y
Rotmistrovka	Ukraine	N 49° 0'	E 32° 0'	2.7	120 ± 10	N	Y
Shunak	Kazakhstan	N 47° 12'	E 72° 42'	2.8	45 ± 10	Y	Y
Goyder	Northern Territory, Australia	S 13° 9'	E 135° 2'	3	< 1400	Y	N
Iso-Naakkima	Finland	N 62° 11'	E 27° 9'	3	> 1000	N	Y
Gusev	Russia	N 48° 26'	E 40° 32'	3	49.0 ± 0.2	N	Y

Granby	Sweden	N 58° 25'	E 14° 56'	3	~ 470	N	Y
Zapadnaya	Ukraine	N 49° 44'	E 29° 0'	3.2	165 ± 5	N	Y
Newporte	North Dakota, U.S.A.	N 48° 58'	W 101° 58'	3.2	< 500	N	Y
New Quebec	Quebec, Canada	N 61° 17'	W 73° 40'	3.44	1.4 ± 0.1	Y	N
Kgagodi	Botswana	S 22° 29'	E 27° 35'	3.5	< 180	Y	Y
Ouarkiz	Algeria	N 29° 0'	W 7° 33'	3.5	< 70	Y	N
Flynn Creek	Tennessee, U.S.A.	N 36° 17'	W 85° 40'	3.8	360 ± 20	Y	Y
Steinheim	Germany	N 48° 41'	E 10° 4'	3.8	15 ± 1	Y	Y
Brent	Ontario, Canada	N 46° 5'	W 78° 29'	3.8	396 ± 20*	N	Y
Mount Toondina	South Australia, Australia	S 27° 57'	E 135° 22'	4	< 110	Y	N
Suvasvesi N	Finland	N 62° 42'	E 28° 10'	4	< 1000	N	Y
Glasford	Illinois, U.S.A.	N 40° 36'	W 89° 47'	4	< 430	N	Y
Mishina Gora	Russia	N 58° 43'	E 28° 3'	4	300 ± 50	Y	Y
Ile Rouleau	Quebec, Canada	N 50° 41'	W 73° 53'	4	< 300	Y	N
Kärdla	Estonia	N 59° 1'	E 22° 46'	4	~ 455	N	Y
Riachao Ring	Brazil	S 7° 43'	W 46° 39'	4.5	< 200	Y	N
Rio Cuarto	Argentina	S 32° 52'	W 64° 14'	4.5	< 0.1	Y	N
Dobeles	Latvia	N 56° 35'	E 23° 15'	4.5	290 ± 35	N	Y
Mizarai	Lithuania	N 54° 1'	E 23° 54'	5	500 ± 20	N	Y
Gow	Saskatchewan, Canada	N 56° 27'	W 104° 29'	5	< 250	Y	N
Gardnos	Norway	N 60° 39'	E 9° 0'	5	500 ± 10	Y	N
Goat Paddock	Western Australia, Australia	S 18° 20'	E 126° 40'	5.1	< 50	Y	Y
Chiyl	Kazakhstan	N 49° 10'	E 57° 51'	5.5	46 ± 7	Y	Y
Söderfjärden	Finland	N 63° 2'	E 21° 35'	5.5	~ 600	N	Y
Foelsche	Northern Territory, Australia	S 16° 40'	E 136° 47'	6	> 545	N	N
Tin Bider	Algeria	N 27° 36'	E 5° 7'	6	< 70	Y	N
Middlesboro	Kentucky, U.S.A.	N 36° 37'	W 83° 44'	6	< 300	Y	Y
Maple Creek	Saskatchewan, Canada	N 49° 48'	W 109° 6'	6	< 75	N	Y
Kursk	Russia	N 51° 42'	E 36° 0'	6	250 ± 80	N	Y
Chukcha	Russia	N 75° 42'	E 97° 48'	6	< 70	Y	Y
Decaturville	Missouri, U.S.A.	N 37° 54'	W 92° 43'	6	< 300	Y	Y
Sääksjärvi	Finland	N 61° 24'	E 22° 24'	6	~ 560	Y	Y
Rock Elm	Wisconsin, U.S.A.	N 44° 43'	W 92° 14'	6	< 505		
Pilot	Northwest Territories, Canada	N 60° 17'	W 111° 1'	6	445 ± 2	Y	N
Wetumpka	Alabama, U.S.A.	N 32° 31'	W 86° 10'	6.5	81.0 ± 1.5	Y	Y
Arkenu 1	Libya	N 22° 4'	E 23° 45'	6.8	< 140	Y	N
Cloud Creek	Wyoming, U.S.A.	N 43° 7'	W 106° 45'	7	190 ± 30 Ma	N	Y
Crooked Creek	Missouri, U.S.A.	N 37° 50'	W 91° 23'	7	320 ± 80	Y	N
Piccaninny	Western Australia, Australia	S 17° 32'	E 128° 25'	7	< 360	Y	N
Lockne	Sweden	N 63° 0'	E 14° 49'	7.5	455	Y	Y
Wanapitei	Ontario, Canada	N 46° 45'	W 80° 45'	7.5	37.2 ± 1.2	N	N
Couture	Quebec, Canada	N 60° 8'	W 75° 20'	8	430 ± 25	Y	N
Serpent Mound	Ohio, U.S.A.	N 39° 2'	W 83° 24'	8	< 320	Y	Y
Des Plaines	Illinois, U.S.A.	N 42° 3'	W 87° 52'	8	< 280	N	Y
Beyenchime-Salaatin	Russia	N 71° 0'	E 121° 40'	8	40 ± 20	Y	N
Vepriai	Lithuania	N 55° 5'	E 24° 35'	8	> 160 ± 10	N	Y
Neugrund	Estonia	N 59° 20'	E 23° 40'	8	~ 470	N	
La Moinerie	Quebec, Canada	N 57° 26'	W 66° 37'	8	400 ± 50	Y	N
Elbow	Saskatchewan, Canada	N 50° 59'	W 106° 43'	8	395 ± 25	N	Y
Bigach	Kazakhstan	N 48° 34'	E 82° 1'	8	5 ± 3	Y	Y

Glover Bluff	Wisconsin, U.S.A.	N 43° 58'	W 89° 32'	8	< 500	Y	Y
Crawford	Australia	S 34° 43'	E 139° 2'	8.5	> 35	Y	N
Calvin	Michigan, USA	N 41° 50'	W 85° 57'	8.5	450 ± 10	N	Y
Ilyinets	Ukraine	N 49° 7'	E 29° 6'	8.5	378 ± 5*	N	Y
Connolly Basin	Western Australia, Australia	S 23° 32'	E 124° 45'	9	< 60	Y	N
Mien	Sweden	N 56° 25'	E 14° 52'	9	121.0 ± 2.3	Y	Y
Red Wing	North Dakota, U.S.A.	N 47° 36'	W 103° 33'	9	200 ± 25	N	Y
Ragozinka	Russia	N 58° 44'	E 61° 48'	9	46 ± 3	N	Y
Lumparn	Finland	N 60° 9'	E 20° 6'	9	~ 1000	N	Y
Arkenu 2	Libya	N 22° 4'	E 23° 45'	10	< 140	Y	N
Flaxman	Australia	S 34° 37'	E 139° 4'	10	> 35	Y	N
Paasselkä	Finland	N 62° 2'	E 29° 5'	10	< 1800	Y	Y
Upheaval Dome	Utah, U.S.A.	N 38° 26'	W 109° 54'	10	< 170	Y	Y
Eagle Butte	Alberta, Canada	N 49° 42'	W 110° 30'	10	< 65	N	Y
Karla	Russia	N 54° 55'	E 48° 2'	10	5 ± 1	Y	Y
Kelly West	Northern Territory, Australia	S 19° 56'	E 133° 57'	10	> 550	N	N
Bosumtwi	Ghana	N 6° 30'	W 1° 25'	10.5	1.07	Y	N
Ternovka	Ukraine	N 48° 08'	E 33° 31'	11	280 ± 10	N	Y
Wells Creek	Tennessee, U.S.A.	N 36° 23'	W 87° 40'	12	200 ± 100	Y	Y
Avak	Alaska, U.S.A.	N 71° 15'	W 156° 38'	12	> 95	N	Y
Serra da Cangalha	Brazil	S 8° 5'	W 46° 52'	12	< 300	Y	Y
Vargeao Dome	Brazil	S 26° 50'	W 52° 7'	12	< 70	Y	N
Nicholson	Northwest Territories, Canada	N 62° 40'	W 102° 41'	12.5	< 400	N	N
Aorounga	Chad, Africa	N 19° 6'	E 19° 15'	12.6	< 345	Y	N
Marquez	Texas, U.S.A.	N 31° 17'	W 96° 18'	12.7	58 ± 2	N	Y
Kentland	Indiana, U.S.A.	N 40° 45'	W 87° 24'	13	< 97	Y	Y
Deep Bay	Saskatchewan, Canada	N 56° 24'	W 102° 59'	13	99 ± 4	N	Y
Sierra Madera	Texas, U.S.A.	N 30° 36'	W 102° 55'	13	< 100	Y	Y
Spider	Western Australia, Australia	S 16° 44'	E 126° 5'	13	> 570	Y	N
Gweni-Fada	Chad, Africa	N 17° 25'	E 21° 45'	14	< 345	Y	N
Zhamanshin	Kazakhstan	N 48° 24'	E 60° 58'	14	0.9 ± 0.1	Y	Y
Jänisjärvi	Russia	N 61° 58'	E 30° 55'	14	700 ± 5	Y	N
Logoisk	Belarus	N 54° 12'	E 27° 48'	15	42.3 ± 1.1	N	Y
Kaluga	Russia	N 54° 30'	E 36° 12'	15	380 ± 5	N	Y
Ames	Oklahoma, U.S.A.	N 36° 15'	W 98° 12'	16	470 ± 30	N	Y
Suavjärvi	Russia	N 63° 7'	E 33° 23'	16	~ 2400		
Oasis	Libya	N 24° 35'	E 24° 24'	18	< 120	Y	N
Lawn Hill	Queensland, Australia	S 18° 40'	E 138° 39'	18	> 515	Y	N
El'gygytgyn	Russia	N 67° 30'	E 172° 5'	18	3.5 ± 0.5	Y	N
Dellen	Sweden	N 61° 48'	E 16° 48'	19	89.0 ± 2.7	Y	N
Obolon'	Ukraine	N 49° 35'	E 32° 55'	20	169 ± 7	N	Y
Logancha	Russia	N 65° 31'	E 95° 56'	20	40 ± 20	N	N
Gosses Bluff	Northern Territory, Australia	S 23° 49'	E 132° 19'	22	142.5 ± 0.8	Y	Y
Rochechouart	France	N 45° 50'	E 0° 56'	23	214 ± 8	Y	N
Lappajärvi	Finland	N 63° 12'	E 23° 42'	23	73.3 ± 5.3	Y	Y
Ries	Germany	N 48° 53'	E 10° 37'	24	15.1 ± 0.1	Y	Y
Boltysh	Ukraine	N 48° 45'	E 32° 10'	24	65.17 ± 0.64	N	Y
Presqu'île	Quebec, Canada	N 49° 43'	W 74° 48'	24	< 500	Y	N
Haughton	Nunavut, Canada	N 75° 22'	W 89° 41'	24	23 ± 1	Y	N
Kamensk	Russia	N 48° 21'	E 40° 30'	25	49.0 ± 0.2	N	Y

Strangways	Northern Territory, Australia	S 15° 12'	E 133° 35'	25	646 ± 42	Y	N
Steen River	Alberta, Canada	N 59° 30'	W 117° 38'	25	91 ± 7*	N	Y
Clearwater East	Quebec, Canada	N 56° 5'	W 74° 7'	26	290 ± 20	Y	Y
Mistastin	Newfoundland/Labrador, Canada	N 55° 53'	W 63° 18'	28	36.4 ± 4*	Y	N
Keuruselkä	Finland	N 62° 8'	E 24° 36'	~30	<1800	Y	N
Shoemaker (formerly Teague)	Western Australia, Australia	S 25° 52'	E 120° 53'	30	1630 ± 5	Y	N
Slate Islands	Ontario, Canada	N 48° 40'	W 87° 0'	30	~ 450	Y	N
Yarrabubba	Western Australia	S 27° 10'	E 118° 50'	30	~ 2000	Y	N
Manson	Iowa, U.S.A.	N 42° 35'	W 94° 33'	35	73.8 ± 0.3	N	Y
Clearwater West	Quebec, Canada	N 56° 13'	W 74° 30'	36	290 ± 20	Y	Y
Carswell	Saskatchewan, Canada	N 58° 27'	W 109° 30'	39	115 ± 10	Y	Y
Saint Martin	Manitoba, Canada	N 51° 47'	W 98° 32'	40	220 ± 32	N	Y
Mjølner	Norway	N 73° 48'	E 29° 40'	40	142.0 ± 2.6	N	Y
Woodleigh	Australia	S 26° 3'	E 114° 39'	40	364 ± 8	N	Y
Araguainha	Brazil	S 16° 47'	W 52° 59'	40	244.40 ± 3.25	Y	N
Montagnais	Nova Scotia, Canada	N 42° 53'	W 64° 13'	45	50.50 ± 0.76	N	Y
Kara-Kul	Tajikistan	N 39° 1'	E 73° 27'	52	< 5	Y	N
Siljan	Sweden	N 61° 2'	E 14° 52'	52	361.0 ± 1.1	Y	Y
Charlevoix	Quebec, Canada	N 47° 32'	W 70° 18'	54	342 ± 15*	Y	Y
Tookoonooka	Queensland, Australia	S 27° 7'	E 142° 50'	55	128 ± 5	N	Y
Beaverhead	Montana, U.S.A.	N 44° 36'	W 113° 0'	60	~ 600	Y	N
Kara	Russia	N 69° 6'	E 64° 9'	65	70.3 ± 2.2	N	Y
Morokweng	South Africa	S 26° 28'	E 23° 32'	70	145.0 ± 0.8	N	Y
Puchezh-Katunki	Russia	N 56° 58'	E 43° 43'	80	167 ± 3	N	Y
Chesapeake Bay	Virginia, U.S.A.	N 37° 17'	W 76° 1'	90	35.5 ± 0.3	N	Y
Acraman	South Australia, Australia	S 32° 1'	E 135° 27'	90	~ 590	Y	N
Manicouagan	Quebec, Canada	N 51° 23'	W 68° 42'	100	214 ± 1	Y	Y
Popigai	Russia	N 71° 39'	E 111° 11'	100	35.7 ± 0.2	Y	Y
Chicxulub	Yucatan, Mexico	N 21° 20'	W 89° 30'	170	64.98 ± 0.05	N	Y
Sudbury	Ontario, Canada	N 46° 36'	W 81° 11'	250	1850 ± 3	Y	Y
Vredefort	South Africa	S 27° 0'	E 27° 30'	300	2023 ± 4	Y	Y

* pre-1977 K-Ar, Ar-Ar and Rb-Sr ages recalculated using the decay constants of Steiger and Jager (1977)
Ages in millions of years (Ma) before present.

Web Site and Updates Maintained by James Whitehead
for John G. Spray, Director PASSC
Last updated November 2, 2004



PHOTO 1. CHERT FOUND IN THE RAMP ZONE OF THE FOCH THRUST FAULT. THE TEXTURE WAS FORMED BY CHOCOLATE TABLET-TYPE BOUDINAGE.



PHOTO 2. CHERT SUBJECTED TO CHOCOLATE TABLET-TYPE BOUDINAGE, FOUND IN THE OVERTURNED BLACK REEF DECOLLEMENT ZONE OF THE ALLOCHTON, GROOTEDRIFT, WEST OF PARYS.



PHOTO 3. SPALLING AND COMMINUTION OF ANGULAR FRAGMENTS, FOCH THRUST ZONE, NORTH OF POTCHEFSTROOM



PHOTO 4. MATRIX OF PSEUDOTACHYLITE OCCURRENCE SHOWN IN PHOTO 6. NOT A MELT ROCK, BUT IT DISPLAYS MICROSCOPIC STELLATE FELSPAR AGGREGATES.



PHOTO 5. LATE-STAGE, CENTRIPETALLY-EXTENSIONAL FAULTING CAUSED BLOCKS OF THE HOSPITAL HILL QUARTZITE TO BE DISPLACED TOWARDS GROUND ZERO. DAMPOORT, NW OF VREDEFORT.



PHOTO 6. BENCHES OF THE MARLIN QUARRY, WEST OF PARYS, INTERSECTING PSEUDOTACHYLITE. LARGE GRANITE INCLUSIONS ACCUMULATED ON FLOOR, OVERLAIN BY CLEAN MATRIX.



PHOTO 7. LARGE STROMATOLITES, MONTE CHRISTO FORMATION, ROOIPOORTJE, EAST OF POTCHEFSTROOM.



PHOTO 8. IRONSTONES FROM THE CENTRE OF THE ASTROBLEME, ~ 3.5 GA OLD. THEY ARE FROM 38 KM BELOW THE PRE-IMPACT SURFACE OF THE EARTH.



PHOTO 9. FLUTES AND SMEARS FROM THE PLANE OF A THRUST OF THE FOCH GENERATION, NORTH OF POTCHEFSTROOM.

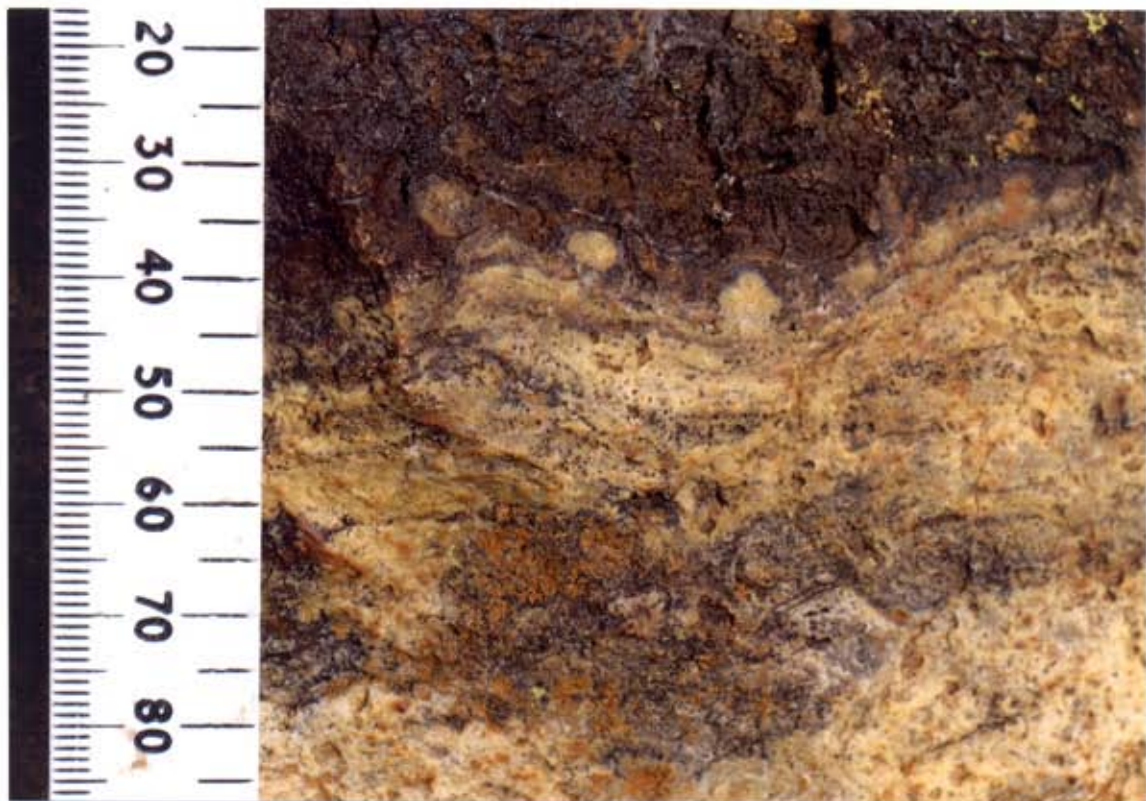


PHOTO 10. FOCH-RELATED ULTRAMYLONITE/PSEUDOTACHYLITE, WITH POSSIBLE EMBAYMENTS EMPLACED INTO OVERLYING COUNTRY ROCK. FOCH FAULT ZONE, NORTH OF POTCHEFSTROOM.



PHOTO 11. SECTION OF A SHATTER CONE. THABELA THABENG, WEST OF PARYS.



PHOTO 12. SUNRISE OVER THE HILLS OF THE ALLOCHTON, KOEDOESFONTEIN, WEST OF PARYS.



PHOTO 13. CHERT BRECCIA. CHERT FRAGMENTS MIXED BY FAULT MOVEMENT SUBSEQUENT TO BEING FRACTURED BY CHOCOLATE TABLET BOUDINAGE, GROOTEDRIFT, SOUTHEAST OF POTCHEFSTROOM.



PHOTO 14. CAVE FORMATION IN AN OVERTURNED THRUST ZONE, MALMANI SUBGROUP, LOWER TRANSVAAL SUPERGROUP, GROOTEDRIFT, SOUTHEAST OF POTCHEFSTROOM.



PHOTO 15. PSEUDOTACHYLITE MELT ROCK OCCUPYING THE CENTRE OF A VEIN OF "SHAND"-TYPE, ROCK FLOUR-DERIVED PSEUDOTACHYLITE. THICKNESS OF DARK CENTRE = 20 mm.

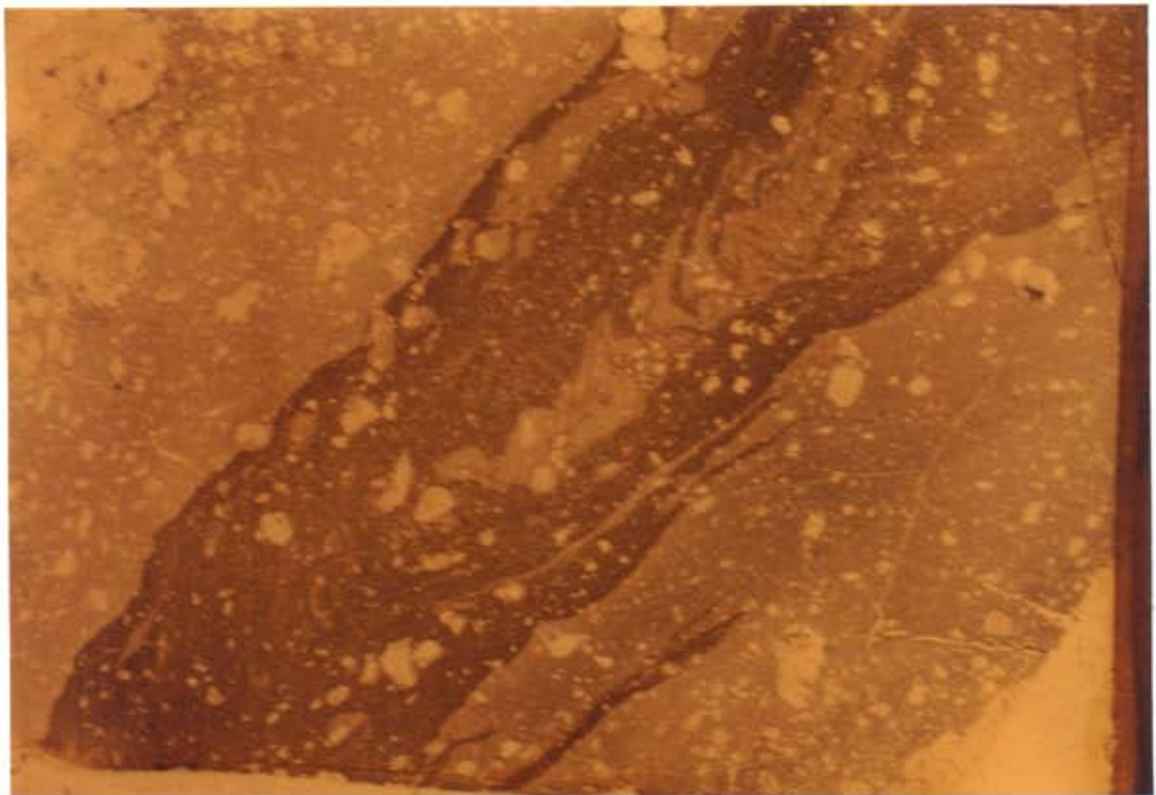


PHOTO 16. THIN SECTION OF PSEUDOTACHYLITE VEIN CONTAINING CENTRE OF MELT ROCK, PHOTOGRAPHED AGAINST TUNGSTEN LIGHT. THICKNESS OF DARK CENTRE OF VEIN = 20mm.

The Refereed Report from Prof. A.E. Schoch,
Department of Geology, University of the Free State,
Bloemfontein, South Africa

February 2005

THE VREDEFORT SUBMISSION

About 2 023 million years ago, a large bolide slammed into a stable part of the Earth's crust, devastating the Archaean planet. At the impact site we find today a scenic "Haven of Peace", where enigmatic and concentric multiple-ring structures around the town of Vredefort bears mute testimony of a violent past. The granitic root zone, originally situated far below the point of impact, is today exposed after the very long period of weathering and erosion. The authors of the submission have excellent credentials; collectively they embody a significant percentage of the accumulated knowledge on the Vredefort structure and combine personal field experience of many decades, - a choice team to collate the voluminous geological evidence. The document contains a summary of relevant geological facts and points to unique features that can be best studied only at this particular astrobleme. The text is too long, and in some sections possibly too detailed, but the facts that are presented are correct and assembled in the proper context.

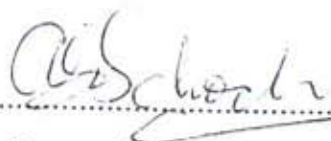
There was a time when opinions on the origin of the "Vredefort dome" were divergent and varied, but today the weight of the mounting evidence leaves little room for doubt. First consensus was already largely reached two decades ago, when the C/T working group of the International Commission on Stratigraphy (ICS) of the International Association of Seismology and Physics of the Earth's Interior (IASPEI) and the CSIR of South Africa, organised a well-attended conference in Parys, Free State [6-10 July, 1987: "International Workshop on Cryptoexplosions and Catastrophes in the Geological Record – with a Focus on the Vredefort Structure"]. The astrobleme interpretation has since been enhanced by the devastating revelation obtained from the images beamed back by space probes of the planetary exploration program, that all members of the solar system were subjected to repeated and major impacts. It has only seemed less prominent on Earth because the local dense atmosphere and hydrosphere have faded the evidence like a giant eraser on a mammoth blackboard. The present Solar System astrobleme champion is Hellas Planitia on Mars (3 000 km diameter) but everybody agrees that the Vredefort structure is the terrestrial champion (even though they may still have differences of opinion concerning the restored size, which is hardly surprising after 2 000 million years of erosion).

On the strength of the evidence presented, the authors are in my opinion quite justified to expand the estimated diameter of the astrobleme from 190 km to 380 km. This means that many towns besides Vredefort and Parys are included within the central part of the structure (e.g. Potchefstroom and Carletonville, as well as fabulously rich gold mines such as West Driefontein and Western Deep Levels). The core region remains the Vredefort-Parys vicinity and its surroundings, including a picturesque series of concentric hills (composed of Witwatersrand Supergroup rocks, followed by dolomites of the Transvaal Supergroup).

There will perforce be a large variation of indigenous flora and fauna even just in the core region, because of the great variation in topography and soil types (different elevations: plains and hills; different soils from varied underlying geological formations: granite and epidiorite, siltstone and conglomerate-bearing quartzite, dolostone and limestone). The geological reasons for protection of the Vredefort environment will therefore be strengthened by arguments involving the local biological ecosystem. The geological features are elevated above local importance however, it truly merits world heritage status.

When the Vredefort impact occurred it must have had a major effect on the biosphere. The Earth would have reverberated like gong for a long time, exacerbating the disruptive effect. The impressive fossil stromatolite structures in the dolomite of the Transvaal Supergroup, tells us that the Earth was dominated by cyanobacteria at the time. It is possible that Exobiologists will find Vredefort to be an important site in future. Who knows what evidence is still to be uncovered concerning the transition of prokaryotes/archaea to eukaryotes? Not to mention the transition of a reducing atmospheric environment with methane (as seen today on Titan, large moon of Saturn with a nitrogen atmosphere similar to that of the Earth), to an oxidizing environment when the atmosphere gained oxygen. Did this happen before or during Vredefort event time?

There are many phenomena mentioned in the submission that are better exposed and represented at Vredefort than at any of the other 60 known astrobleme sites. These aspects do not only entail exotic mineralogical aspects (such as the properties and occurrence of coesite, stishovite and CME's) but also highly practical geo-economic aspects. [Such aspects include improved insight into the modification of the Bushveld Igneous Complex, host to a lion's share of the world Pt and Cr reserves; it also includes insight into the distribution and redistribution of gold in some carbon-associated occurrences involving some of the richest deposits on Earth]. For impact specialists there are the various pseudotachylite occurrences and mafic granophyre dykes (impact melts?; fluidization-phenomena?). The authors of the submission has touched on a long list of reasons why the region under discussion should be preserved for posterity and why it is important for the entire world. I agree with the reasons that they have advanced. One glance at the ominous "List of Potentially Hazardous Asteroids" with the hundreds of Earth-crossing trajectories that is yet incompletely known, is enough to convince any sceptic that we need all the information concerning geohistorical major impacts that we can get. The authors of the submission says that the Vredefort structure is the most important terrestrial astrobleme. I agree with them.



AE Schoch, DSc, FGSSA, Pr.Sci.Nat.

Reaearch-Professor (Em)

University of the Free State

18th February, 2005. BLOEMFONTEIN.

4. Landowner and Community Support

It is true that almost all of the land, encompassing the proposed World Heritage Site is individually owned. This is true for the core area, the surrounding buffer, as well as the three satellite (discussed above) sites to be included.

The process to list the area as a World Heritage Site, commenced in 1998. To start the process of listing the site, officials from this Department of Tourism, Environmental and Economic Affairs (DTEEA-FS) spend weeks in the proposed site visiting each landowner on the ground. The aim was to make landowners aware of the initiative, allay fears of expropriations, determine a representative sample of land to be proposed for listing and to compile a detailed address list of all landowners. This address list would form the basis of communications with landowners. The latest update of the address list was completed during January 2005 and can be found in appendix 4. Numerous meetings took place during this process with all relevant stakeholders, including local councils/municipalities around the area.

This initiative was boosted by 2000 to 2002 by an initiative from one of the local councils (Potchefstroom Local Municipality) who established a forum under their auspices to help drive the process of listing the area as a World Heritage Site.

The proposed World Heritage Site falls in two provinces, namely North-West and the Free State. An existing conservancy (Bergland Dome Conservancy) in the North-West Province who represent about 80% of landowners (covering 90% of the land in the North-West Province to be included in the World Heritage site) were actively part of the process to list the area from 1998 till currently. Their support for the listing is attached in appendix 3.

A similar conservancy as above (which is a voluntary organization striving to protect their environment) was established recently in the Free State Province (Vredefort Dome Conservancy – Free State) following the IUCN inspection of Mr Graeme Worboys. Attached in appendix 3 is their support for the initiative. They represent about 2/3 of the landowners in the area.

Feedback from the conservancy chairs indicates that many more people are positive and would like to be included in the conservancy but is unable to attend their meetings during the week. They work in the Johannesburg metropolitan area about one and a half hours drive away and utilize their land only on weekends for recreational purposes. These landowners bought their land especially for recreational purpose and the tranquility of the area.

The support from the landowners of the three satellite sites can be found in appendix 1.

Running parallel with the effort to list the area as a World Heritage Site is a national initiative to declare the same area as a National Heritage Site. This initiative is governed by the National Heritage Resources Act, Act 25 of 1999, as submitted in the nomination dossier. The board of the South African Heritage Resource Agency, which manage this act in South Africa, had already during December 2002 decided in principal (by way of a Board Meeting) to list the area as a National Heritage Site, provided a cultural management plan is being done. This Cultural Heritage Survey and Management Plan had been completed (a copy of the front page as well as other relevant documentation) is attached in appendix 4.

During all the above-mentioned initiatives, public participation and public involvement had been prerequisite. The same can be said for the preparation for the IUCN inspection of Mr Graeme Worboys. He was taken around the site during his weeklong inspection during Aug/Sept 2004 and visited schools, landowners, conservancy management, etc. to enable him to determine public support.

During this process of listing the site as a National – and World Heritage Site, lots of publicity in the printed and electronic media was received. Numerous national publications (magazines and newspapers) carried articles. The site is also included in a national tourism route. Some relevant documentation can be found in appendix 4.

By way of summarizing the landowner and community support, it can be safely state that the listing of the area as a National- and World Heritage Site is general knowledge on a local and national basis. And that the majority of stakeholders (90%) is aware and in favor of the listings process.

5. Management

Following on point 5 of the Supplementary Information document submitted November 2004, documentation is attached in appendix 5 to indicate progress with the management issues of the proposed site.

Although an Integrated Management Plan (IMP) does not exist yet, the compilation of the IMP (also including the three satellite sites) is still on track through a process which started by the compilation of Strategic Development and Management Plan, dated February 2002 (Cover page attached in appendix 5 with the whole document attached in the

nomination dossier). This document determines broad guidelines to be followed in managing the site. Also attached is the newspaper advert for proposals for the compilation of a Strategic Environmental Assessment (SEA), which will identify issues to be addressed in the IMP to follow.

The South African World Heritage Convention Act, Act 49 of 1999 provides in Chapter 4, Section 25(1) for a six-month period after listing to compile a Management Plan. A copy of the complete act is provided in the Nomination Dossier. Therefore the state parties are committed by law to develop an IMP within six months after the listing. Funding from the state parties are also earmarked for the process. See attached some documentation in this regard in ^{appendix 5} ~~appendix 5~~.

Also attached in appendix 5 are the minutes of the monthly Interprovincial Vredefort Dome Task Team. Point 7.1 of the minutes refers to the funds allocated for the 2005/6 financial years to establish a Management Authority for the site and point 7.4 to the appointment of consultants to do the SEA. The tender committee had already sat on the evaluation of the proposals, but a technicality is delaying the process temporarily. Point 7.6.2 refers to the existing political forum established to manage the site politically.

Also attached is a copy of the Cultural Heritage Survey and Conservation Management Plan done for South African Heritage Resource Agency to manage cultural resources in the site. Also see the discussion pertaining to this issue under point 4

Appendix 1

I, Wim J. Westra the
owner of the portion of Grootedrift 499 IQ on which a breccia, formed by meteorite
impact ("chocolate tablet boudinage") is found, herewith confirm that I have been
informed that my permission will be requested by the Department of Nature
Conservation, to include this part of my property to be conserved as a satellite area of
the proposed Vredefort Dome World Heritage Site.
I understand that my confirmation entails no obligation on my part and that my sole
rights to my property will not be in any way affected


Signed at Potchefstroom on this 21st day of February 2005.


.....
OWNER

I, Daniël Gerlaardus Fourie the
owner of the portion of Rooipoortje 453 IQ, on which a colony of fossil stromatolites
are found, herewith confirm that I have been informed that my permission will be
requested by the Department of Nature Conservation, to include this part of my
property to be conserved as a satellite area of the proposed Vredefort Dome World
Heritage Site.

I understand that my confirmation entails no obligation on my part and that my sole
rights to my property will not be in any way affected

Signed at Potchefstroom on this 18^{de} day of February 2005.



OWNER

J Campbell
Lecukop Quarry
Fax: 046 - 624 3278
Cell: 082 655 4272

Coenie Erasmus
Department of Tourism, Environmental and Economic Affairs
Free State Province
Tel / Fax: 051 - 4004781
Cell: 082 455 8867

Re: Lecukop Quarry site

I acknowledge that I am the owner of the Lecukop Quarry site, on which occurs a pseudotachylite breccia indicative of the meteorite impact. I am also aware that the site (cliff face) will be included in the documentation which is aimed at listing the Vredefort Dome as a World Heritage Site and have no objections to it.


.....
J Campbell
Date: 4/3/05

Appendix 2

1

Proposed Vredefort Dome
World Heritage Site
With 5Km Buffer Area

FREE STATE PROVINCIAL
GOVERNMENT



Legend

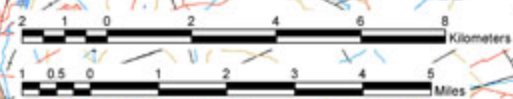
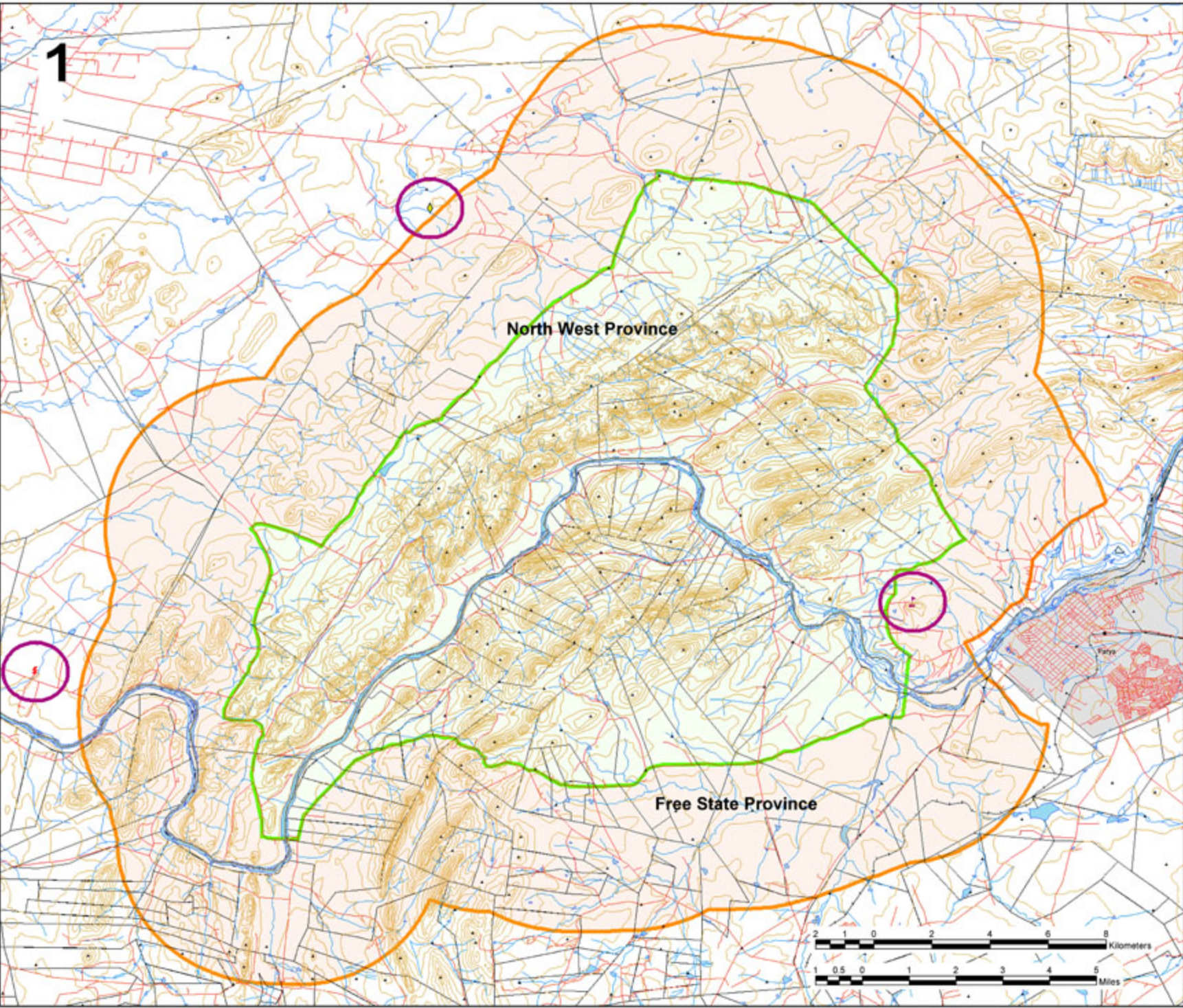
- d Chocolate Tablet Breccia
- n Pseudotachylite Quarry
- Y Stromatolite / Basal Fault Plane
- Vredefort Dome
- 5Km Buffer Area
- Spot Heights
- Contours
- ▭ Islands
- Rivers
- ▭ Surface Water
- Roads
- Railway Line
- Railway Stations
- ▭ Farm Boundary
- ▭ Town Area
- ▭ Provincial Boundary



DIRECTORATE
SPATIAL PLANNING
DEPARTMENT
LOCAL GOVERNMENT & HOUSING



COMPILED BY: S.W. SLABBERT
DATE: 10/03/2005



Appendix 3



15 February 2005

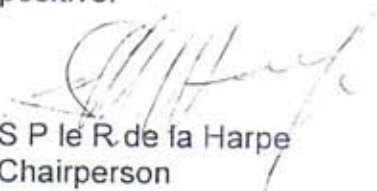
To Whom It May Concern

I herewith wish to confirm that the members of the Dome Bergland Conservancy (North West Province) are in favour of the declaration of the area as a World Heritage site.

Approximately 80% of the landowners , representing more than 90% of the land in the demarcated area in the North West Province side, are members of the Conservancy.

Landowners who are not members of the conservancy are not necessarily against the potential World Heritage status of the area but wish to continue with their present activities which are mainly farming.

During the past few months various attempts were made by the authorities to enlighten the local population, who are not landowners, of the implications of the declaration of the area as a World Heritage Site and has the reaction been very positive.


S P le R. de la Harpe
Chairperson



PO Box 1344 Potchefstroom 2520 Tel & Fax: 056 818 1116 / Cell: 083 406 0843

Direkteure/Directors

C. Meyer, A. Muller, C. Rutherford, J. Jordaan, J.F. Malan, S. de la Harpe, T. Holtzhausen

Vredefort Dome Conservancy (Free State)

P.O. Box 2309

Parys

9585

Monday, February 21, 2005

Dept. of Tourism, Environmental and Economic Affairs of the Free State province

Fountain Towers Building

34 Markgraaff Str., Bloemfontein, 9300

P Bag X20801

Bloemfontein

Free State Province

South Africa

Tel/Fax: (051) 4004781

E-mail erasmusc@dteea.fs.gov.za

Att: Coenie Erasmus

Dear Coenie

Re: Public support for the Vredefort Dome Conservancy (Free State).

At a Public Meeting called for all stakeholders to determine support the area commonly known as the Vredefort Dome and the area identified as the proposed VREDEFORT DOME WORLD HERITAGE site declared as a National and a World Heritage Site.

It was decided that with majority stakeholder support, the area to be declared a Conservancy with immediate effect to do the following:-

- conserve and promote the geological significance and scientific value of the Vredefort Dome Structure and its archaeological, historical and natural assets;
- behave responsibly in line with internationally accepted norms and standards in protecting a site of such outstanding global value;
- fully capitalize on the unique geology, international interest and tourism values of the area; and
- comply with a number of important specific values and obligations ensuing from:
 - The intended listing as a World Heritage Site
 - The intended compliance with IUCN criteria for managing a Protected Area
 - Commitments made to landowners, operators and other affected parties during the planning and development of the Conservancy

The committee for the Vredefort Dome Conservancy was chosen, the following Committee members were chosen.

Mr Johathan van Aswegen	016 973 1534 (Fax)
Mr Nardus Conradie	018 294 4115 (Fax)
Mrs Bets Conradie	018 294 4115 (Fax)
Mr Clive Gillespie	011 388 0695 (Fax)
Miss Susan Love	011 388 0696 (Fax)
Mr Andries Kotzē	NoFax
Mrs Amanda Dedwith	056 818 1352 (Fax)
Mr Wally Dedwith	056 818 1352 (Fax)
Mr Louis Lindeque	No Fax
Mr Deon Kriel	011 861 3361 (Fax)
Mr Albert Wiegand	056 931 0001 (Fax)
Mr Swanepoel	016 342 2812 (Fax)

The following stakeholders attended the meeting.

Nardus & Mrs Bets Conradie	Slangkop, Bethal 9
Andries Kotzē	Schurwedraai 382
Amanda Dedwith	Theunissen 1081, Rensburgsdrif 432
Wally Dedwith	Daskop 1103 (Tarentaalkop)
Louis Lindeque	Steenkampsberg 127
Deon Kriel	Ventersrant 394 De Tuine 394
Albert Wiegand	Dampoort
Johan Loots	Elim
Mr Brown	Fonteinplaas
D J K Terblanché	Lesutokraal 604 (Remainder)
K D Alebout	Lesutokraal 604 (Subdivision 1)
K Uys	Groot Eiland 35
E Erasmus	Aasvogelrand 281
R Strydom	Oudewerf 425
S Hill	Riverview 393
G Meyer	Doornhoek 1000
Mrs M Prinsloo	Hydochs Rust 1403, Ortlep 1098
S L Jansen van Rensburg	Helena
J de Lange	Daskop 1103 (Daskop)
J P van Biljon	Reidsrust 46, Goedgedag 971, Vyfersrust 971
A S Smith	Witbank Gedeelte 2
Clive Gillespie	Parson's Rust 465
Susan Love	Parson's Rust 465

29 Farms were represented at the meeting and another 19 farms expressed their support, thus representing 48 farms out of the 74.

Clive Gillespie

Email: Clive@habula.co.za

Web Address : www.habula.co.za

Physical Address: Farm Parsons Rust, Vredefort District

Mobile :+27 83 309 4880

Office (Direct Line) :+27 11 267 2501

Fax (Direct Line) :+27 11 388 0695

Appendix 4

9/2/329/6

SUBMISSION TO COUNCIL OF SAHRA: 15 & 16 AUGUSTUS 2003

PROPOSED DECLARATION AS NATIONAL HERITAGE SITE: VREDEFORT DOME, FREE STATE AND NORTH WEST

STATEMENT OF SIGNIFICANCE

The Vredefort Dome represents a unique geological phenomenon of international significance and is considered to qualify for listing as a World Heritage Site. It is part of the vast Vredefort impact structure, formed about 2 023 million years ago and regarded as the oldest and largest meteorite impact structure on Earth. Within the area, strata comprising the middle and upper zones of the earth's crust, developed over a period of more than 3 200 Ma, are exposed. All the classical Vredefort-related characteristics of a large astrobleme are found in the area.

In addition to that, the area displays exceptional scenic beauty and is rich in biodiversity with remarkable animal and plant populations. It is also rich in archaeological and historical heritage sites, which indicate that human occupation and utilisation of the area have occurred for thousands of years.

SAHRA COUNCIL DECISION: 04/05 DECEMBER 2003

At the meeting of the SAHRA Council, held on 04/05 December 2002 it was decided that the Vredefort Dome be declared a national heritage site, provided that a survey be done of heritage resources of cultural significance within the Dome and a management plan developed. It was also decided that a delegation of Council members and staff should visit the Dome and inspect heritage resources of cultural significance. This inspection occurred on 11 February 2003 and was reported on by Dr J. Deacon at the next Council meeting, held on 12 and 13 March 2003.

An application for an amount of R142 120 to the National Lottery Distribution Trust Fund was subsequently developed and submitted to the Arts, Culture and National Heritage Distribution Agency. A response to the application is still awaited.

The lottery funds, if received, will be used for a desk-top study and on-site survey of heritage resources of cultural significance within the Vredefort Dome, as well as the preparation of a catalogue and conservation management plan in consultation with landowners and other stakeholders. The management plan will include an assessment of the potential threats to the identified heritage resources, as well as management strategies and mechanisms for their future conservation and responsible incorporation in tourism development. The project should be completed within four months after the appointment of a consultant.

COMPILED BY: Ms H.H. Gous
PROVINCIAL MANAGER: FREE STATE

DATE: 16-07-2003

FREE STATE PROVINCE



DEPARTMENT OF TOURISM, ENVIRONMENTAL AND ECONOMIC AFFAIRS

HEAD OF DEPARTMENT

Tuesday, October 15, 2002

TO: Mr. Coen Erasmus
Mr. Elbi Erasmus
Mr. Daan Muller

RE: LAUNCH OF THE STRATEGIC MANAGEMENT AND DEVELOPMENT PLAN
AND WORLD HERITAGE SITE APPLICATION VREDEFORT DOME

By direction of the HOD I forward the attached document relating to the abovementioned matter for your attention..

Kind regards,

MAMATSHENG MOKOENA
SECRETARY TO THE HOD

Absa - Free Internet Access

From: "Willie Boonzaaier" <contour@mweb.co.za>
To: "Coenie Erasmus" <coenie.er@freemail.absa.co.za>; "Adv Steven de la Harpe" <pvrspdlh@puknet.puk.ac.za>
Sent: 08 November 2001 03:14
Attach: PUBLIC WORKSHOP 23 - 24 Nov 01.doc
Subject: VREDEFORT WORKSHOP ADVERTS

Dear Coenie and Steven,

Attached the proposed public workshop advert for inclusion in local newspapers. Your comments please.

Yours sincerely,

Willie Boonzaaier

CONTOUR Project Managers CC
PO Box 4906, Rustenburg 0300, South Africa
Please visit our Website at <http://www.linx.co.za/contour/>
Tel (014) 537 2226
Fax (014) 537 2118

The information transmitted is intended only for the person or entity to which it is addressed and may contain confidential and/or privileged material. Any review, retransmission, dissemination or other use of, or taking of any action in reliance upon, this information by persons or entities other than the intended recipient is prohibited. If you received this in error, please contact the sender and delete the material from any computer.

VREDEFORT DOME PUBLIC WORKSHOP

The Management Committee is in the process of developing a Strategic Management and Development Plan for the Vredefort Dome. As part of the strategic planning exercise, Contour Project Managers will be facilitating workshops with interested and affected parties during the weekend of 23 and 24 November 2001.

The workshops will broadly cover the following items:

1. Presentation of the Situation Analysis (phase 1 results)
2. Identification of key issues, strategic considerations and related discussions
3. Nomination of working group representatives
4. The way forward

The workshops will be held at the Vredefort Dome area as follows:

23 November 2001: 14h00 – 18h00 at the farm xxxxxxx in the Free State

24 November 2001: 08h00 – 12h00 at Kiepersol in North West

A brainstorming session by the nominated working group members will follow at Kiepersol from 14h00 – 18h00 to further strategise around key issues.

Further information can be obtained from any of the following:

Coenie Erasmus, Environmental Affairs Free State, 051-4033024, 082-4558867

Adv. Steven de la Harpe, Management Committee, 018-2946475, 083-4060843

Willie Boonzaaier, Contour Project Managers, 014-5372226, 082-4427388



SOUTH AFRICAN HERITAGE RESOURCES AGENCY

FICHARDT HOUSE, 40 ELIZABETH STREET, BLOEMFONTEIN 8001

P. O. BOX 9743, BLOEMFONTEIN, 9300

TEL: (051) 430 4139 FAX: (051) 448 2536

OUR REF: 9/2/329/6

YOUR REF:

ENQUIRIES:

DATE: 02-02-2004

Mr C. Erasmus
Free State Department of Tourism, Environmental & Economic Affairs
Private Bag X20801
BLOEMFONTEIN
9300

Dear Mr Erasmus

PROPOSED SURVEY AND MANAGEMENT PLAN: VREDEFORT DOME, PARYS DISTRICT

Our previous telephone conversations regarding the above-mentioned matter refer.

I hereby confirm in writing that the Arts, Culture and National Heritage Distribution Agency of the National Lottery has approved a grant of R142 120-00 to the South African Heritage Resources Agency for a survey and management plan for the Vredefort Dome. We will appoint consultants to perform the tasks, set out in our application for funds, after the Grant Agreement has been signed and the Terms of Reference for the project have been compiled.

I also wish to make use of this opportunity to express our appreciation for your efforts to obtain alternative funding for the above-mentioned purpose while we were waiting for a response from the Distribution Agency regarding our application for the necessary funds.

Kind regards

H.H. Gous
Ms H.H. Gous
PROVINCIAL MANAGER: FREE STATE



SOUTH AFRICAN HERITAGE
RESOURCES AGENCY

Deleted: ¶

VREDEFORT DOME

CULTURAL HERITAGE SURVEY AND CONSERVATION MANAGEMENT PLAN



NOVEMBER 2004

Contributors:

Prof. Karel Bakker, M Naude, N Clarke

Dr Johnny van Schalkwyk

Dr Chris van Vuuren

Mr Carel van Zyl

The Project was done on behalf of the South African Heritage
Resources Agency and funded by the National Lottery
Distribution Trust Fund



Deleted: ¶

Deleted: ¶

Contributors: ¶
Dr Karel Bakker, M Naude, N
Clarke ¶
Dr Johnny van Schalkwyk ¶
Dr Chris van Vuuren ¶
Mr Carel van Zyl

FINAL 23 NOVEMBER 2004

**VREDEFORT DOME
CULTURAL HERITAGE SURVEY AND CONSERVATION MANAGEMENT PLAN**

EXECUTIVE SUMMARY

- In the Vredefort Dome the geology and the morphology are the main drivers for its declaration as a National Heritage Site.
- There are numerous Iron Age and historical structures and places in the Dome, but very few have so far been proposed to be classified of high conservation value individually.
- When the Dome is declared as a National Heritage Site, any development that may impact any heritage resource will require scrutiny by an Archaeologist and/or Architect with approved heritage experience to ensure that cultural significance is not lost or diminished and that an undetected heritage resource is not damaged or unsympathetically treated.
- It is foreseen that the Management Authority Heritage Convention Act, 1999 will be made up of various representations and disciplines and that SAHRA will have to enter into _____ agreement with them on their responsibilities and to ensure SAHRA will be enabled to fulfil their statutory responsibilities in accordance with Section 23 of the Mineral and Petroleum Resources Act, 1999.
- Landowners in the Dome will continue to give access to heritage resources on their own terms and within their tourism arrangements within the standard Dome guidelines they will participate to draft with the specialists. Their applications for permits to develop or change their properties will be dealt with strictly within the statutory and agreed regulations and guidelines. They can continue with their present land uses as long as it is within the protective measures of the NHRA. Applications for new land uses have to be accompanied by an environmental and heritage impact assessment procedure.
- The Landowners indicated at a well-notified meeting on 16 October 2004 that they are in favour of the Dome being declared as a National Heritage Site. No objections were received to the 150 summary reports send by mail, which was also posted on the web page.
- The team, who drafted this report, wishes to acknowledge with thanks, the assistance, information and advice received from the owners and officials involved, and especially from SAHRA. Without the financial assistance of the National Lottery Distribution Trust Fund this study would also not be possible.

Formatted: Bullets and Numbering

Deleted: h

Deleted: s

Deleted: medium or

Deleted: h

Deleted: s

Deleted: Steering

CONTENTS

1. Introduction
 - 1.1 Background
 - 1.2 Legal Analysis
 - 1.2.1 The acts
 - 1.2.2 The National Heritage Resources Act (NHRA) No. 25 of 1999
 - 1.2.3 Environmental Conservation Act No. 73 of 1998 as amended
 - 1.2.4 World Heritage Convention Act of 1999
 - 1.2.5 Relevant international heritage charters and conventions
 - 1.2.6 Local Government Municipal Systems Act No. 32, 2000
 - 1.2.7 Local Government: Municipal Structures Act No. 17, 1998
 - 1.3 Formalisation process

2. Site Description and Surveys
 - 2.1 Identification of Place and Stakeholders
 - 2.2 Information Recorded
 - 2.2.1 Theme Overview Vredefort Dome Area
 - 2.2.2 Oral Tradition and Indigenous Knowledge in the Vredefort Dome Area
 - 2.2.3 Architectural Significance in the Vredefort Dome
 - 2.2.4 A Survey of Archaeological Heritage Resources
 - 2.3 Statement of Significance
 - 2.3.1 Scientific Value
 - 2.3.2 Tourism and Educational Value
 - 2.3.3 Cultural Value
 - 2.3.4 Indigenous Knowledge Value
 - 2.4. Obligations arising from Significance

3. Formulating a Conservation Management Plan
 - 3.1 Impact Analysis and Key Management Issues
 - 3.2 Conservation, Principles and Objectives
 - 3.3 Management Policies and Protection
 - 3.4 Management Plan
 - 3.4.1 Management Structure
 - 3.4.2 Development Framework
 - 3.4.3 Database Management

Deleted: a

OWNERSHIP OF LAND IN THE DEMARCATED AREA OF THE VREDEFORT DOME

FARM NAME	LANDOWNER	POSTAL ADDRESS	CONTACT NUMBERS
KLEIN SWEETHOME 893	N.A Marks	PO Box 131073 Northmead 1511	Tel (05692) – 2521 (011) 425 3069 Fax: (011) 425 5033
Subdivision DEELFONTEIN 19	W.C Greeff	P.O Box 276 Vredefort 9595	Tel (05696) 1204
Subdivision DEELFONTEIN 19	A. Cloete	P.O Box 334 Vredefort 9595	Tel (05962) 1202 Cell 082 808 1837
Subdivision DEELFONTEIN 19	T. Greeff	P.O Box 263 Vredefort 9595	Tel (0568) 18 1558
Subdivision DEELFONTEIN 19	A. Rheeder	P.O Box 246 Vredefort 9595	Tel (056) 931 0411 Fax (056) 931 0063 (att Rheeder)
Subdivision DEELFONTEIN 19	M. Greeff	P.O Box 190 Vredefort 9595	Tel (05692) 2611 Fax (011) 364 7056 Cell 083 701 5215
Subdivision DEELFONTEIN 19 ERFDEEL 499	J. van Biljon	P.O Box 148 Vredefort 9595	Tel (05692) 2511
PARSON'S RUST 465	G. Gillespie	P.O Box 2309 Parys 9585	Tel (056) 818 1220 Cell 083 407 1899
SKURWEDRAAI 382	A.C Kotze	P.O Box 284 Parys 9585	Tel (056) 817 6548
STEENKAMPSBERG 127	L. Lindeque	P.O Box 237 Parys 9585	Tel (05692) 2713 Cell 083 384 7158
HELENA 780	S.L.J Jansen van Rensburg	P.O Box 290 Vredefort 9595	Tel (056) 818 1351 Cell 083 626 2762
ELIZA 972	S.P Papavarnavas	P.O Box 29 Parys 9585	Tel (056) 817 7786 (W) (056) 811 3052 (H)
EDENVALE 407	J.J Danhauser	P.O Box 456 Parys 9585	Tel (056) 81 4584 Cell 083 655 0125

DASKOP 1103 TARENTAALKOP 1103	W.R Dedwith	P.O Box 53 Parys 9585	Tel (056) 818 1352
RENSBURGSDRIFT 432 THEUNISSEN 1081	A. Dedwith	P.O Box 53 Parys 9585	Tel (056) 818 1352
EERSTE GELUK 515	P.A Gericke	P.O Box 152 Vredefort 9595	Tel (05692) 2620 Cell 082367 4045
Subdivision DAMPOORT 699	A. J Wiegand	P.O Box 40 Vredefort 9595	Tel (05692) 2711
HEIMBACH 500 DRIEHOEK 329 FONTEIN 501	H.J van Zyl	P.O Box 327 Vredefort 9595	Tel (05692) 2704 Cell 083 408 278?
Subdivision DAMPOORT 699	C.D Reitz	P.O Box 259 Vredefort 9595	Tel (055692) 2721
SKURWEDRAAI SKOOL 382	F. van der Merwe	P.O Box 191 Mt Pellen Glenvista Johannesburg	Tel (056) 811 4054 (011) 682 3614
BETEL 267	R. Dixon	P.O Box 335 Parys 9585	Cell 082 650 4488
Subdivision REBOKKOP 290	P.J Muller	P.O Box 205 Vredefort 9595	Tel (05692) 2621
ZUID-WITBANK 433 SPITZKOP 1060 DIEPSLOOT 1186	K. Marx	P.O Box 70793 De Wilgers 0041	Cell 082 459 6877
BOSHRANT 849	G. Potgieter	P.O Box 112 Vredefort 9595	Tel (056) 818 1426 (Neighbours)

1
1
1
18
19
20
21
22
23
24

<p>AASVOGELRANT 249 UNION 440 PIESANHOEK 617 DE NOON 294 BERGPLAAS 420 GROOTFONTEIN 421 MAARA 618 TOAL 819 TOAL 820 TOAL2 482 TOAL 3 471 MOUNT SINAI 292 RIETKUIL 110 DAMPOORT 699 VAN VUURENSKOP 457 TOAL 463 TOAL C820 TOAL B819 GIBSON 294 RAMROOT 471 WINKELHAAKDAM 455</p>	<p>J van Aswegen</p>	<p>P.O Box 591 Sasolburg</p>	<p>Cell 082 554 9030 Fax (016) 973 1534</p>
<p>AASVOGELRANT -OOS 281 BYEBOER</p>	<p>E. Erasmus</p>	<p>P.O Box 21198 Noord Brug Potchefstroom</p>	<p>Tel (018) 297 4831 Fax (018) 299 2316 Cell 082 801 2874</p>
<p>HYDOCKSRUST 1403 ORTLEPP 1098</p>	<p>M. Prinsloo</p>	<p>P.O Box 1734 Parys 9585</p>	<p>Tel (056) 818 1425</p>
<p>RIVERVIEW</p>	<p>S. Hill</p>	<p>P.O Box 2188 Parys 9585</p>	<p>Tel (056) 818 1558</p>
<p>DE TUIN 422 (WONDEROORD)</p>	<p>J. Senekal</p>	<p>P.O Box 1109 Parys 9585</p>	<p>Tel (056) 811 4129</p>
<p>VENTERSRANT 394 DE TUINE 394</p>	<p>D. Kriel</p>	<p>Private bag X12 Alberton 1450</p>	<p>Tel (011) 861 3338 Fax (011) 861 3361 Cell 083 442 3745</p>
<p>OUDEWERF (VAAL HACKLE)</p>	<p>R. Strydom</p>	<p>P.O Box 154 Ifafi 0260</p>	<p>Tel (012) 259 0453 Cell 083 271 1483</p>
<p>FONTEIN 501</p>	<p>A. Jacobs</p>	<p>P.o Box 84 Vredefort 9595</p>	<p>Tel (05692) 2503</p>

25

26

27

28

29

30

31

32

DASKOP 1103	J. de Lange	P.O Box 69 Parys 9585	Tel (056) 818 1726
WITBANK (RIVERSIDE 433) DIMALACHITE	H. Pretorius	P.O Box 270 Vredefort 9595	Tel (056) 818 1860 (056) 818 1616
WITBANK 433	A. Smith	P.O Box 1339 Parys 9585	Tel (056) 818 1204
BOOMPLAATS 1005	R. Petzer	P.O Box 793 Parys 9585 RETURNED	Tel (056) 811 4053 (016) 933 6012
BARNARDSRUS 1003	A.P.S Meyer	P.O Box 1855 Parys 9585	Tel (056) 818 1355
HOEDERLAND 1002	J. van der Merwe	P.O Box 667 Alberton 1450	Tel (011) 869 4604
DOORNHOEK 1000	G. Meyer	P.O Box 2691 Vanderbijlpark 1900	Tel (056) 811 5040 (016) 9311 7201 Cell 082 449 8411
NOOITGEDACHT 89	J. Bronkhorst	P.O Box 22 Vredefort 9595	Tel (05692) 1731
BASKOP 461 VIRGINIA 517 RUST EN VREDE 109	S. Engelbrecht	P.O Box 4149 Pretoria 0001	Cell 083 625 4175 Fax (012) 664 7795
KOMANDONEK 1185	W. de Vries	P.O Box 1248 Mafikeng 2745	Cell 083 459 8933
VENTERSKLOOF 424	G. Lachmann	38 Lupine Street Potchefstroom 2531	Tel (018) 290 5863
BET EL 267 SLANGKOP 423	N. Conradie	P.O Box 543 Potchefstroom 2520	Tel (018) 294 8828
Subdivision B1110 REBOKKOP 290	H.S du Preez	P.O Box 19598 Noordbrug Potchefstroom 2522	Tel (018) 2905619

Subdivision 931 REBOKKOP 290	Prof. A. Heyns	P.O Box 6778 Baileypark Potchefstroom 2526	Tel (018) 290 5146
S KLIP 496	S.H Moorcroft	104 Newlands Johannesburg 2092	Tel (05692) 2702 (011) 477 7129
GOEDGEDAG 971 VYFERSRUST 971	M.B van Biljon	P.O Box 286 Vredefort 9595	Tel (0568) 18 1980
THEUNISRUST 290 THESENSRUST	W.H van Biljon	20 Stauss Street Vanderbijlpark 1911	Tel (016) 982 1104
REIDSRUST 46	J.P van Biljon	16 Gillespe Street Vanderbijlpark 1911	Tel (016) 933 3090
SWEETHOME 893	J.A van Wyk	P.O Box 664 Viljoenskroon 9520	Tel (011) 837 5329
Subdivision REBOKKOP 290	Prof. V.E Dassenville	P.O Box 6276 Weltevrededepark 1715 RETURNED	Tel (011) 475 2839 Fax (011) 475 2839
SUNNYSIDE 514 WITKLIPFONTEIN 166	Dr. F.J Rademan	P.O Box 45304 Maifair 2108	Tel (011) 888 4551 (H) (011) 837 8995/6 (W) Cell 082 337 2184
LIBERTAS 518	A. de Klerk	P.O Box 1207 Potchefstroom 2520	Tel (05692) 2231
MIZPA 516	C. Pretorius	32 Voortrekker street Vredefort 9595	Tel (056) 931 0419
LESUTOSKRAAL 72	E. du Toit	10 Park Street Vredefort 9595	Tel (056) 931 0624
WITKLIPFONTEIN A519	A.E.C Janse van Vuuren	P.O Box 198 Vredefort 9595	Tel (056) 931 0052
MORAY 505	L.Stols A.W Viljoen And others		Cell 082 443 2208
BAVIAANSKRANTZ 435			

WELVERDIEND 973			
FONTEINPLAAS 848			
ROCKY RIDGE 23	F. Weideman	P.O Box 615 Parys 9585	Tel (056) 818 1644
KOPJESKRAAL	S. Buys	P.O Box 2271 Parys 9585	Tel (056) 818 1810 Fax (056) 817 7331
KOEDOESFONTEIN	P.L Rontgen	P.O Box 329 Parys 9585	Tel (056) 811 4015
KOEDOESFONTEIN	J. Ferreira	P.O Box 92 Parys 9585	Tel (056) 811 3851 Cell 082 271 8465
KOEDOESLAAGTE	L. van Vuuren	58 Umgeni street Drie Riviere 1939	Tel (016) 423 3458
KOEDOESLAAGTE	N. J Croeser	P.O Box 70554 Miederpark 2527	Tel (018) 294 4746 (B) (056) 818 1155 Cell 082 800 8371
KOEDOESFONTEIN	I.S Fourie	P.O Box 10551 Johannesburg 2000 RETURNED	Tel (011) 498 4000(B) (011) 475 2546 (H) Fax (011) 836 3763
BUFFELSHOEK	J.H Nel	P.O Box 1405 Parys 9585 RETURNED	
KOEDOESFONTEIN	J.A Jordaan	P.O Box 1771 Parys 9585	Tel (056) 818 1605
BUFFELSHOEK	W. Olivier	P.O Box 829 Parys 9585	Tel (056) 818 1182
KOEDOESFONTEIN SONOP LEEUFONTEIN	Adv. S.le R. De la Harpe	P.O Box 1344 Potchefstroom 2520	Tel (056) 818 1750 (H) (018) 299 1636 (B)
KOEDOESFONTEIN	R. Herbst	P.O Box 2347 Sasolburg 9579	Tel (056) 818 1319 (H) (016) 920 2957 (B) Cell 082 804 6557

KOEDOESFONTEIN	W.J Jackson	P.O Box 905 Parys 9585	Tel (056) 818 1604
VILJOENSRUS	G. Viljoen	P.O Box 872 Parys 9585	Tel (056) 818 1316
KOEDOESFONTEIN	P.Els	P.O Box 630 Parys 9585	Tel (056) 811 3856
KOEDOESFONTEIN	P.J Claassen	P.O Box 715 Parys 9585	Tel (056) 811 3856
BUFFELSHOEK	D. Serenyane	P.O Box 651680 Benmore 2010	Tel (011) 803 3510 (B) (011) 802 2863 (H) Cell 082 372 5566
APACHE BUFFELSHOEK	J. Geldenhuys	P.O Box 2446 Klerksdorp 2570	Tel (018) 462 8426 (B) (018) 468 6673 (H)
KOEDOESFONTEIN	P.Malan	18A van der Hof Road Potchefstroom 2520	Tel (018) 297 1352
KOEDOESLAAGTE	J.S.M Coetzee	P.O Box 72 Parys 9585 RETURNED	
KOEDOESLAAGTE	E. Grammel	198 Daffodil Road Lynwood Ridge 0081	Tel (012) 476 9265
KOEDOESLAAGTE	J.J Landman	P.O Box 129 Parys 9585	Tel (056) 811 3812
BUFFELSKLOOF	J.H Naude	P.O Box 420 Kroonstad 9585	Tel (0562) 3968
BUFFELSKLOOF	J.S van der Merwe	P.O Box 1923 Parys 9585	Tel (056) 818 1116
BUFFELSKLOOF	R.P van der Berg	P.O Box 17909 Sunward Park 1470	Tel (011) 869 1483
BUFFELSKLOOF	Dr. M.N Herman	P.O Box 668 Heilbron 9650	Tel 058 852 1445 Cell 082 453 7358

ROODERANT	G. Erasmus	P.O Box 1058 Rooihuiskraal Centurion 0154	Tel (012) 661 9343 (H) (012) 311 2711 (B) Cell 082 770 8784
ROODERANT	Prof. J.C Coetzee	123 Molen Street Potchefstroom 2520	Tel (018) 294 6190
ROODERANT	L. Coetzee	473 Aruis Street Waterkloof Ridge Pretoria 0002	Tel (012) 462 6612
ROODERANT	F.P de Beer	P.O Box 5585 Kocks Park Potchefstroom 2523	Tel (018) 291 1192
ROODERANT	J. Haggard	P.O Box 252 Viljoenskroon 9520	Tel (056) 343 0051 Cell 082 829 4238
TIERFONTEIN	P.J Pienaar	P.O Box 1107 Potchefstroom 2520	Tel (018) 291 1307
TIERFONTEIN UITVAL	D. van der Merwe	P.O Box 310 Fochville 2515	Tel (018) 291 1313
TIERFONTEIN	J. Jordaan	P.O Box 6318 Baillie Park 2526	Tel (018) 291 1314
GROOTFONTEIN	P. van Wyk	P.o Box 6599 Baillie Park 2526	
LEEUFONTEIN	Rev. De W. Kruger	P.O Box 20836 Noordbrug 2522	Tel (018) 297 3747
LEEUFONTEIN	P. Kirstein	P.O Box 324 Potchefstroom 2520	Tel (018) 291 1127
HEADLANDS KOPJESKRAAL	J.C Olivier	P.O Box 2191 Parys 9585 RETURNED	Tel (056) 818 1709
KOEDOESFONTEIN	D. Senekal	P.O Box 5252 Kocks Park 2523	Tel (056) 818 1274

88

89

90

91

92

93

94

95

96

97

98

99

100

	I Smiz	P.O Box 455 Walkerville 1876		101
KLIPFONTEIN	B. Erasmus	Potchefstroom		102
KOEDOESFONTEIN	Adv. De W. Nigrini			103
KOEDOESFONTEIN	G. van Rensburg			104
JUMBO	Prof. C.F.C van der Walt	P.O Box 19972 Noordbrug 2522	Tel (018) 290 6532	105
STEILTES	Mrs. T. du Preez	16 Cilliers street Klerksdorp	Tel (018) 468 2838 (018) 462 1039	106
ROODERANT	Rooderant Trust (C du Plessis)	P.O Box 1413 Potchefstroom 2531 RETURNED	Tel (018) 294 3254	107
KOPJESKRAAL	Miss. T. Theron	P.O Box 34 Parys 9585	Tel (056) 818 1655	108
BUFFELSHOEK	E. Beyleveld		Tel (056) 818 1179	109
BUFFELSHOEK	G. Risseuw		Tel (056) 818 1497	110
ROODERANT	P. Erasmus			111
TIERFONTEIN	B. Linde			112
TIERFONTEIN	W. Haarhoft			113
TIERFONTEIN	A. Scholtz			114
TIERFONTEIN	J. Barnard			115
KOEDOESFONTEIN	J.S Ferreira	10 Kort Street Parys 9585		116

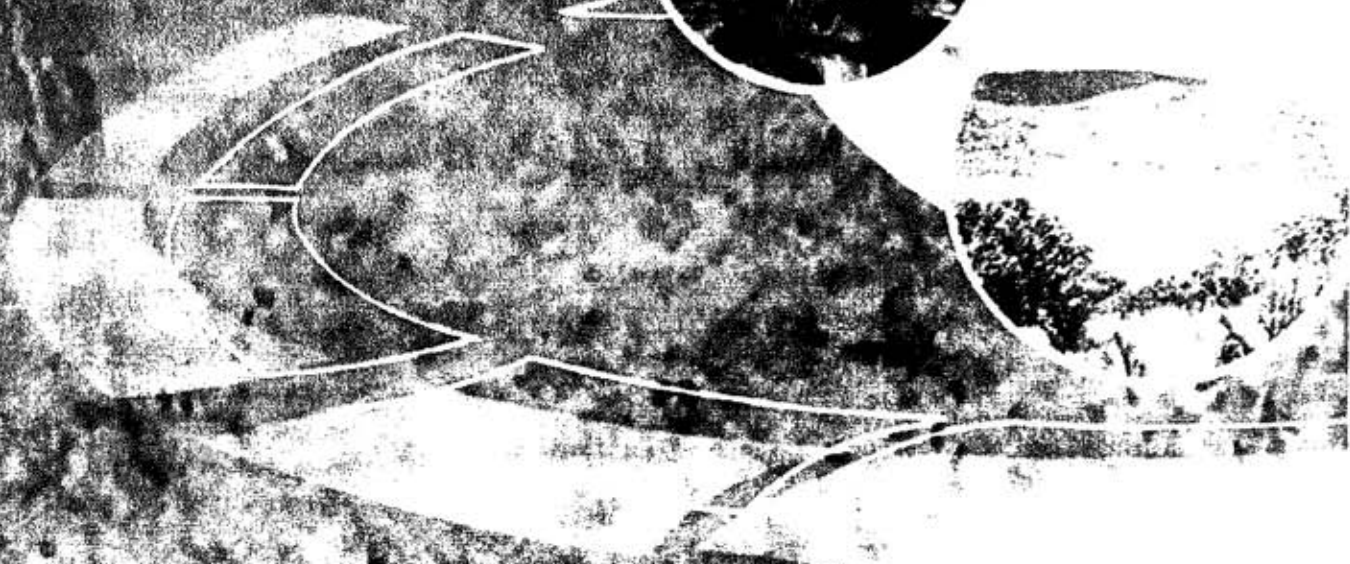
RIETPOORT	A. Muller		Tel (0180 297 3841)	117
TIERFONTEIN	S. Theron	P.O Box 200 Potchefstroom 2520 RETURNED	Tel (018) 294 3867	118
LEEUFONTEIN	J.P.A Pienaar	P.O Box 514 Potchefstroom 2520	Tel (018) 291 1121	119
ROODERANT	Dr. Burger	192 Anderson Drive Northcliff 2195	Tel (011) 782 4972	120
SCHOEMANSDRIF	Mrs. K. Janse van Rensburg	P.O Box 34 Vredefort 9595	Tel (018) 291 1328	121
ROODERANT	F. Bekker	P.O Box 5008 KocksPark Potchefstroom 2523	Tel (018) 293 0570 (H) (018) 297 1014 (B)	122
BOSHUT	Toyen Polimac	P.o Box 2407 Sasolburg 9579	Tel (016) 976 0444	123
VENTERSKROON	i. VAN DER Walt	66 Tom Street Potchefstroom 2531	Tel (018) 294 8745	124
ROODRANT Div.13	A.C de Agrela	P.O Box 5155 Kocks Park 2523	Tel (018) 291 1191	125
ROODERANT	P. van Zyl	147 Nieuwe Street Potchefstroom 2520	Tel (018) 294 7630	126
ROODERANT Div. 75	T.B Lourens	158 Milton drive Orkney 2619	Tel (018) 473 3132	127
ROODERANT	Mrs. A Hilder		Tel (018) 291 1193	128
ROODERANT Div. 12	O. Stumpke	P.O Box 446 Sundra 2200	Tel (013) 661 1880	129
ROODERANT Div.23	P.J Allen	26 Cecil Drive Melrose Johannesburg 2000	Tel (011) 788 5843 (011) 442 6419	130

ROODERANT Div. 24	J. Swanepoel			131
ROODERANT Div. 12	G. Vos	P.O Box 720652 Parkview 2193	Tel (011) 646 4637 (011) 646 1808	132
ROODERANT	T.B Lourens	168 Milton Drive Orkney 2619	Tel (018) 473 3132	133
ROODERANT	T. van Niekerk	P.O Box 684 Lydenburg 1120	Tel (01323) 51409 Cell 083 305 7868	134
ROODERANT	B. Arendt	P.O Box 44200 Linden 2104	Tel (011) 782 7431 (H) (011) 888 1079 (B) (018) 291 1186	135
BUFFELSKLOOF	DR Church, Noordbrug	P.O Box 20499 Noordbrug Potchefstroom	Tel (056) 818 1555	136
GROOTFONTEIN	F.P Naude	P.o Box 242 Kroonstad RETURNED	Tel (0562) 4261 Cell 083 255 2003	137
BUFFELSKLOOF	W. van der Merwe	1 Santa Barbara Gerhard Moerdyck street Pretoria 0002	Tel (012) 44 9873	138
BUFFELSKLOOF	T. Dale		Tel (011) 376 2305 (B) (011) 646 1263 (H) Cell 082 569 2860	139

Vredefort Dome Conservancy

STRATEGIC
DEVELOPMENT AND
MANAGEMENT PLAN

FEBRUARY 2002



The development of this plan was sponsored
by the Department of Environmental Affairs and Tourism Board

POTCHEFSTROOM

Potchefstroom Tourism Info & Development Centre
P.O. Box 912, Potchefstroom 2520
Tel: 018 293 1611 Fax: 018 297 2082

Places of Interest

- Buffelsvlei Game Park** - Tel: 018 298 1081
- Churches** - One of the oldest Reformed Churches in South Africa, (1891) which features some exceptional stained glass windows, is located in the town.
- Goetz Fleishack Museum** - A fine example of early townhouses built around the New Market Square during the mid 1850's. Tel: 018 299 5021
- National Monuments** - Potchefstroom offers a wealth of interesting architectural buildings dating back to the mid 1850's when the town was a major centre serving the western Transvaal farmlands and the diamond fields of the Northern Cape. These buildings, many of which have been declared national monuments, include the Old Gunpowder House, the Old Police Station Building, the Kruger Kraal Opstal, the Heimat building of the University of Potchefstroom Campus and the Old Magistrate's Office on Greyling Street.
- Old Fort & Cemetery** - A British defensive position used during the First Anglo-Boer War. Casualties are buried in the cemetery, nearby.
- Potchefstroom Museum** - Excellent exhibits trace the history of the Potchefstroom region with fine ethnographic representation including an oxwagon from the Battle of Blood River. The museum houses a reference library and museum shop. Tel: 018 299 5021
- President Pretorius Museum** - The residence of MW Pretorius, first President of the ZAR.
- Tom Street** - 700 oak trees line this road forming a unique spectacle, now a national monument.
- Totius House Museum** - A museum conserving the life and writings of JD Du Toit, Afrikaans translator, poet and theologian.
- Boskop Dam Nature Reserve** - Popular angling and picnic site between Carltonville and Potchefstroom on the R501.
- Hiking Trails** - The Summit, Boat & Paddle, Mooivivier, Pioneers' Route Inner City and Rooihaas trails make Potchefstroom a favourite hiking destination. Tel: 018 294 8572
- OPM-Prozesky Bird Sanctuary** - Wetland bird sanctuary adjoining the golf course. Tel: 018 299 5130
- Potchefstroom Lakeside Resort** - Self catering accommodation, camping and caravanning facilities include watersports, fishing, mini-golf. Tel: 018 299 5473
- Thabela Thabeng Hiking Trails** - Several exciting hiking options set in the scenic Vredefort Dome. Tel: 056 818 1116.
- Vredefort Dome** - See special feature.

Accommodation

Hotels

Elgro Hotel	018 297 5411
Impala Hotel	018 297 3954
Royal Hotel	018 294 4219
Willows Garden Court Hotel	018 297 6285

Guest Houses

AA Acacia	018 290 5021
Acorn Lodge	018 297 1569
Agapanthus	018 290 9904
Akkerlaan	018 293 1213
Alec Wright's House	018 297 4120
Annelie	018 297 7663
Ariané Royal	018 294 8891
Bokmakierie	018 297 7890
De Tuishuiz	018 297 3670
Die Anker	018 290 5475
Drostdy	018 290 5624
Eleazer	018 294 7414
Emmie	018 294 5992
Hadidas	018 297 4796
HuysTenBosch	018 294 4310
Lemon Blossom	018 297 1137
Oak Lodge	018 293 2599
Old Rose	018 294 8262
Oudrift	018 297 4939
Pine Grove Manor	018 290 6604
Provence	018 297 3494
Pukulani	018 297 4297
Riverfield	018 294 7232
Rooshoek	018 297 4084
Syringa	018 297 6335
Tapestries Gardens	018 297 4856
Tuinhuus	018 293 2422
Venter	018 297 3797
Venter & M. Erasmus	018 294 6065

Bed & Breakfast

Aalwee Nicoran	018 293 1310
Adelhof	018 297 4084
An-Huisj	018 294 5890
Arendsrus	018 290 6118
Artkat Koffie & Kuns	018 294 5396
Auberge	083 632 9905
Beukes 25	018 297 1348
Cosy Cottage	018 290 5710
Die Mooie Molen	018 294 8005
Gracias	018 297 5040
Kalahari	018 294 4171
Lynette Coetzee	018 294 8797
Melhaven	018 297 5163
Mooivivier	018 290 5010
Ons Spens	018 297 4988
Remembrance	018 294 5707
Serendipity	018 293 0834
Shady Acres	018 290 5773
Soetdoring	018 294 6202
Tarentaaltjie	018 297 0280
The Farmhouse	018 290 5228
Varsity	018 293 3882

Vredefort Dome

2000 million years ago a giant meteorite struck the earth near the present day village of Vredefort creating a crater 90km in diameter and forcing the surrounding landscape into a dome like feature. This is the largest and oldest meteorite impact site on earth and is soon to be nominated for World Heritage status.

The Vaal River forms the southern boundary to the area, while to the north a conservancy has been established to conserve the diverse animal and plant life. In between, a beautiful valley set aside for farming and tourism. The Dome offers some of the finest hiking and adventure tourism sites in South Africa. The Dome can be accessed either from Parys or Fochville via the R500 following signs to Venterskroon. Travelling from Potchefstroom, exit the town on Mooi River Drive, south and follow signs to Schoemansdrift. Turn left at the Venterskroon sign into the Dome.

Accommodation

Bear Africa Leadership Concept & Conference Centre	056 818 1679
Benjo Angling Camp & Caravan Park	056 818 1114
Bundu and Boplaas Bush Camps	018 291 1309
Dome Trails Base Camp	018 294 8572
Donkervliet Youth Training Centre	056 811 3957
Dutch Reformed Church, Takwasa Camp	056 818 1555
Elgro River Lodge	018 297 5411
Ferri Wedding Village	056 818 1151
Jakkalsdraai Chalets	018 299 6627
Kaya Ibubezi Conference Centre	056 818 1613
Leeuwfontein Koepel Guest House	018 291 1125
Lenaga Horse Trails	083 633 0529
Lenyebi River Lodge	018 291 1306
Limeric Lodge	018 291 1518
Morala Game Farm	056 818 1314
Raaswater	082 891 1908
Reformed Church Youth Camp	018 294 8572
Rondekap Game Farm	018 294 3683
Stonehenge Hotel	056 818 1615
Suikerbos Nature Lodge	018 294 3867
Sunwa River Rafting	056 817 7101
Thabela Thabeng Mountain Retreat	056 818 1116
Veldwaarts Adventure Centre	018 291 1192

Tour Operators

Astra Travel	018 297 5226
Avis Rent-a-Car	018 290 8535
Beytell Bus Diens	018 294 5990
Codesa Transport Services	082 635 0909
Imperial Car Hire	018 462 9899
Ka-Bee Car Hire	018 297 3465
Kruger Bus Services	018 290 7877
Mag Tours	082 688 4863
Malupi Safaris	018 290 1753
News Adventure Tours	018 297 1960
Open Air Safaris	018 294 5629
Porcupine Tours & Safaris	018 571 1249
Pukulani Safaris	018 297 4297

Africa Wild

Monthly Publication

**Extreme Skydiving
Unique Baobabs**

**Vredefort Dome
Cataclysmic Impact from Outer Space**



October 2003
SA R19.95 (Incl.Vat)
Namibia NS21.25
Other countries R21.25 (Excl.Tax)

Travel - Wildlife Conservation - Nature - Tourism

PROGRAMME

PUBLIC PARTICIPATION MEETING: DECLARATION OF VREDEFORT DOME AS WORLD HERITAGE SITE

17 JULY 2004

DONKERVLIET EDUCATIONAL CENTRE

9H45 – 10H15 Arrival and Tea

10h15 Meeting start

AGENDA

1. Opening and welcome (Ms I Coetzee: Executive Manager – NWP)
2. Purpose of the meeting (Ms P Naude: Facilitator)
3. Briefing on progress with regard to the nomination of the Vredefort Dome as a National Heritage Site (Mr C Erasmus: FS Prov)
4. Questions and answer session
5. Briefing on expectations and preparations for the inspection team from the World Heritage Secretariat (Mr Ntsizi November: DEAT)
6. Question and answer session
7. Discussion, way forward and summary (Facilitator)

12H30 Closure

Contact details:

Mr Coenie Erasmus
Free State: Department of Tourism, Environment and Economic Affairs
082 455 8867
erasmusc@dteea.fs.gov.za

Ms Ingrid Coetzee
North West: Department of Agriculture, Conservation, Environment and
Tourism
0828039105
icoetzee@nwpa.gov.za

Website: www.unesco.org/whc

Appendix 5

DEPARTMENT OF ENVIRONMENT AND ENVIRONMENTAL AFFAIRS
 25 FEB 2005
 PRIVATE BAG X2039
 MMABATHO 2735
 NORTH WEST PROVINCE
 REPUBLIC OF SOUTH AFRICA



→ Thabang
 Tselalimtho
 → Hennie
 Schoeman
 10 YEARS OF FREEDOM

Office of the Premier

→ Dion Swart
 → Irene Swaenich
 → Tshapo Muremi
 (i.r.o Harkbees
 pool Dam)

for your urgent attention please.
 Template attached
 M
 23/2

Chief Directorate Policy Management

Ref: K12/15/6
 Enq: K. Molise

**TO : HEAD OF THE DEPARTMENT
 DEPARTMENT OF AGRICULTURE, CONSERVATION,
 ENVIRONMENT & TOURISM**

FROM : CHIEF DIRECTORATE: POLICY MANAGEMENT

DATE : 21 FEBRUARY 2005

SUBJECT : BUDGET REMINDER

At the recent Exco Lekgotla at Potchefstroom, the Department of Finance and Economic Development announced that the "Top Sliced" 9.5% of the Provincial budget has been allocated as "Earmarked" funds to the budgets of departments. It was further confirmed that these "Earmarked" funds could only be released for expenditure on submission of a registered project and an approved Business Plans.

All departments were also requested to produce these business plans for approval before 31 March 2005 if they do not want to risk the funds to be utilised for other purposes.

According to information received from Treasury, the following allocations have been "Earmarked" on your budget:

Budget vote & Programme	2005/06 MTEF Allocation (R'000)	2006/07 MTEF Allocation (R'000)	2007/08 MTEF Allocation (R'000)
Land Care	5,000	5,500	5,747
Comp. Agric. Support Programme	33,594	40,313	53,091
Agric. Support on Communal Land	10,000	10,000	10,000
Post Settlement Support Services	40,000	40,000	40,000



Taung Heritage Site Maintenance	2,100	2,700	2,900
Vredefort Heritage Site Maintenance (Management)	3,218	3,817	4,370
TOTAL	93,912	102,330	116,108

At the subsequent PMT meeting your representatives were fully briefed on the need to register projects and produce business plans as a matter of urgency for approval before 31 March 2005. The representatives were also supplied with copies of a proposed template and guidance for the preparation of all types of business plans.

It would be highly appreciated if you could supply us with:

- Confirmation of Projects registered in the Project Management Information System (Pro-ProMIS) for at least the 2005/06 financial year; (Name, registration number and budget requirement for 2005/06);
- A printout of the project data sheet that shows the information captured on the system;
- The name of your Data capturer on the system and official representative on the PMT. The names that we currently have are T. Moselehi and M. Malambo for PMT. For data capturing we have M. Mokalobe, S. Mphephu, and O.E. Sekhakhhu.

Copies of your business plan(s) to motivate and explain your budget allocation for 2005/06 should please reach us not later than the end of February to allow sufficient time for appraisal by the Office of the Premier and approval by the Executive Council and Treasury.

Your cooperation and support is highly appreciated.

Danie Schoeman

Danie Schoeman
CD: Chief Directorate Policy Management

05/02/21

Date

CC: Mr. E. Abrahams – Provincial Treasury
Mr. T. Moselehi – PMT Representative
Dr. Malambo - PMT Representative

ilzant@ucppg.gov.za



TERMS OF REFERENCE

STRATEGIC ENVIRONMENTAL ASSESSMENT VREDEFORT DOME

1. INTRODUCTION AND BACKGROUND

Vredefort dome is well known for its unique geological formation and structure. This gave rise to a very valuable natural environment that has a distinctive biological habitat and landscape formations. So much so that this area is earmarked for an application as a World heritage Site. Eco-Tourism in the area is developing at such a fast rate that there is fear that this pressure for development may not be sustainable environmentally. There is also concern that due to this area being of particular value due to its ecological and scenic value and also its geological uniqueness, the pressure for development without proper information and informed planning can lead to the very particular values being eroded.

2. OBJECTIVES

2.1 Reasons for SEA

In order to achieve sustainable development the constraints placed on development by the environment need to be assessed, hence the need for a Strategic Environmental Assessment (SEA).

2.2 Expected results

General outcomes

- A broad plan with programme alternatives
- A vision and identification of significant strategic issues
- A situation assessment, which will include:
 - A detailed resource inventory
 - Sustainability objectives, criteria and indicators
 - Environmental opportunities and constraints
- Formulation of sustainability parameters
- Alternatives including environmental substitutes and trade-offs
- A management plan including implementation, monitoring and auditing

Specific outcomes

The objective is to develop an approach a framework for the Vredefort Dome that ensures a sound integration of environmental issues into all decision making processes on a strategic level.

Specific outputs

A Spatial framework for strategic development upon which decision makers can base development policies, plans and programmes – including opportunities and constraints the environment place on development.

Guidelines to assist regulatory agencies during decision-making – especially in the process of evaluation of EIA's

Maps describing sensitive areas or areas of specific significance in relation to the geological, bio diversity and environmental importance and recommended land use

3. ISSUES TO BE INVESTIGATED IN THE SEA

3.1 Land use planning in the Vredefort Dome

The status quo and future plans currently included in the municipal spatial framework, which has to be revised annually. SEA outputs are to be incorporated into the spatial framework during these annual revisions.

3.2 Environmental aspects to be included in resources inventory

- Quality and availability of water and air - including water pollution issues, extraction of sub-surface water, regional supply, soil conditions.
- Biodiversity and conservation status of fauna and flora.
- A baseline of the socio-cultural-economic status, including population and economic growth trends and cultural heritage resources.

3.4 Specified industries spatial needs and plans.

3.5 Farming, protection of agricultural land, sub-divisions of farming land & interaction with wild animals.

3.6 Bulk services provision - effectiveness and adequacy. Establish whether demand for water. Sewage, roads, electricity and sanitation for current and future developments. Establish whether waste management structures and facilities are adequate and able to cope with growth and

3.7 Existing institutional structures, which influence the maintenance and enhancement of environmental resources, e.g. law enforcement, co-operation between government institutions.

3.8 *Any further issues to be identified by the consultant.*

4. SCOPE OF THE SEA

The Vredefort dome and buffer zone

5. PLAN OF WORK AND METHODOLOGY

The SEA shall be conducted according to the Guideline document for SEA in South Africa (DEAT, 2000) and the more recent sourcebook for SEA (CSIR, 2002), adapted for the specific context.

A Plan of Study for SEA is to be submitted with the tender document.

The following potential sources of information should be used.

5.1 Published information (Secondary data)

- Municipal departments including Town Planning, City Engineer, Parks and Recreation
- Provincial government departments:
- National government departments: Water Affairs and Forestry (including Catchment Management Agencies), Agriculture, Environment Affairs and Tourism, Trade and Industry (SDI) information
- North West Parks Board
- Universities - Potchefstroom and North West
- Consultants
- Literature and internet
- Development Bank of South Africa
- S A Heritage Resources Agency (SAHRA)
- Interested and Affected Parties
- Any other bodies

It is anticipated that the bulk of the resource inventory can be completed by compilation and integration of existing data from the sources listed above.

5.2 Field surveys (Primary data)

These should be limited to point checks to confirm trends from compilation of existing data. The field surveys must include, but are not restricted to, biodiversity, uncontrolled development and availability of services.

5.3 Sustainability parameters

Sustainability parameters must be formulated. Such indicators have been developed as part of the SOE process at national and provincial level. These are to be used as a point of departure for the SEA, and adapted and refined as required.

5.4 Stakeholder involvement

This is a core concept of the SEA process. In order to avoid costly delays, public participation must take place through existing structures

6. REQUIRED EXPERTISE

It will be expected that the SEA team will comprise the following areas of expertise:

- Project management
- SEA experience including strategic thinking and integrative skills
- GIS skill and facilities
- Spatial analytical skill
- Town and Regional planning
- Local and indigenous knowledge
- Bio-diversity and Heritage
- Environmental management policy and legislation

7. MANAGEMENT STRUCTURE AND TIMETABLE

The SEA team will report to a steering committee comprising of representatives of:

- DACET North West Province
- DTEEAS Free State Province
- Relevant local authorities

This committee will have the power to co-opt as required.



DEON SWART
SENIOR MANAGER
CONSERVATION SERVICES
Private Bag X2039, Mafikeng, 2735
Tel: 018 389 5111 Fax: 018 389 5640



VREDEFORT DOME TASK TEAM – MINUTES OF 28TH JANUARY 2005.

1. Welcome.
2. Apologies: I Coetzee, Dr D Muller.
3. Absent: Tseko Liphokojoe
4. People who attended:

North West - D. Swart, P. Weinberg, E. Swart, L. Gaborone, A. Monau, I. Sinovich, C. Wessels, I. Kgokong, P. Matlapeng & M. Forbang.

Free State – N. Mdi, C. Erasmus, D. Krynauw.

5. Adoption of previous meeting's minutes.

The minutes of the meeting held on the 10th were adopted with few amendments. The minutes of other past meeting were also adopted.

6. Adoption of agenda:

The agenda was adopted.

7. Matters under discussion:

7.1 Management authorities :

It was decided the report regarding management authorities which emanated from the Natal and Cradle of humankind. It was decided that the Secretariat should compile the report using the existing frame work and then circulate to the Free State colleagues for input. North West and Free State Land owners must acknowledge and ratify the management authority before sending it to the IUCN. Allocation of R 1.3 million to run and establish Management Authority (MA) available, but the actual costs will be determined by the model of the MA adopted.

7.5 Determination of Islands ownership and provincial boundaries:

Mr D. Krynauw made presentation of the ownership status of Islands in the Vaal river area of the Vredefort Dome. Apparently all islands in the Vaal river are state owned except where private farm boundaries specify or include them. The principle is that where title deed are non existent or do not specify the rightful owner, then the areas are assumed to belong to no one else. The status of ownership of some lands and islands will however be further confirmed with the National Dept. of Land Affairs's Surveyor General.

Action: Mr D Krynauw to approach the Surveyor General's office (i.e. Amelia) and the Premier's office to get clarity on islands which's ownership is not specified.

7.6 Any other business: -

7.6.1 Task team operations.

The task team secretariat needs to do things in a professional manner. With effect from this meeting, the secretariat will be transferred to the Potchefstroom Office given its proximity to the Vredefort Dome. Mr Pierre Weinberg will assume the custodianship of the task team.

Mr D Swart will advise on the compilation of the action list for task team meetings. The issue of quorum of the task team was also discussed. Members feel that a list of all permanent members of the task team should be drawn, but not treat other members as less important. The chairpersonship will rotate between the two provinces, as represented by Ms I Coetzee and N Mdi. Mr P Weinberg did a presentation on the updating of land ownership in the Vredefort Dome.

Action: The terms of reference of the task team should be revisited so as to determine who needs to attend the task team as a permanent member.

7.6.2 Political Oversight Meeting.

There was general concern about the time it took without the political oversight forum (made up of MEC's and Mayors) meeting. There was also concern about the status of the memorandum of understanding (MOU), and when will it be likely completed for presentation to the political oversight forum. It was resolved that members of the political oversight need to visit the Cradle of humankind and that the secretariat has to arrange such a trip and meeting following the normal protocol.

Action: The secretariat will organize the political oversight trip to the Cradle of humankind, where they are also expected to hold a meeting between the 15th to the 18th March 2005. The agenda for the meeting will also be drawn by the Secretariat.

7.6.3 Branding of Vredefort Dome.

The Vredefort Dome needs to be appropriately branded as a tourism product, but however the proposal are still at the conceptual stage. The issue will be discussed at the forthcoming steering committee meeting.

The next meeting will be held on the 25th February 2005 at the Potchefstroom Agricultural College @ 10h:00.



SOUTH AFRICAN HERITAGE
RESOURCES AGENCY

Deleted: ¶

VREDEFORT DOME

CULTURAL HERITAGE SURVEY AND CONSERVATION MANAGEMENT PLAN



NOVEMBER 2004

Contributors:

Prof. Karel Bakker, M Naude, M Clarke

Dr Johnny van Schaikwyk

Dr Chris van Vuuren

Mr Carel van Zyl

Deleted: ¶

The Project was done on behalf of the South African Heritage
Resources Agency and funded by the National Lottery
Distribution Trust Fund



Deleted: ¶

¶
Contributors ¶
Dr Karel Bakker, M Naude, M
Clarke ¶
Dr Johnny van Schaikwyk ¶
Dr Chris van Vuuren ¶
Mr Carel van Zyl

FINAL 23 NOVEMBER 2004

The CDC does not bind itself to accept the lowest or any Tender and no correspondence will be entered into in this regard.



All enquiries regarding this Tender shall be directed to: Mr MS (Giel) Meyer
The Consulting Engineers: BKS / MDC / MSBA Joint Venture

Tel: (041) 585 2514 ** Fax: (041) 585 8478 ** E-mail: gielm@bks.co.za

Postal Address: Postnet Suite No. 35, Private Bag X13130, Humewood, Port Elizabeth, 6013
Physical Address: Lora Chambers, Oakworth Road, Humoral, Port Elizabeth, 6001 ** Web site: www.coega.com

NORTH WEST TENDER BOARD

TENDERS ARE HEREBY INVITED FOR:

- NW 180/04: Department of Agriculture: Proposals for the strategic environmental assessment for the Vrededorst Dome World Heritage Site.**
Preferential Goals and Evaluation Criteria: 90/10 points.
Breakdown of 90 points: •Price •Information •Functionality.
Breakdown of 10 points: •SMMEs •Locality within the Province •HDI (woman equity ownership and disabled).
A compulsory pre-tender meeting will be held on Thursday, 28 October 2004 at 10:00 at Agricentre, James Moroka Drive, Mmabatho.
For more information, please contact Mr S.A. Jantjie at (018) 389-5455 or Mr D. Swart at 082 338-0356.
A non-refundable deposit of R100.00 is payable for this document.
Closing date: 25 November 2004 at 11:00.
- NW 181/04: Department of Agriculture: Proposals for the strategic environmental assessment for Heritage Park (Pilaanesberg-Madikwe Corridor).**
Preferential Goals and Evaluation Criteria: 90/10 points.
Breakdown of 90 points: •Price •Information •Functionality.
Breakdown of 10 points: •SMMEs •Locality within the Province •HDI (woman equity ownership and disabled).
A compulsory pre-tender meeting will be held on Thursday, 28 October 2004 at 11:00 at Agricentre, James Moroka Drive, Mmabatho.
For more information, please contact Mr S.A. Jantjie at (018) 389-5455 or Mr D. Swart at 082 338-0356.
A non-refundable deposit of R100.00 is payable for this document.
Closing date: 25 November 2004 at 11:00.
- NW 182/04: Department of Agriculture: Proposals for the consolidation of the North West Biodiversity Management Bill.**
Preferential Goals and Evaluation Criteria: 80/20 points
Breakdown of 80 points: •Price •Information •Functionality.
Breakdown of 20 points: •SMMEs •Locality within the Province •HDI (woman equity ownership and disabled).
A compulsory pre-tender meeting will be held on Thursday, 28 October 2004 at 12:00 at Agricentre, James Moroka Drive, Mmabatho.
For more information, please contact Mr S.A. Jantjie at (018) 389-5455 or Mr D. Swart at 082 338-0356.
A non-refundable deposit of R100.00 is payable for this document.
Closing date: 25 November 2004 at 11:00.
- NW 183/04: Department of Finance: Request for information.**
The purpose of this Request for Information (RFI) is to identify Storage Area Network (SAN) Integrator Vendors and to seek information regarding their companies and the functionality and scope of their proposed products.
A detailed Request for Information document can be obtained by phoning Timothy Lescoyane on (018) 387-4161 or by e-mailing: Timothy@Nwpg.gov.za
For technical information, please contact Eloff Scholtz at (018) 387-3640.
NB: There will be two stages to this process: •RFI •Closed tenders for shortlisted suppliers: Those suppliers whose responses to the RFI are considered to be technically qualified.
Closing date: 5 November 2004 at 11:00.

The North West Tender Board and client departments do not bind themselves to accept the lowest or any other tender in whole or in part.

Tender documents will be available from the Office of the North West Tender Board, First Floor, Botshelo Water Building, University Drive, Mmabatho or Private Bag X2132, Mmabatho 2735. Telephone: (018) 387-4227.

IMPORTANT NOTICE: Should the tax clearance certificate NOT be attached or not be the original copy or not be signed by SARS by closing of the tender, the tender will be regarded as invalid.



North West Province
SOUTH AFRICAN PROVINCE

AFRICA

VREDEFORT DOME

SOUTH AFRICA



1. DOCUMENTATION

- i) **Date nomination received by IUCN:** April 2004
- ii) **Dates on which any additional information was officially requested from and provided by the State Party:** IUCN letters requesting supplementary information were sent on 26 October 2004, after the field visit, and 10 January 2005, following the IUCN WH Panel. State Party responses were received on 8 December 2004, and 29 March 2005.
- iii) **IUCN / WCMC Data sheet:** 2 references (one reference with 47 citations)
- iv) **Additional Documentation Consulted:** Brink, M., Waanders, F., Bisschoff, A.A. 2004. **IUCN Technical Evaluation: Vredefort Dome, 30th August 2004, Geological Aspects.** Paper prepared for the IUCN Mission, Vredefort Dome, South Africa, August 2004. Planetary and Space Science Centre 2004, Department of Tourism, Environmental and Economic Affairs, Free State. Brink, M.C., Bisschoff, A.A., Waanders, F.B., Schoch, A.E. 2005. **An addendum to the supplementary information document on the Vredefort Dome. Earth Impact Database, Impact Cratering on Earth** (including World Impact Structures sorted by location) University of New Brunswick. <http://www.unb.ca/passc/ImpactDatabase/essay.html>. Brink, M., Bisschoff, A.A., Waanders, F. 2004. **The Vredefort Impact Structure, Poteschefstroom, South Africa.** Brink, M.C., Waanders, F.B., Bisschoff, A.A., Gay, N.C. 2000. **The Foch Thrust-Poteschefstroom Fault structural system, Vredefort, South Africa: a model for impact-related tectonic movement over a pre-existing barrier.** Journal of African Earth Sciences, Vol 30, No 1, pp. 99-117. Elsevier Science Ltd Great Britain. Bisschoff, A.A. 1999, **The Geology of the Vredefort Dome (and Geological Sheets).** Council for Geoscience, Geological Survey of South Africa. Explanation of Sheets 2627CA, CB, CC, CD, DA, DC. 2727AA, AB, BA. Scale 1:50,000. Gibson, R.L., Reimold, W.U. 1999 **Field Excursion through the Vredefort Impact Structure.** Department of Geology, University of Witwatersrand, South Africa. French, B.M. 1998, **Traces of Catastrophe. A Handbook of Shock-Metamorphic Effects in Terrestrial Meteorite Impact Structures** Lunar and Planetary Institute, Houston USA. Glikson, A.Y. 1996. **Mega-impacts and mantle-melting episodes: tests of possible correlations.** AGSO Journal of Australian Geology and Geophysics, 16 (4) pp. 587-607. Grieve, R.A.F., Pilkington, M. 1996. **The signature of terrestrial impacts.** AGSO Journal of Australian Geology and Geophysics, 16 (4) pp. 399-420. Sutherland, F.L. **The Cretaceous/Tertiary-boundary impact and its global effects with reference to Australia.** AGSO Journal of Australian Geology and Geophysics, 16 (4) pp. 567-585. Shoemaker, E.M., Shoemaker, C.S. 1996. **The Proterozoic impact record of Australia.** AGSO Journal of Australian Geology and Geophysics, 16 (4) pp. 379-398.
- v) **Consultations:** 7 external reviewers, including ICOMOS. Officials from South Africa National, Provincial and District governments, representatives of community organisations and individuals.
- vi) **Field Visit:** Graeme Worboys, August 2004
- vii) **Date of IUCN approval of this report:** April 2005

2. SUMMARY OF NATURAL VALUES

The nominated serial property, Vredefort Dome, is located approximately 120 km to the south and west of Johannesburg, South Africa. Covering a total area of 30,111ha, the serial property includes a main core component of 30,108 ha, and three smaller (each 1 ha in size) component sites - two to the west, and one to the south east of the core area. The three satellite sites were added to the nomination, following discussions with IUCN, to include special outlier geological (outcrop) sites of significance to the overall geological story told at the nominated property.

The Vredefort Dome straddles the westerly flowing Vaal River, which also forms the administrative boundary of the Northwest Province and the Free State Province. It is

a representative part of a larger meteorite impact structure (or astrobleme) which has a radius of impact of 190 km. The eastern boundary of the distorted north easterly trending oval shaped core component of the serial property is found 5 km from the town of Parys, with its western boundary located some 19 km from the town. The southern boundary of the core component area lies about 6 km to the north of the town of Vredefort, and the northern boundary is about 26 km to the north of the town.

Meteorite impact has played a significant part in the geological history of the Earth. Geological activity on the Earth's surface means that the evidence of the majority of impacts has disappeared (in contrast to the prominent remains of such impact sites on the Moon). The largest meteorite impact craters are testament to catastrophic

changes in the record of the planet and life on Earth: these impacts would have caused devastating global changes, and some scientists believe some may be the cause of major evolutionary changes, including mass extinctions in the fossil record. This specialised and scarce group of geological sites therefore form a critical part of the evidence of Earth's geological history and the understanding of the evolution of the planet.

The Vredefort Dome meteorite impact structure is the oldest (2023 million years) and largest (radius 190 km) so far found on earth. It is one of only three meteorite

impact structures known with a diameter greater than 150 km, the other two being the structurally deformed Sudbury meteorite impact structure in Canada (1800 million years) and the buried Chicxulub meteorite impact structure in Mexico (60 million years). Chicxulub is also famous for its links to the demise of the dinosaurs at the end of Cretaceous (Table 1). The Vredefort Dome meteorite impact structure is one of about 200 meteorite impact structures currently known on the earth (Table 2). It is also the most deeply eroded impact structure known, with current levels of exhumation between 8 and 11 km.

Table 1: Terrestrial meteorite impact structures larger than 10km crater diameter (After French, 1998)

Crater diameter	Approx projectile diameter	Energy (TNT equivalent)	Mean impact frequency (Earth: No. per million yrs)	Mean impact interval (Earth)	Comparable terrestrial event
10km	500m	11,000 MT	10	100,000yr	Bosumtwi Meteorite Impact Crater, Ghana
20km	1km	87,000 MT	7.1	350,000yr	Ries Meteorite Impact Crater, Germany
50km	2.5km	1,300,000 MT	0.22	4.5m.y.	Charlevoix Meteorite Impact Structure, Canada
100km	5km	11,000,000 MT	0.04	26m.y.	Popigai Meteorite Impact Structure, Russia
200km	10km	87,000,000 MT	0.007	150m.y.	Largest known terrestrial impact structures, Sudbury Canada, Vredefort Dome, South Africa

Table 2: Meteorite impact structures larger than 10km (Earth Impact Data base, 2002, Brink et al, 2004)

Diameter	Meteorite impact structures
10-49 km	Ames, USA; Aorounga, Chad; Araguainha, Brazil; Avak, USA; Azuara, Spain; Boltys, Ukraine; Bosumtwi, Ghana; Carswell, Canada; Clearwater East, Canada; Clearwater West, Canada; Deep Bay, Canada; Dellen, Sweden; Eagle Butte, Canada; El'gygytgyn, Russia; Gosses Bluff, Australia; Gweni-Fada, Chad; Haughton, Canada; Janisjarvi, Russia; Kaluga, Russia; Kamensk, Russia; Karla, Russia; Kelly West, Australia; Kentland, USA; Lappajarvi, Finland; Lawn Hill, Australia; Logancha, Russia; Logoisk, Belarus; Manson, USA; Marquez, USA; Mistastin, Canada; Mjolnir, Norway; Montagnais, Canada; Nicholson, Canada; Oasis, Libya; Obolone, Ukraine; Ries, Germany; Rochechouart, France; Saint Martin, Canada; Serra da Cangalha, Brazil; Shoemaker, Australia; Sierra Madera, USA; Slate Islands, Canada; Spider, Australia; Steen River, Canada; Strangways, Australia; Suavjarvi, Russia; Upheaval Dome, USA; Ust-Kara, Russia; Vargeao Dome, Brazil; Wells Creek, USA; Zhamanshin, Kazakhstan.
50-99km	Acraman, Australia; Beaverhead, USA; Charlevoix, Canada; Chesapeake Bay, USA; Kara, Russia; Kara-Kul, Tajikistan; Morokweng, South Africa; Puchezh-Katunki, Russia; Siljan, Sweden; Tookoonooka, Australia; Woodleigh, Australia.
100-199km	Chicxulub, Mexico (170km); Manicouagan, Canada (100km); Popigai, Russia (100 km).
>200km	Sudbury, Canada (250 km); Vredefort Dome, South Africa (380 km).

There are two basic types of meteorite impact structures: simple structures of up to 4 km in diameter, with uplifted and overturned rim rocks surrounding a bowl shaped depression partially filled by breccia; and complex

structures, generally 4km or more in diameter, with a distinct central uplift in the form of a peak and/or ring, an annular trough, and a slumped rim. Most terrestrial meteorite impact structures that have formed on earth

have been obliterated by terrestrial geological processes over time, and many are buried.

2.1 Evolution of the Vredefort Dome meteorite impact structure

The impactor that formed the meteorite impact structure at the nominated property was either a large body such as an asteroid with a diameter of about 12 km traveling at a relative velocity of 20 km/sec, or a smaller one, such as the head of a comet, approaching at a much higher speed. The impact event created the greatest single energy release event known for the surface of the earth. The meteorite impact structure was estimated to have been created in about 4 hours. Major stages in the evolution of the structure are described below:

Stage One: At impact. A shockwave is generated at the moment of impact, followed by the excavation of a transient crater, the delamination of the earth's crust and its transport away from the impact point occurs.

Stage Two: Transient excavation. More material is accelerated away from the impact point, folding is starting to develop and a dent is starting to form. As the dent deepens, there is further outward acceleration of material away from the centre, and old Vredefort Dome fault surfaces are reactivated, and assume the role of a fortuitously placed ramp. A thrust system is formed by material moving over the ramp surface. Rock around the impact site is extremely highly compressed. As the crater reaches its final depth, gravitational sliding of material back into the crater takes place.

Stage Three: Rebound. The inner zone, situated within the newly formed final crater, rebounds. A much larger central cone is formed, underlain by a mantle dome. The dent is now modified to assume the shape of an annular syncline as the rebound accentuates. Along the sides of the uplifted central cone, beds are first overturned above a detachment surface and broken by faulting to form lingoidal nappes (thought to be unique to the Vredefort Dome). Inward-moving material starts falling back over the slopes of the uplifted cone. Equilibrium occurs and 1500 million years of erosion commences.

Stage Four: The Present. The eroded meteorite impact structure protrudes from below more recent sediments (The Karoo), with its granite basement rock core and the overturned collar forming major features of the central part of the nominated property. Despite the broadly circular and subvertical orientation of the strata around the collar of the dome, the structure is complicated on a smaller scale by both folding and concentric and vertical radial faults. Rocks and geological structures exhibit a mixture of compressional and extensional stress effects. The annular syncline, the basement rock dome and erosion resistant strata of the overturned collar help define the ring structure of the meteorite impact structure.

2.2 Vredefort Dome meteorite impact structure evidences

The rock exposures and geological evidences of the meteorite impact structure are very clearly displayed at a number of key locations.

1. *Shape:* The characteristic circular or ring shape of a meteorite impact structure is clearly demonstrated at Vredefort Dome. The annular syncline surrounds the inner mountainous ring. Part of this mountainous area is found in the nominated property.

2. *Evidence of great energy release:* The extreme physical conditions imposed by shock waves of impact intensity produce unique, recognizable, durable shock metamorphic effects including planar deformation features (microscopic features in quartz and feldspar); shatter cones; impact-related breccias or pseudotachylite; chocolate tablet brecciation (stress release in a very hard rock type); polymorphs of quartz (coesite and stishovite); and, possible impact melting. These are all found at the Vredefort Dome. The property is also the type locality for pseudotachylite for the world. No crater-fill breccias or ejecta deposits have so far been found at the Vredefort Dome. Had they existed, they would have been removed by the extensive period of erosion that lasted for about 1500 million years.

3. *Evidence from structural features:* The detachment surface or fault plane (above which the rock displacement occurred) is evident at the property in ramp faults that underlie nappes. There are multiple structural features associated with this meteorite impact structure.

4. *Evidence of deep crustal material exposed on the surface:* Thanks to the meteorite impact and rebound effects (and subsequent erosion), the core-portion of nominated property represents the equivalent of a borehole, drilled into the earth to a depth of 25 km. Deep crustal rock types, including granulite-hornfels facies grade metamorphics, are found.

2.3 Vredefort Dome meteorite impact structure: the scenic, landscape and natural and cultural heritage values of the nominated area

The nominated property includes part of the ring structure and a cross-section of the geological formations and structures that provide evidence for the impact. At a landscape scale, the magnitude of the ring structure diameter can be appreciated from vantage points within the nominated property. The magnitude of the forces which contributed to forming the overturned, steeply dipping and highly faulted hills of the Vredefort Dome can also be better appreciated at this landscape scale. The steepest gradient of the Vaal River is found where it courses through the Vredefort Dome hills giving rise to rapids, irregular stream patterns and islands, and a range of riverine habitats. Short, sharp streams have formed steep gullies and valleys that have cut into these hills. Flora mapping of the nominated property recognises 5 broad communities including the dolomite grasslands, andesite mountain bushveld, gold reef mountain bushveld, Vredefort Dome granite grassland and the riverine bushland. The area is very rich for some native species (butterflies), and includes many native birds, mammal species and other fauna. There are large areas of natural lands within the nominated property, and many areas are being rehabilitated to their natural habitat for game farming. The property contains evidence of past human use including agriculture, mining and conflict, and has a rich cultural heritage. There are many areas which are partly or intensively modified for

agriculture and ecotourism. The natural and cultural values of the property (other than the geological meteorite impact phenomena) complement the geological attributes.

3. COMPARISON WITH OTHER COMPLEX METEORITE IMPACT STRUCTURES

A detailed global comparative analysis was received in February 2005 as requested by IUCN. The multi-ring complex meteorite impact structure centred on the Vredefort Dome represents the oldest meteorite impact structure known for earth. The catastrophic, short duration impact that created this feature was the single greatest energy release event ever known to have affected earth (Table 3). Of the three largest meteorite impact structures, Vredefort Dome is not only the largest (380 km diameter) and oldest, but it has better exposures of impact evidences than either Sudbury (Canada) or Chicxulub (Mexico). Field inspections at Vredefort Dome clearly demonstrated the outstanding quality of the meteorite impact geological evidence. The property's structure provides the only structurally intact exposure of the basement, below the crater floor of a very large astrobleme. This is unique for the planet. It shows a geological section that reaches from the rocks which once covered the crater floor, through the floor, and down into the basement of the structure. The central cone of the crater rose (rebound) by approximately 38 km to provide a surface outcrop equivalent of mantle rocks obtained from the deepest borehole drilled on earth.

These mantle rocks also show a type of metamorphism found only in conditions of very high energy release. This characteristic may be unique to the nominated property. It is not found at Sudbury and Chicxulub. The energy released created chocolate tablet boudinage in cherts, and their association with distally situated ring thrusts is also thought to be unique. The impact forces overturned 17 km (true thickness) of strata to dip towards the centre of the structure. No other similar terrestrial phenomenon of this nature, of a comparable magnitude has (probably) been observed. Like other complex impact structures, Vredefort Dome includes examples of shatter cones, planar deformation features in minerals, high pressure mineral polymorphs. It does not include evidences of impact melts. In conclusion, the nominated property, has high quality exposures of a complex meteorite impact event that are readily accessible. It is a high quality representative example of a meteorite impact structure and has special significance given its status as evidence of the world's greatest single event release of energy. It is the world's only structurally intact exposure of the basement, below the crater floor, of a very large astrobleme. It provides the only mappable and restorable profile that illustrates the genesis and development of an astrobleme during the very short time after impact. A brief comparison relative to the world's 3 largest meteorite impact structures is provided in Table 3. The criteria cover aspects of significance in relation to all the relevant aspects of World Heritage natural criterion (i).

Table 3: Comparison, Earth's 3 largest known meteorite impact structures

Complex meteorite impact structure	Diameter (km)	Estimated energy released	Some surface exposure	Totally buried	Subsequent deformation	Link to major event in earth's history	Evidence of meteorite impact
Vredefort Dome, South Africa	380	87 million megatons (plus)	Yes	No	No	Impact at 2.2 billion yrs (the end of a large scale bombardment? Eukaryote / Prokaryote boundary?)	HD; E; LG: Circ; Mult Rings; Cent; PDF; Coes; Stish; Brecc; Shatt; Melt (rare); Det Fault; Faults, Folds
Sudbury Canada	250	87 million megatons	Yes	No	Yes	Impact at 1.8 billion yrs	DEF; HD (upper part); Brecc; Melt
Chicxulub, Mexico	170	87 million megatons	No	Yes	No	60 million yrs. End of the dinosaurs	This site is buried

Key to Table 3: Meteorite impact structure evidence

A) State of preservation

HD: High degree of preservation of meteorite impact evidence
LG: Landscape geomorphic evidence
DEF: Deformed meteorite impact evidence
W: Weathered meteorite impact evidence
E: Meteorite impact evidence eroded

B) Meteorite impact evidence

Circ: Circular ring structure and annular syncline
Mult Rings: multiple rings
Cent: Central structural uplift evidence
PDF: Planar deformation features (characterised by microscopic effects in quartz or feldspar)
Stish: Quartz polymorph mineral Stishovite

Coes: Quartz polymorph mineral Coesite
Brecc: Impact related breccia (mylonite to pseudotachylite)
Choc Tab: Chocolate tablet brecciation (characteristic of stress release in a very hard rock type)
Shatt: Shatter cones
Melt: Impact melting. Crystallisation of rock from a molten stage
Crat Fill: Crater-fill breccias
Eject: Ejecta deposits
Det Fault: Detachment fault surface
Faults: Multiple faulting evidences associated with the impact structure
Folds: Folds and over folds associated with the impact structure

4. INTEGRITY

4.1 Land Ownership

The nominated serial property straddles the Vaal River and is located within the Free State and Northwest Provinces. It is comprised of 149 private properties, 91 of which are located within the Northwest Province (18,859 ha), and 58 the Free State Province (11,252 ha). There are 600 ha of state owned land within the nominated core component.

4.2 Management and planning framework

The land within the nominated property is predominantly agricultural, has freehold status, and is subject to national, provincial and district statutory regulations. The following national legislation is applicable: The World Heritage Convention Act 49 of 1999; the National Heritage Resources Act 25 of 1999; the National Environmental Management Act 107 of 1998 and the Physical Planning Act 88 of 1967. At the Provincial level, the Northwest and Free State Provinces have applicable nature conservation ordinances regulating environmental aspects of the area. At the local level, the nominated property falls within the District Municipalities of Northern Free State and Southern District North West, and the Local Municipal areas of Potschefstroom (Northwest Province) and Parys (Free State Province), and their environmental regulations.

In December 2002, the South African National Heritage Resources Agency decided, in principle, to declare the nominated property a National Heritage Site under the provisions of the National Heritage Resources Act 25 of 1999 subject to a Cultural Heritage Survey and Management Plan being completed. This document has been completed (February 2005) although no advice of the formal declaration of the National Heritage Site had been received as of March 2005.

In 2004, interim government management structures and actions were put in place in recognition of the potential World Heritage status of the nominated property. They include: *The Vredefort Dome Inter-provincial Task Team* which is coordinating the process of obtaining World Heritage status and providing interim technical and administrative management (until a Management Authority is appointed under the World Heritage Convention Act, 1999). The *Inter-provincial Task Team* is commissioned to develop an *Integrated Management Plan* for the serial property in accordance with the World Heritage Convention Act. Part of this process includes Northwest Province preparing a *Development Plan* (a spatial plan which includes a Strategic Environmental Assessment of the area) and a *Management (zoning plan) Plan*. This work aims to enhance the stature of the Vredefort Dome as a potential National Heritage site and a potential World Heritage site. A *Vredefort Dome Steering Committee* (involving District and Local Municipalities, Provincial, and National Government representatives) has been established to oversee the process of obtaining World Heritage status and the appointment of a Management Authority. A *Vredefort Dome Stakeholder Forum* has been established for public participation and awareness raising about

obtaining World Heritage status and the establishment of a Management Authority.

A *Vredefort Dome Bergland Conservancy* has been established by private landowners in the Northwest Province as a Section 21 Company. The main objectives of the Conservancy are to convert the private properties of the area into a voluntary nature reserve, and to conserve its unique aspects. The Conservancy has prepared a management plan to facilitate these objectives. It will be represented in the *Stakeholder Forum*, and it plays an important role in the facilitation of private landowner's involvement in the nominated property.

A *Vredefort Dome Conservancy* has also been established in the Free State Province by private landowners following the IUCN field mission.

4.3 Traditional protection mechanisms

Traditional intensive agriculture in the nominated property is reported to be diminishing, with rehabilitation of natural vegetation, game farms, and ecotourism based on the natural attributes, including the Vaal River riparian area becoming more important. The greatest protection currently afforded to many of the outstanding and sensitive geological (outcrop) sites is the general lack of publicity and awareness of their significance.

4.4 Public support

Consultations with national, provincial, and municipality officials, elected representatives and local school children demonstrated strong support for the nominated property. Support for and knowledge of the WH nomination by the 149 private property owners within the serial nomination was also evaluated. Assisted by the Dome Bergland Conservancy, it was found that not all landowners within the nominated property may be aware of the potential WH status for their land and the ramifications of this status. This has been recognised by the *Inter-provincial Task Team*, and the *Stakeholder Forum* has been designed to raise awareness of the proposal. In February 2005, this work was still being completed. Landowners of the 3 satellite sites separate from the core component area have been contacted, and are supportive of the nomination.

4.5 Site management

The *VD Inter-provincial Task Team* has assumed management of the nominated property for the interim period commencing 2004. Normal private property agricultural activities, ecotourism and game farming will continue to occur within the nominated property. Special planning provisions will be required to ensure the protection of the scenic landscape attributes of the meteorite impact structure. Active individual site management will be required to protect the three satellite component sites.

4.6 Boundaries

Roads have been used to define the boundary of core component of the nominated property. This is a clear

boundary. Each of the additional three component sites which make up the serial nomination are located in open, agricultural land and will be fenced to identify their boundaries. These 3 sites have been identified (February 2005) as being circular in shape around the geological outcrop and about 1 hectare in area. These circular boundaries are interpreted to be indicative and more definitive practical boundaries are needed. In addition, the eastern disjunct site (the pseudotachylite site) lies immediately adjacent to the core area, which could potentially be expanded to include this area.

4.7 Threats

The major threats to the integrity and functioning of the nominated property are:

Site level: theft or vandalism to the geological evidence

The three satellite component sites, including the stromatolite site, the chocolate tablet brecciation site, and the shatter cone site are all vulnerable to theft and vandalism, and require management and supervision. At least two of the component sites (the stromatolite and chocolate tablet breccia sites) are so site-specific, valuable and vulnerable, that they may require special, small exhibition buildings and on-site supervision to permanently protect them.

Nominated area level: development

The essentially rural and natural scenic amenity of the nominated property and the “ring structure” landscape adds to the integrity of the nominated property. Appreciating the immensity of the meteorite impact ring structure requires a landscape scale vista. Urbanisation of parts or the entire nomination property would diminish the natural-rural scenic value and impact of the “ring structure” landscape. It would also impact on the important remaining natural values. Independent development actions of property owners within the nominated property could also have an impact. Mining is not considered to be a threat to the nominated property, though quarrying for granite could be. The polluted state of the Vaal River diminishes the natural values of the area.

Tourism and visitor access

Legal access will need to be achieved for visitors to the three small component sites and access will need to be negotiated with private property owners within the nominated property. Uncoordinated and unsupervised tourism access could threaten the integrity of the geological evidence as well as cause impacts to access and landscape scale scenery. Unplanned or ad hoc tourism developments could jeopardize the scenic amenity of the property. Therefore, active management of tourism will be needed.

4.8 Concurrence with all relevant “Conditions of Integrity”

The World Heritage conditions of integrity for the Vredefort Dome nomination are:

Section 44 b (i): Contain all or most of the key interrelated and interdependent elements

The current nominated serial property includes key geological (outcrop) sites which demonstrate classic complex meteorite impact structure phenomena.

Section 44 b (v): Should have a management plan

The serial nominated property currently does not have a management plan. The *Inter-provincial Task Team* is currently in the process of investigating and preparing such a plan.

Section 44 b (vi): Should have adequate long-term legislative, regulatory, institutional or traditional protection.

The status of private property for the majority of the serial nominated property will require special land use planning requirements to ensure the aesthetic rural/natural landscape and the key satellite component sites are protected, that public access is available, and that active conservation management is possible. These provisions are critical. The *Inter-provincial Task Team* is currently investigating these requirements. Final practical boundaries for the 3 satellite component sites of the serial nomination need to be made clear and precise.

5. APPLICATION OF WORLD HERITAGE NATURAL CRITERIA

Vredefort Dome is nominated for inscription under natural criterion (i)

Criterion (i): Earth’s history and geological features

Vredefort Dome is the oldest, largest, and most deeply eroded meteorite impact structure in the world. It is the site of the world’s greatest single, known energy release event. It contains high quality and accessible geological (outcrop) sites which demonstrate a range of geological evidences of a complex meteorite impact structure. The rural and natural landscapes of the serial property help portray the magnitude of the ring structures resulting from the impact. The serial nomination is considered to be a representative sample of this meteorite impact structure. A comprehensive comparative analysis with other complex meteorite impact structures demonstrated that it is the only example on earth providing a full geological profile of an astrobleme below the crater floor, thereby enabling research into the genesis and development of an astrobleme immediately post impact. IUCN considers that the nominated property meets this criterion.

6. DRAFT DECISION

IUCN recommends that the World Heritage Committee adopt the following draft decision:

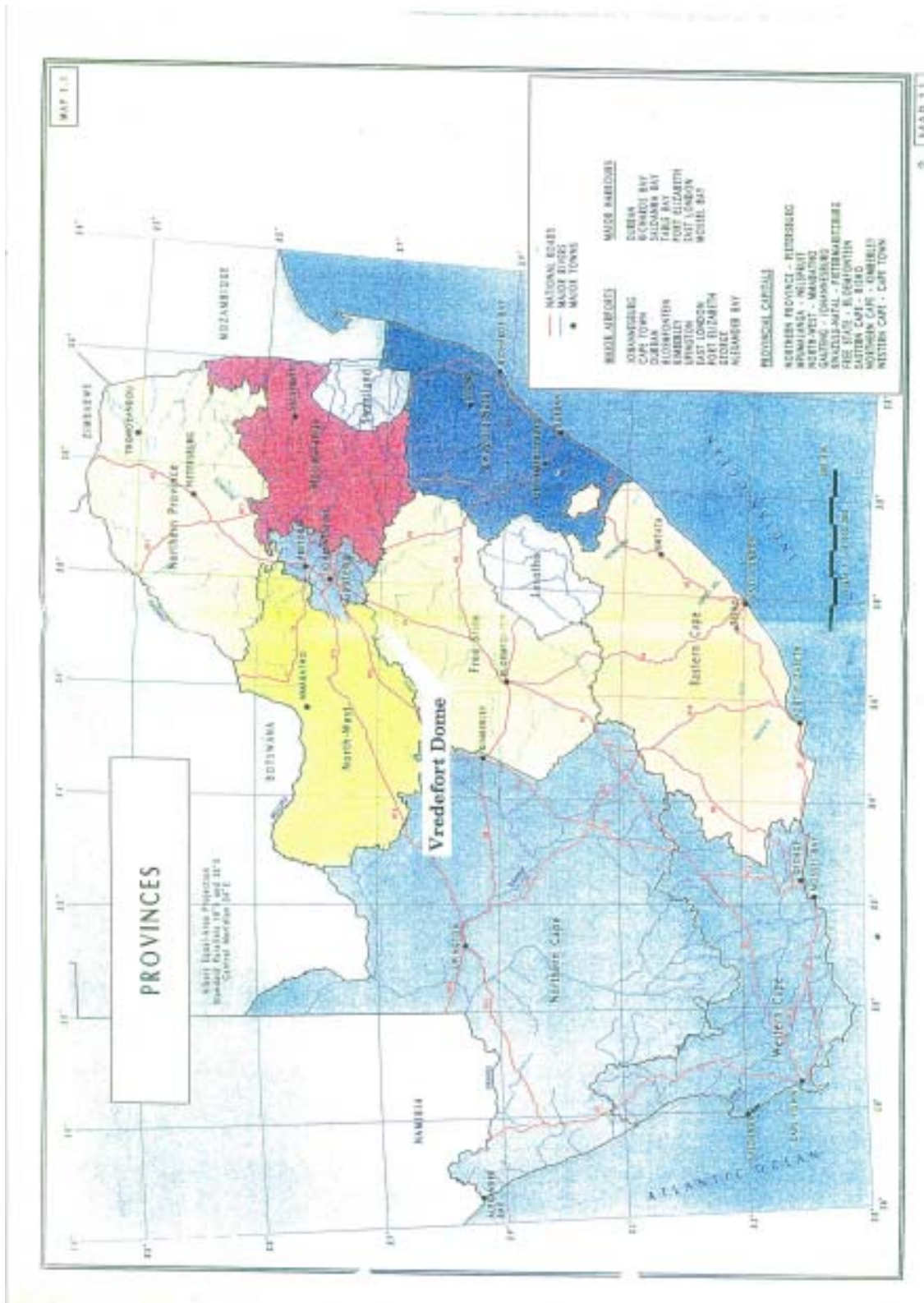
The World heritage Committee,

1. Having examined Document WHC-05/29.COM/8B
2. Inscribes the Vredefort Dome, South Africa, on the World Heritage List on the basis of natural criterion (i)

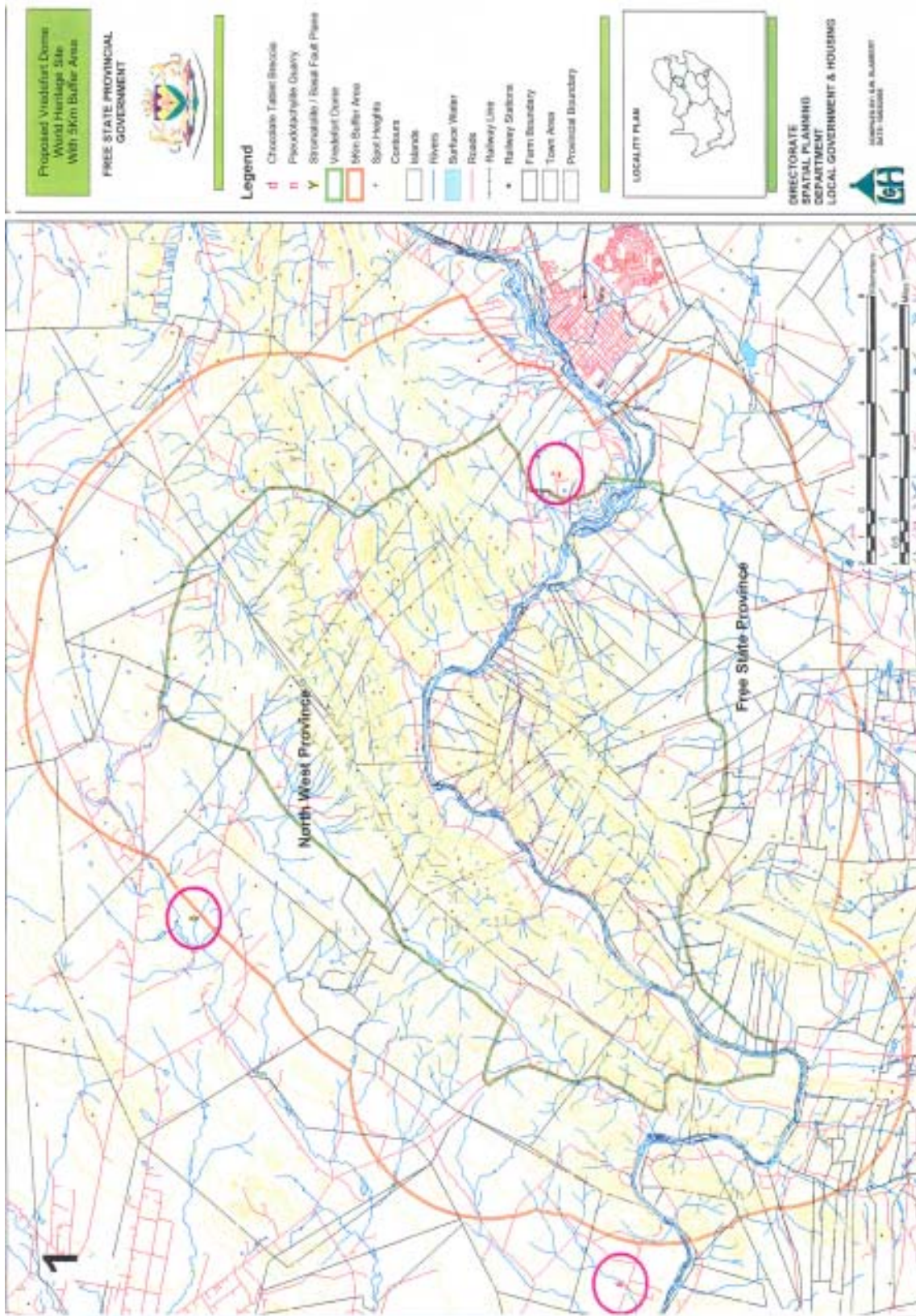
Criterion (i): *Vredefort Dome is the oldest, largest, and most deeply eroded complex meteorite impact structure in the world. It is the site of the world's greatest single, known energy release event. It contains high quality and accessible geological (outcrop) sites which demonstrate a range of geological evidences of a complex meteorite impact structure. The rural and natural landscapes of the serial property help portray the magnitude of the ring structures resulting from the impact. The serial nomination is considered to be a representative sample of a complex meteorite impact structure. A comprehensive comparative analysis with other complex meteorite impact structures demonstrated that it is the only example on earth providing a full geological profile of an astrobleme below the crater floor, thereby enabling research into the genesis and development of an astrobleme immediately post impact.*

3. *Noting that the freehold status of the majority of the nominated property requires special management and collaboration with landowners to ensure the integrity of the property,*
4. *Requests the State Party to clearly define the legal boundaries for the three satellite component sites of the serial property,*
5. *Requests the State Party to complete and start to implement the management plan for the entire property within 2 years of inscription, and ensures that this plan has the support of key stakeholders;*
6. *Further requests the State Party to invite an IUCN mission within 2 years of inscription to evaluate progress with the above actions.*

Map 1: General Location of nominated property



Map 2: Boundaries of nominated property



AFRIQUE

DÔME DE VREDEFORT

AFRIQUE DU SUD



1. DOCUMENTATION

- i) **Date de réception de la proposition par l'UICN** : avril 2004
- ii) **Dates auxquelles des informations complémentaires ont été demandées officiellement puis fournies par l'État Partie** : des lettres ont été envoyées par l'UICN le 26 octobre 2004, après la visite du bien proposé et le 10 janvier 2005, après la réunion du Groupe d'experts du patrimoine mondial de l'UICN, pour solliciter des informations complémentaires. Les réponses de l'État partie sont parvenues le 8 décembre 2004 et le 29 mars 2005.
- iii) **Fiches techniques UICN/WCMC** : 2 références (une référence avec 47 citations).
- iv) **Littérature consultée** : Brink, M., Waanders, F., Bisschoff, A.A. 2004. **IUCN Technical Evaluation: Vredefort Dome, 30th August 2004, Geological Aspects**. Paper prepared for the IUCN Mission, Vredefort Dome, South Africa, August 2004. Planetary and Space Science Centre 2004, Department of Tourism, Environmental and Economic Affairs, Free State. Brink, M.C., Bisschoff, A.A., Waanders, F.B., Schoch, A.E. 2005. **An addendum to the supplementary information document on the Vredefort Dome. Earth Impact Database, Impact Cratering on Earth** (including World Impact Structures sorted by location) University of New Brunswick. <http://www.unb.ca/passc/ImpactDatabase/essay.html>. Brink, M., Bisschoff, A.A., Waanders, F. 2004. **The Vredefort Impact Structure, Potoschefstroom, South Africa**. Brink, M.C., Waanders, F.B., Bisschoff, A.A., Gay, N.C. 2000. **The Foch Thrust-Potoschefstroom Fault structural system, Vredefort, South Africa: a model for impact-related tectonic movement over a pre-existing barrier**. Journal of African Earth Sciences, Vol 30, No 1, pp. 99-117. Elsevier Science Ltd Great Britain. Bisschoff, A.A. 1999. **The Geology of the Vredefort Dome (and Geological Sheets)**. Council for Geoscience, Geological Survey of South Africa. Explanation of Sheets 2627CA, CB, CC, CD, DA, DC. 2727AA, AB, BA. Scale 1:50,000. Gibson, R.L., Reimold, W.U. 1999 **Field Excursion through the Vredefort Impact Structure**. Department of Geology, University of Witwatersrand, South Africa. French, B.M. 1998, **Traces of Catastrophe. A Handbook of Shock-Metamorphic Effects in Terrestrial Meteorite Impact Structures** Lunar and Planetary Institute, Houston USA. Glikson, A.Y. 1996. **Mega-impacts and mantle-melting episodes: tests of possible correlations**. AGSO Journal of Australian Geology and Geophysics, 16 (4) pp. 587-607. Grieve, R.A.F., Pilkington, M. 1996. **The signature of terrestrial impacts**. AGSO Journal of Australian Geology and Geophysics, 16 (4) pp. 399-420. Sutherland, F.L. **The Cretaceous/Tertiary-boundary impact and its global effects with reference to Australia**. AGSO Journal of Australian Geology and Geophysics, 16 (4) pp. 567-585. Shoemaker, E.M., Shoemaker, C.S. 1996. **The Proterozoic impact record of Australia**. AGSO Journal of Australian Geology and Geophysics, 16 (4) pp. 379-398.
- v) **Consultations**: 7 évaluateurs indépendants, y compris l'ICOMOS. Responsables des gouvernements national, provincial et de district de l'Afrique du Sud ; représentants d'organisations communautaires et autres personnes.
- vi) **Visite du bien proposé** : Graeme Worboys, août 2004.
- vii) **Date d'approbation du rapport par l'UICN** : avril 2005.

2. RÉSUMÉ DES CARACTÉRISTIQUES NATURELLES

Le bien sériel proposé, le dôme de Vredefort, se trouve à environ 120 km au sud-ouest de Johannesburg, en Afrique du Sud. Avec une superficie totale de 30 111 ha, le bien sériel comprend un élément central principal de 30 108 ha et trois sites satellites plus petits (chacun d'une superficie de 1 ha) – deux à l'ouest et un au sud-est de la zone centrale. Après discussion avec l'UICN, l'État partie a décidé d'inclure les trois sites satellites excentrés et géologiquement importants pour l'histoire géologique globale racontée par le bien proposé.

Le dôme de Vredefort chevauche la rivière Vaal qui coule vers l'ouest et qui forme aussi les limites administratives

de la province du Nord-Ouest et de la province de l'État libre. Il s'agit d'une partie représentative d'une grande structure d'impact de météorite (ou astéroïde) qui a un rayon d'impact de 190 km. La limite orientale de l'élément central du bien sériel, de forme ovale déformée en direction du nord-est, se trouve à 5 km de la ville de Parys, tandis que sa limite occidentale est située à environ 19 km de cette ville. La limite méridionale se trouve à quelque 6 km au nord de la ville de Vredefort et la limite septentrionale à environ 26 km au nord de cette ville.

Les impacts météoritiques ont joué un rôle important dans l'histoire géologique de la Terre. L'activité géologique à la surface de la Terre est telle que les

preuves de la majorité des impacts ont disparu (sur la Lune, en revanche, les vestiges de tels sites d'impact sont évidents). Les plus grands cratères d'impact de météorite témoignent des changements catastrophiques qui se sont produits dans l'histoire de la planète et de la vie sur Terre : ces impacts ont sans doute provoqué des changements planétaires dévastateurs, et certains scientifiques estiment que certains peuvent être à l'origine de bouleversements de l'évolution, y compris d'extinctions massives dans le registre fossile. Ce groupe, spécialisé et rare, de sites géologiques est donc un témoin vital de l'histoire géologique de la Terre qui contribue à la compréhension de l'évolution de la planète.

La structure d'impact météoritique du dôme de Vredefort est la plus ancienne (2023 millions d'années) et la plus

grande (rayon de 190 km) jamais découverte sur la Terre. Il s'agit de l'une des trois seules structures d'impact de météorite connues qui ont un diamètre supérieur à 150 km; les deux autres sont la structure d'impact de météorite structurellement déformée de Sudbury au Canada (1800 millions d'années) et la structure d'impact de météorite enterrée de Chicxulub au Mexique (60 millions d'années). Chicxulub est aussi célèbre pour ses liens avec la disparition des dinosaures à la fin du Crétacé (tableau 1). La structure d'impact de météorite du dôme de Vredefort est une des quelque 200 structures d'impact de météorite actuellement connues sur Terre (tableau 2). C'est aussi la structure d'impact la plus profondément érodée avec des niveaux actuels d'exhumation situés entre 8 et 11 km.

Tableau 1 : Structures d'impact de météorite terrestres dont le diamètre du cratère est supérieur à 10 km (d'après French, 1998)

Diamètre du cratère	Diamètre approx. de l'impacteur	Équivalent énergie (TNT)	Fréquence d'impact moyenne (Terre : Nb par million d'années)	Intervalle moyen des impacts (Terre)	Événement terrestre comparable
10 km	500 m	11 000 MT	10	100 000 an	Cratère d'impact de météorite de Bosumtwi, Ghana
20 km	1 km	87 000 MT	7,1	350 000 an	Cratère d'impact de météorite de Ries, Allemagne
50 km	2,5 km	1 300 000 MT	0,22	4,5 m an	Structure d'impact de météorite de Charlevoix, Canada
100 km	5 km	11 000 000 MT	0,04	26 m an	Structure d'impact de météorite de Popigai, Russie
200 km	10 km	87 000 000 MT	0,007	150 m an	Plus grandes structures d'impact terrestres connues, Sudbury, Canada, dôme de Vredefort, Afrique du Sud

Tableau 2 : Structures d'impact de météorite supérieures à 10 km (Earth Impact Data base, 2002, Brink et al., 2004)

Diamètre	Structures d'impact de météorite
10-49 km	Ames, É.-U.; Aorounga, Tchad; Araguainha, Brésil; Avak, É.-U.; Azuara, Espagne; Boltsh, Ukraine; Bosumtwi, Ghana; Carswell, Canada; Clearwater East, Canada; Clearwater West, Canada; Deep Bay, Canada; Dellen, Suède; Eagle Butte, Canada; El'gygytyn, Russie; Gosses Bluff, Australie; Gweni-Fada, Tchad; Houghton, Canada; Janisjarvi, Russie; Kaluga, Russie; Kamensk, Russie; Karla, Russie; Kelly West, Australie; Kentland, É.-U.; Lappajarvi, Finlande; Lawn Hill, Australie; Logancha, Russie; Logoisk, Bélarus; Manson, É.-U.; Marquez, É.-U.; Mistastin, Canada; Mjolnir, Norvège; Montagnais, Canada; Nicholson, Canada; Oasis, Libye; Obolone, Ukraine; Ries, Allemagne; Rochechouart, France; Saint-Martin, Canada; Serra da Cangalha, Brésil; Shoemaker, Australie; Sierra Madera, É.-U.; Slate Islands, Canada; Spider, Australie; Steen River, Canada; Strangways, Australie; Suavjarvi, Russie; Upheaval Dome, É.-U.; Ust-Kara, Russie; Vargeao Dome, Brésil; Wells Creek, É.-U.; Zhamanshin, Kazakhstan.
50-99 km	Acraman, Australie; Beaverhead, É.-U.; Charlevoix, Canada; Chesapeake Bay, É.-U.; Kara, Russie; Kara-Kul, Tadjikistan; Morokweng, Afrique du Sud; Puchezh-Katunki, Russie; Siljan, Suède; Tookoonooka, Australie; Woodleigh, Australie.
100-199 km	Chicxulub, Mexique (170 km); Manicouagan, Canada (100 km); Popigai, Russie (100 km)
>200 km	Sudbury, Canada (250 km); dôme de Vredefort, Afrique du Sud (380 km).

Il y a deux types fondamentaux de cratères d'impact de météorite : des structures simples qui mesurent jusqu'à 4 km de diamètre avec des remparts rocheux relevés

et retournés qui entourent une dépression en forme de bol partiellement recouverte de brèches ; et des structures complexes, mesurant généralement 4 km ou

plus de diamètre avec un relèvement central distinct sous forme de pic et/ou de couronne, une forme annulaire et une bordure effondrée. La plupart des structures d'impact de météorite terrestres ont été oblitérées, au fil du temps, par des processus géologiques terrestres et beaucoup sont ensevelies.

2.1 Évolution de la structure d'impact météoritique du dôme de Vredefort

L'impacteur ou bolide extraterrestre qui a formé le cratère d'impact dans le bien proposé était soit un corps de grande taille tel qu'un astéroïde au diamètre d'environ 12 km qui se déplaçait à une vitesse relative de 20 km/s, soit un plus petit tel que la tête d'une comète approchant à une vitesse beaucoup plus élevée. L'impact a créé la plus grande libération d'énergie jamais connue à la surface de la Terre. On estime que le cratère d'impact s'est formé en 4 heures environ. Les principales étapes de l'évolution de la structure d'impact sont décrites ci-dessous :

Première étape : moment de l'impact. Une onde de choc est générée au moment de l'impact, suivie par la formation, par compression, d'un cratère transitoire, par une déstructuration de l'écorce terrestre et par le transport/accélération des matériaux loin du point d'impact.

Deuxième étape : excavation transitoire. Davantage de matériaux sont accélérés loin du point d'impact, un plissement commence à se produire et une fente commence à se former. À mesure qu'elle s'approfondit, l'accélération de matériaux vers l'extérieur, loin du centre, augmente, les surfaces de failles de l'ancien dôme de Vredefort sont réactivées et servent de rampe fortuite. Un système de chevauchement se forme, les matériaux recouvrant la surface de la rampe. Autour du site d'impact, la roche est très fortement compressée. Au fur et à mesure que le cratère d'impact atteint sa profondeur finale, il se produit un glissement gravitationnel de matériaux vers l'intérieur du cratère.

Troisième étape : rebond élastique. La zone intérieure, située dans le cratère final nouvellement formé se soulève par un processus de rebond élastique et un cône (ou pic) central beaucoup plus grand que l'ancien dôme est formé et repose sur un dôme manteau. La fente (voir 2^e étape ci-dessus) se modifie pour prendre la forme d'un synclinal annulaire à mesure que le rebond s'accroît. Le long des côtés du cône central relevé, les lits sont d'abord retournés par-dessus une surface de décollement et cassés par la formation de failles pour former des nappes lingoïdales (qui seraient uniques au dôme de Vredefort). Le mouvement de matériaux vers l'intérieur s'inverse sur les côtés du cône central relevé et commence à retomber sur les pentes du cône. L'équilibre est atteint. Commencent alors 1500 millions d'années d'érosion.

Quatrième étape : le présent. Le cratère d'impact érodé émerge des roches sédimentaires plus récentes (le Karoo), son socle de granit et son col retourné formant les caractéristiques principales de la partie centrale du bien proposé. Malgré une orientation grossièrement circulaire et subverticale de la strate qui entoure le col du dôme central, la structure est compliquée à plus

petite échelle à la fois par des plissements et des failles radiales, concentriques et verticales. Les roches et les structures géologiques présentent un mélange d'effets de stress de compression et de rebond élastique. Le synclinal annulaire, le dôme manteau et la strate résistante à l'érosion du col retourné aident à définir la structure annulaire de la structure d'impact.

2.2 Preuves de la structure d'impact météoritique du dôme de Vredefort

Les affleurements rocheux et les preuves géologiques de la structure d'impact de météorite apparaissent très clairement dans plusieurs localités clés.

1. *Forme* : la forme circulaire ou annulaire caractéristique d'une structure d'impact extraterrestre est clairement démontrée au dôme de Vredefort. Le synclinal annulaire entoure la couronne montagneuse interne. Une partie de cette zone montagneuse se trouve dans le bien proposé.

2. *Preuve de grande libération d'énergie* : les conditions physiques extrêmes imposées par les ondes de choc résultant de l'intensité de l'impact induisent des transformations métamorphiques uniques, reconnaissables, durables : déformation plane (structures microscopiques caractéristiques dans des quartz et des feldspath) ; fractures coniques ; brèches d'impact ou pseudo-tachylites ; brèches en tablette de chocolat (libération de stress dans un type de roche très dure) ; polymorphes de quartz (coesite et stishovite) ; et fonte d'impact possible. Toutes ces caractéristiques sont présentes au dôme de Vredefort. Le bien est aussi la localité type pour la pseudo-tachylite à l'échelle du globe. À ce jour, on n'a trouvé, au dôme de Vredefort, ni brèche de remplissage de cratère ni éjecta. S'il y en avait eu, ils auraient été éliminés par la très longue période d'érosion qui a duré environ 1500 millions d'années.

3. *Preuves apportées par les caractéristiques structurelles* : la surface de décollement ou plan de faille (sur laquelle s'est produit le déplacement de roches) est évidente dans le bien, dans les failles en rampe qui sous-tendent les nappes. Il y a de nombreuses caractéristiques structurelles associées à une structure d'impact de météorite.

4. *Preuves d'exposition à la surface de matériau crustal profond* : suite à l'impact de météorite et aux effets de rebond élastique (ainsi qu'à l'érosion ultérieure), la partie centrale du bien proposé représente l'équivalent d'un puits de forage creusé jusqu'à une profondeur de 25 km. Des types de roches crustales profondes, y compris des roches métamorphiques de faciès granulite-hornfels, sont observées.

2.3 Structure d'impact météoritique du dôme de Vredefort : valeurs panoramiques, paysagères, naturelles et culturelles du site proposé

Le bien proposé comprend une partie de la couronne du cratère d'impact et une partie transversale des formations et structures géologiques qui prouvent l'impact. À l'échelle du paysage, l'ampleur du diamètre de la couronne peut être appréciée depuis différents

points de vue à l'intérieur du bien proposé. L'ampleur des forces qui ont contribué à former les collines retournées, en pente raide et extrêmement faillées du dôme de Vredefort est également mieux appréciée à l'échelle du paysage. Le gradient le plus abrupt de la rivière Vaal se trouve à l'endroit où elle traverse les collines du dôme de Vredefort. On y trouve des rapides, un courant irrégulier et des îles, ainsi qu'une gamme d'habitats riverains. Des cours d'eau, courts et violents, ont creusé des ravins profonds et des vallées qui découpent ces collines. Le relevé de la flore du bien proposé reconnaît cinq communautés principales, à savoir les prairies de dolomite, le bushveld de la montagne d'andésite, le bushveld de la montagne de quartz aurifère, les prairies de granit du dôme de Vredefort et la brousse riveraine. La zone est très riche pour certaines espèces indigènes (papillons) et comprend de nombreux oiseaux, mammifères et autres animaux indigènes. Il y a de vastes terrains naturels dans le bien proposé et beaucoup sont en train d'être rendus à leurs habitats naturels pour l'élevage de gibier. Le bien présente des traces d'activités humaines passées - agriculture, mines et conflits - et possède un riche patrimoine culturel. De nombreuses zones sont partiellement ou fortement modifiées pour l'agriculture et l'écotourisme. Les valeurs naturelles et culturelles du bien (autres que le phénomène géologique d'impact météoritique) complètent les caractéristiques géologiques.

3. COMPARAISON AVEC D'AUTRES STRUCTURES D'IMPACT MÉTÉORITIQUE COMPLEXES

En février 2005, l'UICN a reçu une analyse comparative mondiale détaillée réalisée à sa demande. La structure d'impact à couronnes multiples complexe, centrée sur le dôme de Vredefort, représente la plus ancienne structure d'impact de météorite connue sur Terre. L'impact catastrophique et bref qui a créé ce relief est le plus important phénomène de libération d'énergie qui ait jamais affecté la Terre (tableau 3). Parmi les trois plus grandes structures d'impact de météorite, le dôme de Vredefort n'est pas seulement la plus grande (380 km de diamètre) et la plus ancienne, mais il présente de meilleures expositions des preuves d'impact que Sudbury (Canada) ou Chicxulub (Mexique). Les inspections sur le terrain, au dôme de Vredefort, ont clairement démontré la qualité exceptionnelle des preuves géologiques d'impact de météorite. La structure du bien fournit la seule exposition structurellement intacte du soubassement rocheux, en dessous du fond du cratère d'un très grand astéroïde. C'est un cas unique sur la planète. On y voit une section géologique qui émerge des roches qui couvraient autrefois le fond du cratère, à travers le fond et jusqu'au soubassement rocheux. Le cône central du cratère s'est élevé (par rebond élastique) d'environ 38 km pour fournir un affleurement de surface équivalent aux régolites obtenues dans le trou de forage le plus profond de la Terre. Ces régolites présentent aussi un type de métamorphisme que l'on ne trouve que dans le cas d'une très haute libération d'énergie. Il est possible que cette caractéristique soit unique au bien proposé. On ne la trouve ni à Sudbury ni à Chicxulub. L'énergie libérée a créé un boudinage de type « tablette de chocolat » en silixite, et l'on pense que son association avec des

chevauchements en couronne en situation distale est unique. Les forces d'impact ont retourné 17 km (épaisseur réelle) de strates profondément vers le centre de la structure. On n'a jamais (probablement) observé de phénomènes terrestres de cette nature qui auraient eu une ampleur comparable. Comme d'autres structures d'impact complexes, le dôme de Vredefort comprend des exemples de fractures coniques, de caractéristiques de déformation plane dans les minéraux, de polymorphes minéraux à haute pression. On n'y trouve aucune preuve de fonte d'impact. En conclusion, le bien proposé présente des expositions de haute qualité d'un phénomène complexe d'impact de météorite facilement accessible. C'est un exemple représentatif de haute qualité d'une structure d'impact de météorite qui a une importance particulière en tant que preuve de la plus grande libération d'énergie connue par cette planète. Il s'agit de la seule exposition structurellement intacte du soubassement, en dessous du fond du cratère d'un très grand astéroïde. Le site fournit le seul profil qu'il est possible de cartographier et de restaurer, illustrant la genèse et le développement d'un astéroïde sur une très courte période de temps après l'impact. Une brève comparaison des trois plus grandes structures d'impact de météorite du monde est fournie au tableau 3. Les critères couvrent des aspects de l'importance par rapport aux aspects pertinents du critère naturel (i) du patrimoine mondial.

4. INTÉGRITÉ

4.1 Régime de propriété foncière

Le bien sériel proposé chevauche la rivière Vaal et se situe dans les provinces de l'État libre et du Nord-ouest. Il se compose de 149 propriétés privées, dont 91 sont situées dans la province du Nord-Ouest (18 859 ha) et 58 dans la province de l'État libre (11 252 ha). Il y a 600 ha de terres appartenant à l'État à l'intérieur de l'élément central proposé.

4.2 Gestion et cadre de planification

Les terrains du bien proposé sont avant tout agricoles, en concession et soumis aux règlements statutaires nationaux, provinciaux et de districts. La législation nationale suivante est applicable : Loi 49 de 1999 sur la Convention du patrimoine mondial ; Loi 25 de 1999 sur les ressources du patrimoine national ; Loi 107 de 1998 sur la gestion nationale de l'environnement et Loi 88 de 1967 d'aménagement du territoire. Au niveau provincial, les provinces du Nord-Ouest et de l'État libre ont adopté des ordonnances sur la conservation de la nature qui réglementent les aspects environnementaux du bien. Au niveau local, le bien proposé est placé sous l'égide des municipalités du nord de l'État libre ainsi que du district méridional du nord-ouest et de la municipalité locale de Potschefstroom (province du Nord-Ouest) et de Parys (province de l'État libre), et de leurs règlements sur l'environnement.

En décembre 2002, l'Agence des ressources du patrimoine national sud-africain a décidé, en principe, de faire de ce site un bien du patrimoine national soumis aux dispositions de la Loi 25 de 1999 sur les ressources du patrimoine national, sous réserve de la réalisation

Tableau 3 : Comparaison des trois plus grandes structures d'impact de météorite connues sur terre

Structure complexe d'impact de météorite	Diamètre (km)	Libération d'énergie estimée	Quelques expositions en surface	Totalement enfouie	Déformation subséquente	Lien avec d'importants événements de l'histoire de la Terre	Preuve de l'impact de météorite
Dôme de Vredefort, Afrique du Sud	380	87 millions mégatonnes (plus)	Oui	Non	Non	Impact à 2,2 milliards d'années (la fin d'un bombardement à grande échelle ?) limite eukaryote/ prokaryote?	HD; E; PG: Cour; Cour.mult.; Cent; PDP; Coes; Stish; Brec; FCt; Fonte (rare); FSD; Failles, Plis
Sudbury Canada	250	87 millions mégatonnes	Oui	Non	Oui	Impact à 1,8 milliards d'années	DEF; HD (partie sup.); Brec; Fonte ;
Chicxulub, Mexique	170	87 millions mégatonnes	Non	Oui	Non	60 millions d'années Fin des dinosaures	- Ce site est enfoui

Légende du tableau 3 : Preuves de structure d'impact de météorite**A) État de préservation**

HD : haut degré de préservation des preuves de l'impact de météorite

PG : preuve de paysage géomorphologique

DEF : preuve d'impact de météorite déformée

M : preuve d'impact météorisé

E : preuve d'impact de météorite érodée

B) Preuve d'impact de météorite

Cour : structure en couronne et synclinal annulaire

Cour mult : couronnes multiples

Cent : preuve de relèvement de la structure centrale

PDP : preuves de déformation plane (caractérisée par des effets microscopiques en quartz ou feldspath)

Stish : Quartz polymorphe minéral Stishovite

Coes : Quartz polymorphe minéral Coesite

Brec : brèche reliée à l'impact (mylonite à pseudo-tachylite)

Tab choc : brèche en tablette de chocolat (caractéristique d'une libération de stress dans un type de roche très dure)

FC : fracture conique

Fonte : fonte d'impact. Cristallisation de roche après une étape de fonte

Brec crat : brèches de remplissage de cratère

Eject : dépôts d'éjecta

FSD : faille de surface de détachement

Failles : preuves de nombreuses failles associées à la structure d'impact

Plis : plis et surplis associés à la structure d'impact

d'un plan d'aménagement et d'une étude du patrimoine culturel. Ce document est terminé (février 2005), mais aucun avis de déclaration officielle du bien du patrimoine national n'avait été reçu en mars 2005.

En 2004, des mesures et structures de gestion gouvernementale intérimaires ont été mises en place afin de reconnaître le statut éventuel de bien du patrimoine mondial du bien proposé. Il s'agit du *Vredefort Dome Inter-provincial Task Team* qui coordonne le processus d'acquisition du statut de bien du patrimoine mondial et assure de manière intérimaire la gestion technique et administrative (jusqu'à ce qu'un organe de gestion soit nommé en vertu de la Loi de 1999 sur la Convention du patrimoine mondial). L'*Inter-provincial Task Team* est chargé d'élaborer un plan de gestion intégrée pour le bien sériel, conformément à la Loi sur la Convention du patrimoine mondial. Dans le cadre de ce processus, la province du Nord-Ouest prépare un *plan de développement* (un plan spatial qui comprend une étude stratégique environnementale de la région) et un *plan de gestion (plan de zonage)*. Ces activités ont pour but d'améliorer les chances du dôme de Vredefort en tant que bien potentiel du patrimoine national et du patrimoine mondial. Un *Comité directeur du dôme de Vredefort* (auquel participent les municipalités de district et locales, des représentants

des gouvernements provincial et national) a été établi pour superviser le processus d'obtention du statut de patrimoine mondial et la nomination d'un organe de gestion. Un *Forum des acteurs du dôme de Vredefort* a été établi pour assurer la participation du public et sensibiliser au statut de patrimoine mondial et à l'établissement d'un organe de gestion.

Le *Vredefort Dome Bergland Conservancy* a été établi par des propriétaires privés dans la province du Nord-Ouest en tant que société de la section 21. Les principaux objectifs sont de convertir les propriétés privées de la région en une réserve naturelle volontaire afin de conserver les aspects uniques. Le Conservancy a préparé un plan de gestion pour faciliter ces objectifs qui sera présenté au *Forum des acteurs* et jouera un rôle important en vue de faciliter la participation des propriétaires privés aux affaires du bien proposé. Un *Vredefort Dome Conservancy* a également été établi dans la province de l'État libre par les propriétaires privés après la mission d'inspection de l'UICN.

4.3 Mécanismes traditionnels de protection

Il semblerait que l'agriculture intensive traditionnelle régresse dans le bien proposé et que l'on assiste à la restauration de la végétation naturelle, à l'implantation

de fermes de gibier et à la mise en place de l'écotourisme basé sur les caractéristiques naturelles ; il semblerait même que la région riveraine de la rivière Vaal devienne plus importante. L'excellente protection dont jouissent actuellement de nombreux sites géologiques exceptionnels et fragiles s'explique par l'absence générale de publicité et le fait que leur importance n'est pas connue.

4.4 Appui du public

Des consultations avec des responsables aux niveaux national, provincial et municipal, des représentants élus et des écoliers démontrent qu'il y a un appui important pour le bien proposé. L'appui des 149 propriétaires privés concernés par la proposition sérielle et leur connaissance du statut éventuel de bien du patrimoine mondial ont également été évalués. Avec l'aide du Dome Bergland Conservancy, il a été déterminé que tous les propriétaires concernés par le bien proposé ne sont peut-être pas conscients du statut potentiel de patrimoine mondial pour leurs terres ni des ramifications de ce statut. C'est une chose que reconnaît l'Inter-provincial Task Team, et le Forum des acteurs a été chargé de sensibiliser à la proposition. En février 2005, ce travail n'était pas encore terminé. Les propriétaires de trois sites satellites séparés de l'élément central ont été contactés et soutiennent la proposition.

4.5 Gestion du bien

L'*Inter-provincial Task Team* a assumé la gestion du bien proposé pour la période intérimaire à partir de 2004. Les activités privées agricoles, d'écotourisme et d'élevage de gibier se poursuivront dans le bien proposé. Des dispositions de planification spéciale seront requises pour garantir la protection des caractéristiques paysagères de la structure d'impact de météorite. La gestion active de chaque site sera nécessaire pour protéger les trois sites satellites.

4.6 Limites

Les routes ont été utilisées pour définir les limites de l'élément central du bien proposé. Il s'agit de limites claires. Chacun des trois autres sites composant la proposition sérielle est situé dans des terres agricoles ouvertes et sera clôturé pour identifier les limites. Les trois sites ont été identifiés (février 2005) comme circulaires autour d'un affleurement géologique et couvrant environ 1 ha. Ces limites circulaires sont interprétées comme indicatives et des limites pratiques et définitives sont nécessaires. En outre, le site disjoint de l'est (le site de pseudo-tachylite) est immédiatement adjacent à la zone centrale qui pourrait être, éventuellement, étendue pour l'inclure.

4.7 Menaces

Les principales menaces à l'intégrité et au fonctionnement du bien proposé sont :

Au niveau des sites : vol ou vandalisme des preuves géologiques

Les trois sites satellites - le site de stromatolites, le site de brèches en tablette de chocolat et le site de fissures

coniques - sont tous vulnérables au vol et au vandalisme et nécessitent gestion et supervision. Deux des sites composants au moins (le site de stromatolites et le site de brèches en tablette de chocolat) sont tellement spécifiques, précieux et vulnérables qu'il pourrait être nécessaire de créer de petits bâtiments d'exposition spéciaux et d'instaurer une supervision sur place pour les protéger en permanence.

Au niveau du bien proposé : développement

Le paysage essentiellement rural et naturel du bien proposé et le paysage en couronne ajoutent à l'intégrité du bien proposé. Pour apprécier l'immensité de la structure en couronne de l'impact météoritique, il faut une vue à l'échelle du paysage. L'urbanisation de certaines parties ou de tout le bien proposé diminuerait la valeur paysagère naturelle et rurale et l'impact du paysage en couronne. L'urbanisation aurait aussi des incidences sur les autres valeurs naturelles importantes. Des mesures de développement prises de manière indépendante par les propriétaires dans le bien proposé pourraient aussi avoir un impact. L'exploitation minière n'est pas considérée comme une menace pour le bien proposé mais les carrières de granit pourraient l'être. La pollution de la rivière Vaal diminue les valeurs naturelles de la région.

Tourisme et accès des visiteurs

Il faudra obtenir l'accès légal pour les visiteurs aux trois petits éléments du bien et l'accès devra être négocié avec les propriétaires privés dans le bien proposé. Un accès non coordonné et non supervisé du tourisme pourrait menacer l'intégrité des preuves géologiques et causer des impacts à l'accès et au panorama à l'échelle du paysage. Le développement touristique non planifié pourrait mettre en péril l'intérêt paysager du bien. En conséquence, il faudra une gestion active du tourisme.

4.8 Respect de toutes les « conditions d'intégrité » pertinentes

Les conditions d'intégrité du patrimoine mondial pour la proposition du dôme de Vredefort sont les suivantes :

Section 44 b (i): contenir la totalité ou la plupart des éléments connexes et interdépendants

Le bien sériel proposé comprend des sites géologiques clés qui démontrent un phénomène complexe classique de structure d'impact de météorite.

Section 44 b (v):[devrait] faire l'objet de plans de gestion
Le bien sériel proposé n'a pas à l'heure actuelle de plan de gestion. L'*Inter-provincial Task Team* est en train d'étudier et de préparer ce plan.

Section 44 b (vi) [devrait] avoir une protection législative, réglementaire ou institutionnelle adéquate à long terme
L'état de propriété privée de la majeure partie du bien sériel proposé nécessitera des mesures d'aménagement du territoire spéciales pour garantir la protection du paysage rural/naturel esthétique et des éléments satellites du site, permettre l'accès du public et rendre possible une gestion active pour la conservation. Ces dispositions sont cruciales. L'*Inter-provincial Task Team* est en train d'étudier la question. Des limites pratiques finales pour les trois sites

satellites composant la proposition sérielle doivent être clairement établies et précisées.

5. APPLICATION DES CRITÈRES DU PATRIMOINE MONDIAL/IMPORTANCE

Le dôme de Vredefort est proposé pour inscription au titre du critère naturel (i).

Critère (i) : histoire de la terre et processus géologiques

Le dôme de Vredefort est la structure d'impact de météorite la plus ancienne, la plus grande et la plus profondément érodée du monde. Il s'agit du phénomène de libération d'énergie le plus important du monde. Il contient des sites géologiques accessibles et de haute qualité qui apportent une gamme de preuves géologiques attestant une structure d'impact météoritique complexe. Les paysages rural et naturel du bien sériel permettent de concevoir l'ampleur des structures en couronne qui résultent de l'impact. La proposition sérielle est considérée comme un exemple représentatif de cette structure d'impact météoritique. Une analyse comparative complète avec d'autres structures d'impact météoritique complexes a démontré qu'il s'agit du seul exemple sur la Terre fournissant un profil géologique complet d'un astroblème en dessous du fond du cratère permettant ainsi des travaux de recherche sur la genèse et le développement d'un astroblème immédiatement après l'impact. L'UICN considère que le bien proposé remplit ce critère.

6. PROJET DE DÉCISION

L'UICN recommande que le Comité adopte le projet de décision suivant :

Le Comité du patrimoine mondial,

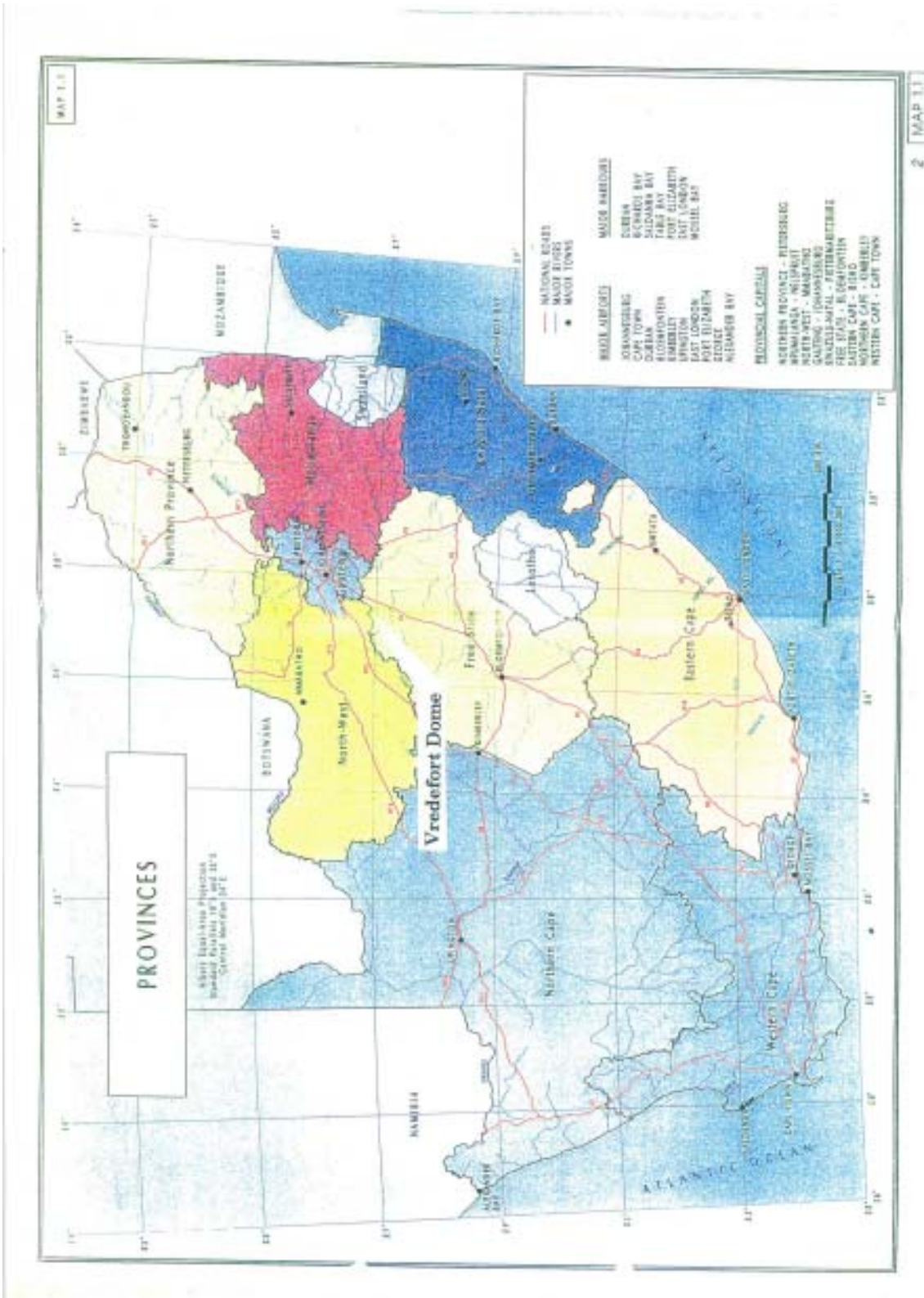
1. Ayant examiné le Document WHC-05/29.COM/8B.
2. Inscrit le dôme de Vredefort, Afrique du Sud, sur la Liste du patrimoine mondial sur la base du critère naturel (i)

Critère (i) : *Le dôme de Vredefort est la structure d'impact de météorite la plus ancienne, la plus grande et la plus profondément érodée du monde. Il s'agit du phénomène de libération d'énergie le plus important du monde. Il contient des sites géologiques accessibles et de haute qualité qui apportent une gamme de preuves géologiques attestant une structure d'impact météoritique complexe. Les paysages rural et naturel du bien sériel permettent de concevoir l'ampleur des structures en couronne qui résultent de l'impact. La proposition sérielle est considérée comme un exemple représentatif de cette structure d'impact météoritique. Une analyse comparative complète avec d'autres structures d'impact météoritique complexes a démontré qu'il s'agit du seul exemple sur la Terre fournissant un profil géologique complet d'un astroblème en dessous du fond du cratère permettant ainsi des travaux de recherche sur la genèse et le*

développement d'un astroblème immédiatement après l'impact.

3. Notant que le statut de propriété privée de la majorité du bien proposé nécessite une gestion et une collaboration spéciale avec les propriétaires pour garantir l'intégrité du bien,
4. Demande à l'État Partie de définir clairement les limites légales des trois sites satellites composant le bien sériel ;
5. Demande à l'État Partie de terminer et de mettre en œuvre le plan de gestion pour tout le bien dans les deux années qui suivront l'inscription et de garantir que ce plan bénéficie de l'appui des principaux acteurs ;
6. Demande enfin à l'État Partie d'inviter une mission de l'UICN à se rendre sur place dans les deux ans qui suivront l'inscription afin d'évaluer les progrès accomplis du point de vue des mesures demandées plus haut.

Map 1: Localisation du bien proposé



Carte 2: Limites du bien proposé

