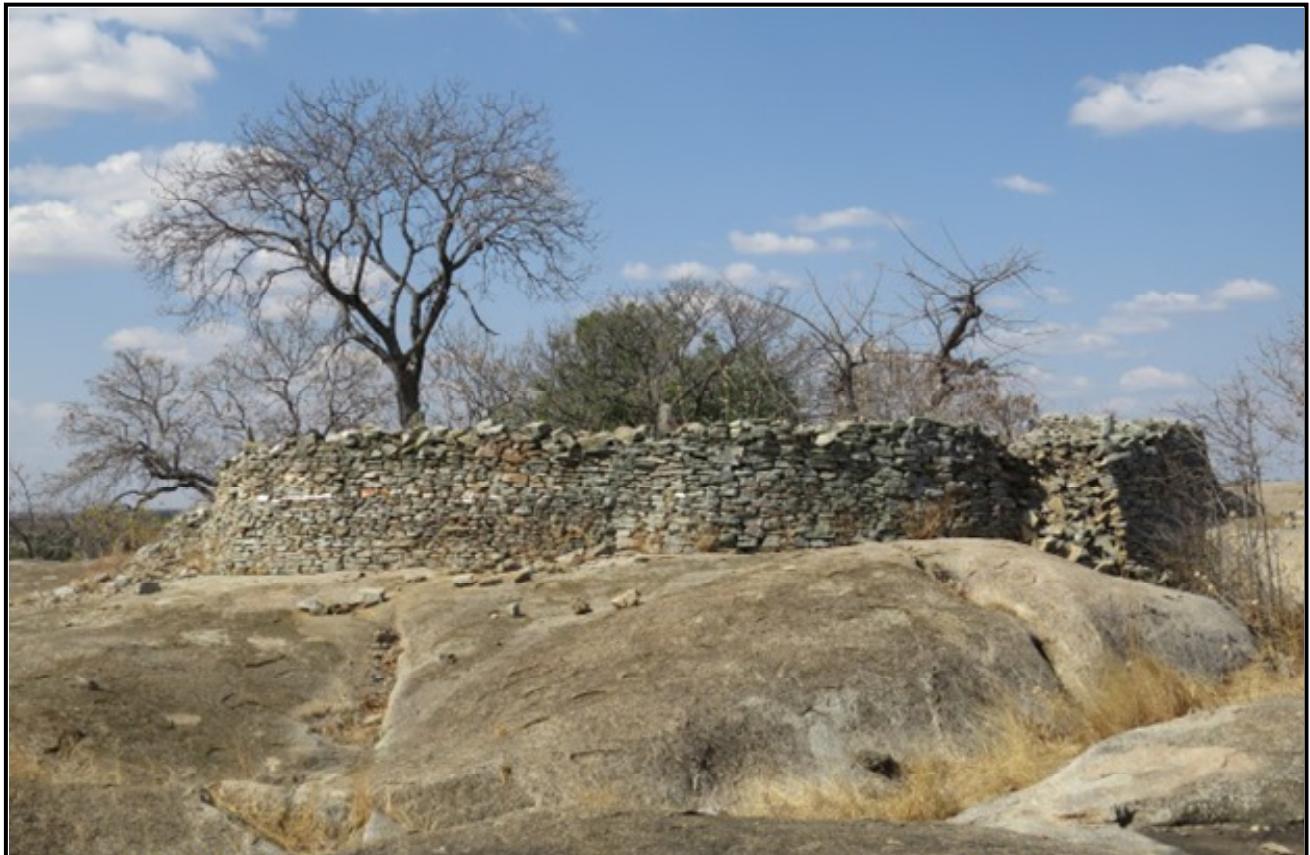




# **HWANGE NATIONAL PARK**



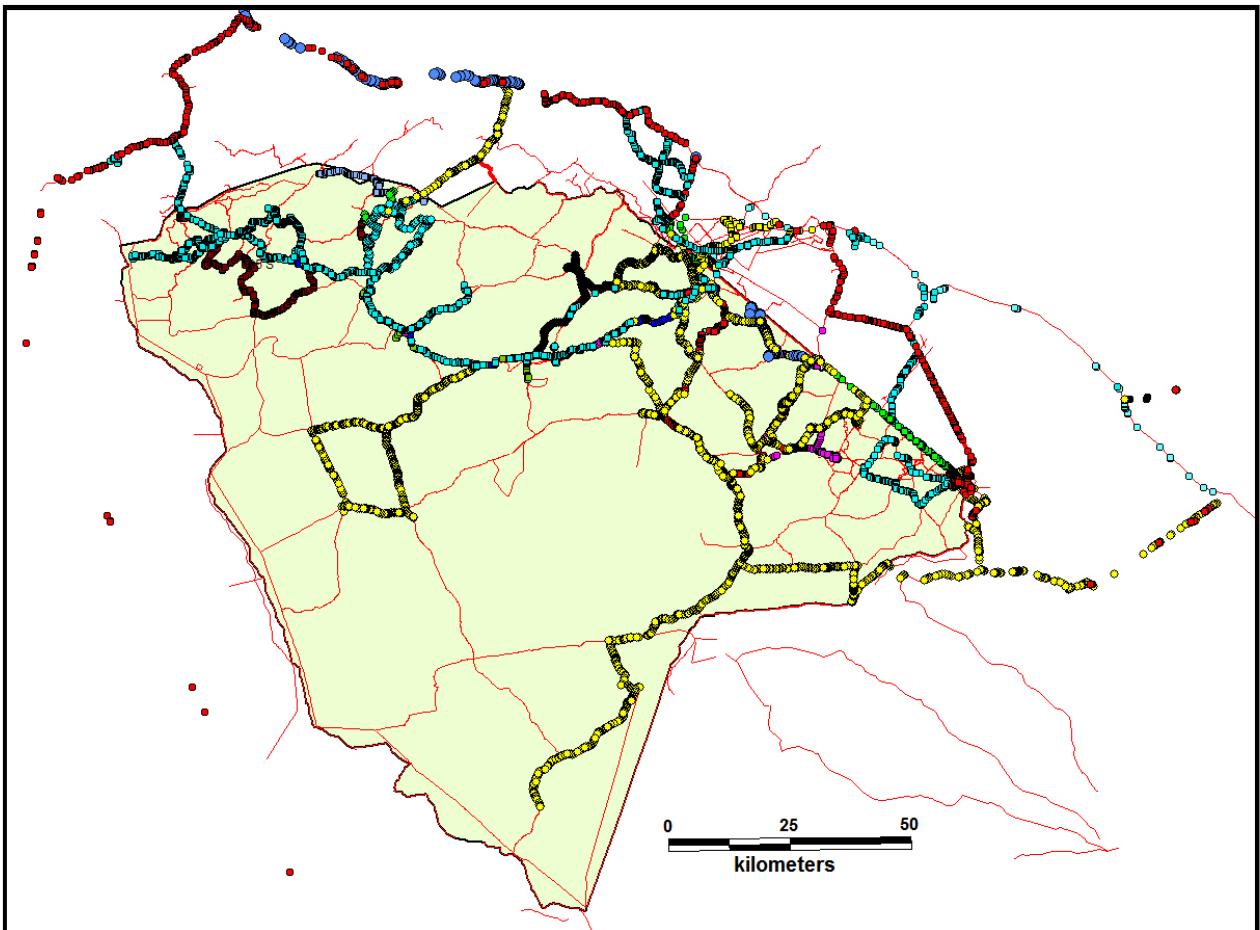
**GENERAL MANAGEMENT PLAN  
PART 3: ANNEXES  
November, 2015**

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## ANNEX 1: GEOREFERENCED PHOTOGRAPHY

During the preparation of the revised management plan approximately 20,000 georeferenced photographs were taken. These helped to inform the process and the locations of the photos are shown below.





## ANNEX 2: HISTORY AND ARCHAEOLOGY

*This section is taken from the 2003 Management Plan as it was dealt with in some detail in this documentation. Much of the material is from an earlier publication – Martin, D. 1997. Hwange. Elephant Country. African Publishing Group. Harare*

### 1.1 EARLY HISTORY

The first known Bantu-speakers in the Hwange area were the Kalundu group whom the earliest archaeological evidence indicates inhabited the area between AD 400 and 500 with their occupancy peaking around AD 800.

Occupations by a series of groups followed with the Tonga moving south from Zambia into North-western Zimbabwe in search of perennial water in the 11th and 12th centuries.

Tonga movement southwards was halted by the northerly migrations and conquests of Shona groups causing the Tonga to withdraw into the Zambezi Valley and southern Zambia where they live today. Another group originating in Zambia, the Leya, occupied much of the area in which Hwange is now incorporated. Although no specific date has been established for their arrival, they initially settled in the Victoria Falls area before expanding their influence to the south and South-East.

Thereafter the history of the area becomes more detailed. Early in the 18<sup>th</sup>, Dende, one of the three sons of the Rozvi Changamire (king or leader), broke away from his father to establish himself as an independent ruler in present-day North-western Zimbabwe.

Dende's actions are said to have infuriated the Rozvi Changamire who gave orders that his son be captured and killed.

Dende's actions in this period strongly suggest he felt in danger. He swiftly moved ever further away from his father, stopping briefly in several places, and strengthening kinship ties through leaving behind sisters who married Tonga men.

Three times he changed his name - from Dende to Sawanga and finally to Wange (said to be an abbreviation of his previous name) which became the hereditary dynastic title.

Dende, and his followers, a patrilineal people of the soko (monkey) totem who were later known as Nambya, entered the Leya territory via Lower Gwayi, settling in the Bhale area between the Gwayi, Nyantuwe and Lukosi rivers. Here they assimilated some of the Leya who had not resisted their incorporation into the Nambya State.

On top of a strategic hill named Shangano (deriving from the Nambya word shangana meaning "meet") they built a stone-walled enclosure which became the first capital of their State.

The Nambya are believed to have moved from Shangano to the Bumbusi area in the upper Deka valley during the reign of the fifth Wange, Shana (1834-60). In large measure the move appears to have been dictated by the greater suitability of the wetter soil at Bumbusi for bulrush millet, sorghum and maize which were Nambya staples.

The new capital was sited on a rocky promontory beneath two large baobab trees which still stand. The stone-walled enclosure was about 55metres long and two metres high and the royal dwellings were located within this complex.

A well organised economic and social structure existed among the Nambya well before the Ndebele raids of 1850 and after, the south-wards advance of the tsetse fly which made cattle keeping impossible in the area, the introduction of firearms, the importation of European goods, and intensive hunting from 1860.

Agriculture followed by animal husbandry, hunting, gathering, fishing and manufacturing, underpinned the society.

The crops grown, and the techniques used to grow them, ensured the area was more or less self-sufficient and provides a salutary lesson to those who today talk about resistant crops to combat drought.

Cattle, once a social asset, a source of protein, a manifestation of wealth used in marriage transactions (lobola), and an item to barter during periods of deficit, inevitably diminished in importance after the arrival of the tsetse fly in the area.

Hitherto, cattle had been at the core of Nambya culture as was the case with several other groups. If the importance of cattle disappeared then part of the culture was lost.

The Nambya now turned to smaller stocks such as sheep and goats to barter or combat crops deficits. Goats in turn brought environmental degradation.

Hunting, gathering (insects, fruits, leaves, roots wild grasses and honey) and fishing were subsidiary pursuits yet they provided additional insurance in times of shortage. The hunting of big game, a dangerous pursuit, was usually a village or communal pursuit while smaller game was hunted by individuals.

Nambya hunters were noted as skilful trackers who would variously employ bows and arrows, spears (the Nambya tipped their spears with a poison drawn from a bulb chenyami), and traps to catch their prey.

The second half of the 19th century brought considerable changes for the Nambya people. Broadly these changes were brought about by two quite different factors, one resulting from the mfecane (a Zulu word literally meaning "the crushing") and the other by the arrival of European traders and settlers.

These two events radically changed the political, economic and social structure which existed in Nambya society.

The first group of European traders to reach the area are thought to have been Portuguese and their African agents, the Chikunda, who originated in Mozambique. These Portuguese were involved in the slave and ivory trade and, hitherto, had been thought to have reached the area by canoe from the east up to the Zambezi Valley from Quelimane in Mozambique via Kariba.

There is, however, reason to believe that the earliest Portuguese reached the area from the Atlantic coast through Angola and the Ovimbundu areas of today's southern Angola and northern Namibia. Their arrival, some historians now argue, pre-dated 1850 and brings into doubt the contention that Dr David Livingstone was the first white man to see the Victoria Falls.

The Portuguese purchased large numbers of young Nambya men and women who were exported as slaves. This trade seriously depleted the Nambya population and following the abolition of slave trade, the Nambya began purchasing slaves back from the Portuguese with ivory, as a means of replenishing their population.

The demand for ivory, and its growing scarcity south of Limpopo River, drew South African hunters to the area from around 1860. They brought with them an alternative source of European goods including, increasingly, guns to barter.

Between 1871 and 1878 the trade took on a more permanent nature with establishment of a trading post to Pandamatenga by George Westbeach, an expert hunter and trader. This, and other subsequent trading stations, sowed the idea of migrant labourers working in South Africa's mines for money which could be converted into items hitherto only obtainable from the slave-and-ivory-and-trading-caravans.

The loose Nambya hegemony and comparative peace was shattered by the Ndebele arrival. Their then Chief Wange, Lusumbami, according to oral accounts, was skinned alive by the Ndebele.

His followers fled, dispersing into smaller family units occupying inaccessible parts of the mountainous country south of the Zambezi River or crossing into Zambia only to return between 1888 and 1893, the latter date marking the defeat of the Ndebele by the British South Africa Company (BSAC) in the Anglo-Ndebele war.

The Nambya were the group most seriously affected by the Ndebele raids, losing their remaining cattle and agricultural lands as well as their Chief and hundreds of their people.

They however managed to retain their cultural identity and government, and the hereditary dynastic title of the Nambya rulers, established over 200 years ago by Dende, continues today with the present Chief Wange being the thirteenth in the line.

## 1.2 COLONIAL AND POST-COLONIAL

As shown in the previous section, the true pioneers of white occupation were in fact the Portuguese who traded in slave and ivory, as well as missionaries such as Livingstone, Robert and Moffat, and hunters like Frederick Courtney Selous.

They were responsible for the rumours of extensive gold deposits in Zimbabwe, and Rhodes' "Pioneer" Column in 1890 merely followed their footsteps searching for El Dorado.

The Nambya who had returned from Zambia, and those who had emerged from their sanctuaries in the hills south of the Zambezi River, were totally deprived of their southern land by the settlers 1910. In 1893 a German, Albert Giese, had heard about "black stones that burn". Two years later he pegged 1,036 square km of the southern Nambya in the Bambusi area as a coalfield.

When development of the coal concession began in 1903 all Nambya living in the area were resettled in the east in the Lukosi and Inyantue areas.

Between 1904 and 1909 the land was surveyed for European farming settlement and by 1910a total of 3,383,800 acres of the best Nambya land land, representing 45 percent of Wankie District's total, had been taken for the colliery, railway and white farmers.

By 1925, of the total land in Wankie District, five per cent had been set aside for Nambya reserves, 45 percent was alienated (already taken) and 50 percent of the area, or a little over 5 million acres, unalienated. This was soon to change for the worse for the Nambya.

In 1928, a total million acres, just over 93 per cent of the unalienated land, was resigned for the Wankie Game Reserve. Nambya, still living in this area, were forcibly removed to the reserves. The villages of those who resisted were burnt by the Southern Rhodesian police.

Of the remaining 286 000 acres of unalienated land, most was subsequently declared a forest reserve, thereby leaving the Nambya landless outside the three reserves (later reduced to two).

The depopulation of the area, and the alienation of large areas for the Wankie Game Reserve and for forestry, was to make the North West of Southern Rhodesia a difficult area for guerrillas to operate in when they began the second Chimurenga (war for liberation) in the 1960s.

While the Nambya had been comparatively inactive during the first Chimurenga against the white settlers in 1896 (most of them had been driven from Hwange District by the invading Ndebele), they were to play a much greater role during the second Chimurenga.

In August 1967, in one of the most publicised and epic battles of the Zimbabwean liberation war, a force of 80 guerrillas fought for several days with the Southern Rhodesia security forces. Seven members of the Southern Rhodesian forces were killed and 13 wounded against 30 guerrillas killed, a security force communiqué claimed.

The Wankie battle, as it became known, appropriately brought together African guerrillas from Zimbabwe and South Africa in a battle symbolising unit against white settlers.

Psychologically, therefore, the Wankie battle was of great importance. As the war of liberation escalated, tourist facilities in the area became increasingly inaccessible and dangerous. Peace returned to the area when Zimbabwe became independent in 1980.

## 1.3 ARCHAEOLOGICAL SITES

### 1.3.1 Introduction

The Hwange environment is dynamically changing. The main goal of a management plan is to anticipate as much as possible what future changes will occur in the ecosystem and to plan how to deal with them. Yet it is absolutely impossible to predict the types of future changes to be expected if we do not know the basic details about the Hwange landscape's prehistoric past, especially the prior types of changes that have occurred in climate, flora, and fauna. These changes have left us with clear evidence of their duration and range, and this evidence now provides the only available information about the variations to be expected in Hwange National Park's future changes.

An essential part of the study of past changes in the Hwange ecosystem involves examining the human presence and the influences that prehistoric human activities have had on the system's flora and fauna. Research into Hwange National Park's prehistory is at an early stage, but some important results are already available and they should have significant implications for the management plan. The research program has two dimensions. First, it involves an ambitious search for archaeological sites in (and around) the Park. Second, it involves a study of paleoenvironmental changes that have occurred in the Hwange district over the long span of time when humans have influenced the ecosystem.

In this abbreviated and preliminary report, archaeological sites are listed and described, along with recommendations for their future treatment by the National Parks Department. As made clear by the Management Plan, one main mission of the Park is to protect archaeological, historical, and palaeo-ecological sites within it. This task is made doubly important because there is a tremendous richness and diversity in the Park's archaeological resources, and they have never before been studied. The task is also made important because there are so many potentially damaging processes that adversely affect these sites and thereby forever remove scientific knowledge about Hwange's past.

### 1.3.2 Archaeological Resources in Hwange National Park

The attached Table lists archaeological sites that we have discovered and studied in and around Hwange National Park. The list is up to date through January 1998. The sites discovered in the National Park are numerous and were created by human groups who used the local resources in all parts of the district. The earliest phase of human occupation of the Park is called the "Early Stone Age" (ESA), and is characterized by very mobile and small groups of archaic Homo sapiens, who manufactured stone tools at a few localities in the Park's northern portion. The dating of this phase is tentative, but it probably began before 250,000 years ago, and came to an end around 200,000 years ago. The succeeding phase of human occupation is termed the "Middle Stone Age" (MSA), beginning 200,000 years ago and continuing until about 40,000 years ago. The last phase of the stone age sequence is termed the "Later Stone Age" (LSA), spanning the time period from 40,000 years ago to just a few hundred years ago.

Each one of these phases is characterized by different stone-tool-making technology, different subsistence and settlement patterns, and very distinct ways of using the landscape and its resources. Early Stone Age hominids mainly oriented their movements and encampments towards high-quality toolstone sources which were found where small streams drained through the contact zones between different bedrock types. The preferred stone for tool-making was quartz, but also used were quartzite and cherts that had been secondarily formed in Kalahari sand calcrete deposits. Middle Stone Age hominids differed in that they no longer were "tethered" to the same specific sources of quartz toolstone, but instead made their stone tools from the smaller chert nodules that were found more widely in calcrete exposures. The Middle Stone Age hominids seemed to prefer foraging at larger pans and along sluggish stream courses, where they hunted (or scavenged) large game animals such as alcelaphines and suids. Neither Early nor Middle Stone Age hominids ventured very far into the Kalahari sands, but restricted their movements to the northern hills of the Park and the central interior

basins where the calcrete savannahs are found today. However, by the time of the Later Stone Age, human groups were widely dispersed into all parts of the Park, including the remotest Kalahari sands region, where their subsistence was very similar to that of the hunting-gathering “bushman” or San peoples whose way of life has been ethnographically recorded in Botswana and Namibia.

These LSA foragers hunted large and small game animals, gathered nuts and berries, and also ate mussels and snails. Their tools and artifacts were made of stone, bone, wood, and plant fibers, evidenced by archaeological remains found in scattered rockshelters in Hwange National Park. They gathered honey in remote parts of the Park area, and hunted large, medium, and small game animals around at least 50% of the pans located in the furthest reaches of the Park’s Kalahari sands region.

Some time after 2,000 years ago, human groups possessing a very different economic orientation appeared in the northern part of the Park. Their appearance — first discovered in the Kapula vlei near Sinamatella — marks the beginning of the so-called Early Iron Age phase in the region. The people of this phase manufactured a distinctive style of pottery, planted domesticated crop plants, and probably kept livestock, primarily cattle. They also hunted large and medium-size game animals such as kudu, possibly relying on wild meat for about a third of their diet.. They did not fully oust all the Later Stone age hunting-gathering peoples in the Hwange district, but their practices of woodland-clearing for fields and pastures undoubtedly did affect the lifeways of the foragers, who nevertheless continued to co-exist in the Park area alongside the iron-using farmers and pastoralists.

Some paleoenvironmental evidence exists in the Park for a wetter period with higher rainfall and perhaps warmer temperatures just before the appearance of the first farming people, suggesting that a drying trend at the end of this wetter interval may have contributed to the movement of farming communities into what had once been hunting- gathering territory. We suggest that the numerous sites of engraved rock art in Hwange National Park’s northern area represent one response of hunter-gatherers to the existence of the ethnically different farming groups, who may have been perceived as socially threatening to the foragers’ traditional way of life.

The last phases of prehistoric human presence in the National Park area began around the year A.D. 1800, when the ancestral Nambya people migrated into the region. The National Park possesses several important sites associated with the Nambya and their way of life during the “Zimbabwe” period of the later Iron Age, including Bumbusi and Mtoa ruins, neither of which has ever been surveyed, test-excavated, or mapped. These sites are currently endangered by elephants and buffalo which knock over the stone walls, by antbears burrowing under the walls and into midden deposits, and by uncontrolled surface-collecting by Park visitors and some employees. At least 10 other smaller stone-wall ruin sites also exist in the Park, primarily in the Sinamatella and Robins areas, and all of them need to be studied further before they are completely destroyed by natural processes such as animal trampling or tree-growth, or by people.

Perhaps one of the more interesting observations emerging from the first stage of this archaeological research is that during the 19th century a surprisingly large and extensive network of villages were occupied by Bantu farmers and cattle-herders in the land that would later become the National Park. We estimate that as many as 2,000 people lived in the future National Park between 1780 A.D. and 1870 A.D. These were Wange’s people. During this time, an estimated 1,000 tonnes of wood per year would have been cut for firewood, fencing, hut construction, and charcoal-making (for iron-manufacture). Hence, the flora and fauna of a large portion of the future National Park must have been dramatically shaped by human activities only a little more than one hundred years ago. As well, the bush-burning practices of hunter-gatherers also would have had a major impact on the area’s woodlands.

Evidence has been recovered from our tree-ring studies that the middle of the 19th century was wetter than the 20th century has been. Yet in spite of the higher levels of moisture one hundred years ago, our archival research in conjunction with the archaeological and paleoenvironmental studies indicates clearly that the Hwange region never supported more than about 6-8,000 elephants during the heyday of the 19th century ivory-hunting period. The well-known Victorian-era hunter EC. Selous shot elephants in the future Hwange National Park about 10 years after most of the Nambya farmers and cattle-keepers had abandoned the region in the face of Ndebele raids, and his descriptions of the landscape and natural history are enlightening about climatic changes over the past 100 years.

The National Park also possesses a fine record of the Colonial era in the region, when the Rhodesian government pegged land for European farmers and ranchers. If properly surveyed, test-excavated, and mapped, these farm sites can be rich sources of information about the early 20th century in the region before the land and its resources were afforded complete protection as a National Park.

### 1.3.3 Management Implications

First, and most importantly, it is to be emphasized and never overlooked that Hwange National Park is charged by law and by its own Mission Statement to protect and preserve the cultural resources located within it. To avoid damaging all historical, archaeological, and palaeo-ecological resources, the Department of National Parks should first produce an inventory of known or predicted historical, archaeological, and palaeo-ecological sites within the boundaries of Hwange National Park, and this inventory should be evaluated by trained archaeologists who may then determine how best to salvage information from threatened sites. The major proportion of the costs of producing such an inventory most likely would be borne by external researchers who are willing to undertake the task, if the Department of National Parks can agree to provide some assistance such as the waiving of Park entry fees, the waiving of fees currently demanded for the use of Research Scouts, and other such unnecessary and restrictive fees or related burdens that have recently been placed upon external researchers.

The salvaging of sites and information can be a simple procedure, if done professionally. Some sites are threatened by natural processes such as animal-trampling, which are relatively ungovernable. Yet nonetheless the effects of such natural processes can be objectively examined, and some means can be devised to either neutralize the processes or to mitigate their effects.

Other destructive processes affecting sites are caused by human actions, such as road-grading, gravel-quarrying, or outright looting or vandalism, the latter activity having already adversely affected Bumbusi and Mtoa ruins, among other sites in the Park. Before any more building construction or road-grading is done in the Park, professionally trained archaeologists must be allowed to survey and test-excavate every potential historical, archaeological, and palaeo-ecological site in the Park. Once again, we emphasize that external researchers should be encouraged to undertake this work, and should be positively supported through the waiving of fees and perhaps by the provision of free temporary housing to visiting archaeologists from the National Museums and Monuments.

A second set of implications for the Management Plan derives from our discoveries of cycles of climatic extremes in the Hwange district. We now have identified several major trends in climate over the past 110,000 years for Hwange National Park. A trend called "Punctuated aridity" characterizes the region, and has left its traces in the deepest Kalahari sands where large relict fields of longitudinal dunes can be found. Very arid periods lasting up to 5,000 years interrupted wetter periods in prehistory, and during these intervals the crests of Pleistocene dunes were dramatically re-activated by winds. The driest periods were 110-100,000 years ago, 50-40,000 years ago, and around 20,000 years ago. But there were also many other dry intervals of lesser duration, as well, when woodlands changed composition in response to changes in rainfall amounts and distribution. During the wetter periods, such as around 27-33,000 years ago, or before 2,000 years ago, miombo woodland elements such as *Brachystegia* spp. expanded their range by about 30-100 kilometers beyond their current limits. Baikiae woodlands also expanded and contracted in response to rainfall changes. These observations indicate that the Hwange system is completely dynamic but it is also sensitive to an unknown degree to certain climatic changes. The sensitivity must be further studied, and the Department of National Parks should encourage external researchers to carry on tree-ring dating and dendroclimatological studies in and around the National Park. These studies will help reveal the age of the Park's teak woodlands and other vegetational communities, and will be critical in understanding the future shape of the Park's changing floristic component.

ATTACHMENT 1: Table listing archaeological sites, the periods when they were occupied by people (Hist = Historical [from 1870 to the present], Iron Age = 2,000 -100 years ago, Stone Age = 250,000 - 200 years ago), their locations, and suggested actions to be taken for each one.

## TABLE: ARCHAEOLOGICAL SITES IN HWANGE NATIONAL PARK

Compiled by G. Haynes/J. Klimowicz

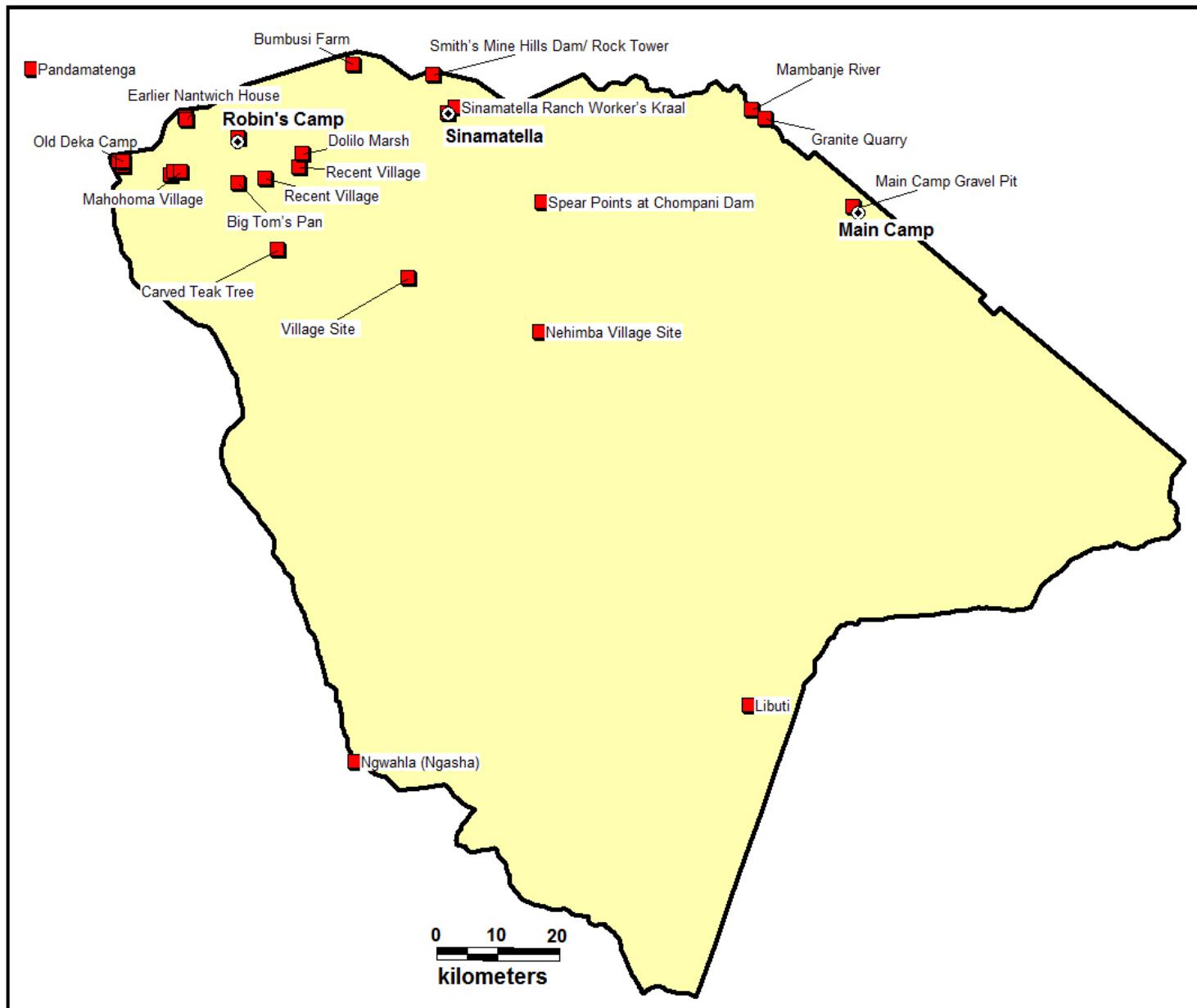
| MAP    | SITE NAME                        | UTM COORD  | HIST | IRONAGE | STONE AGE | COMMENTS                                       |
|--------|----------------------------------|------------|------|---------|-----------|--|
| 1825D1 | Pandamatenga                     | LK 592 514 | Yes  | No      | Yes       | not in Park                                    |
| 1825D2 | Earlier Nantwich House           | LK847 433  | Yes  | No      | No        | should be tested and mapped                    |
| 1825D2 | Big Tom's Pan                    | LK933 331  | Yes  | No      | Yes       | should be surveyed                             |
| 1825D2 | Mahohoma Area Village            | LK838 348  | Yes  | Yes     | Yes       | should be surveyed, collected, mapped          |
| 1825D2 | Robins Camp Deka River Slopes    | LK925 411  | No   | Yes     | Yes       | should be surveyed                             |
| 1825D2 | Tsamtsa Pan                      | LK793 289  | No   | Yes     | Yes       | should be surveyed                             |
| 1825D2 | Tsamhole Pan                     | LK827 275  | No   | No      | Yes       | should be surveyed, tested, mapped             |
| 1825D2 | Last Big Nantwich House          | LK846 436  | Yes  | No      | No        | should be tested and mapped                    |
| 1825D2 | Old Deka Camp                    | LK737 364  | Yes  | No      | Yes       | should be tested, mapped                       |
| 1825D2 | Old Deka Camp                    | LK744 364  | Yes  | No      | Yes       | should be tested, mapped                       |
| 1825D2 | Giese's Deka Historic Huts/Dump  | LK744 358  | Yes  | No      | Yes       | should be tested, mapped                       |
| 1825D2 | Historic Farm Cattle Area (?)    | LK822 343  | Yes  | No      | Yes       | should be tested                               |
| 1825D2 | Historic Farm Kraal or House     | LK827 348  | Yes  | No      | Yes       | should be tested                               |
| 1825D2 | Mahohoma Area Village            | LK845 331  | No   | Yes     | Yes       | should be surveyed, tested, mapped             |
| 1825D2 | Mahohoma Area Wall/Graves        | LK846 335  | No   | Yes     | Yes       | should be mapped, tested                       |
| 1825D2 | Tsamtsa Vlei                     | LK794 285  | No   | No      | Yes       | should be surveyed                             |
| 1825D4 | Black Vlei Paved w/Chert Pebbles | LK880230   | No   | No      | Yes       | should be systematically surveyed              |
| 1825D4 | Sibuyu Baobab                    | LK075 019  | Yes  | No      | No        | destroyed by elephants                         |
| 1826A4 | Kamandama Ruins                  | MK430611   | No   | Yes     | No        | not in Park: partly destroyed by road- grading |
| 1826B3 | Chirowamaga Ruins ("Shangano")   | MK562 607  | No   | Yes     | No        | not in Park                                    |

| MAP    | SITE NAME                                | UTM COORD  | HIST | IRONAGE | STONE AGE | COMMENTS                             |
|--------|--|------------|------|---------|-----------|--------------------------------------|
| 1826C1 | Bumbusi Last Shelter(South side of road) | MK154 529  | No   | Yes     | Yes       | should be tested                     |
| 1826C1 | Crocodile Pools                          | LK987 413  | No   | No      | Yes       | should be surveyed                   |
| 1826C1 | Walling Near Chingahobe Dam              | MK079415   | No   | Yes     | No        | should be tested, mapped             |
| 1826C1 | Spoor                                    | MK142 533  | No   | No      | Yes       | should be tested, recorded           |
| 1826C1 | Ruins (Khami Type)                       | LK993 396  | No   | Yes     | Yes       | should be tested, mapped             |
| 1826C1 | Bumbusi Ridge Rockshelter w/Engravings   | MK155 529  | No   | No      | Yes       | should be tested, recorded           |
| 1826C1 | IA Site Near ESA Lookout Site            | LK996 279  | No   | Yes     | Yes       | should be tested, mapped             |
| 1826C1 | ESA Lookout Site                         | LK989 285  | No   | Yes     | Yes       | should be surveyed                   |
| 1826C1 | East Side of ESA Lookout Site            | LK994 278  | No   | No      | Yes       | should be surveyed                   |
| 1826C1 | Deteema River Scatters                   | MK092 334  | No   | Yes     | Yes       | should be surveyed                   |
| 1826C1 | Deteema Ruins                            | MK097 354  | No   | Yes     | No        | should be tested, mapped             |
| 1826C1 | Bumbusi Cave                             | MK141 525  | No   | Yes     | Yes       | should be re-tested                  |
| 1826C1 | Recent Village Near Dolio Springs        | MK034 357  | Yes  | No      | No        | should be tested, mapped             |
| 1826C1 | Dolio Springs -'Near Recent Village      | MK028 356  | No   | No      | Yes       | should be surveyed                   |
| 1826C1 | Deka River & Deteema Mouth               | MK065 499  | No   | No      | Yes       | should be surveyed                   |
| 1826C1 | Tshowe Ruins or Wall                     | LK96 46    | No   | Yes     | No        | (not yet located on ground)          |
| 1826C1 | Road Near River & Farm                   | MK 1252    | No   | No      | Yes       | should be mapped                     |
| 1826C1 | Bumbusi Ruins, Main Site                 | MK 142 533 | No   | Yes     | No        | Should be tested, mapped, stabilized |
| 1826C1 | Dolilo Marsh                             | MK 038 379 | Yes  | No      | Yes       | should be tested.                    |
| 1826C1 | Bumbusi-Spoor & Pots                     | MK 15 53   | No   | Yes     | Yes       | should be tested, Recorded           |
| 1826CI | Bumbusi Farm                             | MK 121 524 | Yes  | No      | Yes       | should be tested , mapped            |

| MAP    | SITE NAME                          | UTM COORD  | HIST | IRONAGE | STONE AGE | COMMENTS                             |
|--------|------------------------------------|------------|------|---------|-----------|--------------------------------------|
| 1826CI | Deka & Big Tom's Junction          | LK 982 411 | No   | No      | Yes       | should be surveyed                   |
| 1826CI | Salt Pan                           | LK 978 338 | No   | No      | Yes       | should be surveyed                   |
| 1826CI | Salt Pan Recent Village            | LK 978 338 | Yes  | Yes     | No        | should be tested , mapped            |
| 1826C2 | Salt Spring-Deteema Road           | MK 212 415 | No   | No      | Yes       | should be surveyed                   |
| 1826C2 | Sinamatella Ranch Worker's Kraal   | MK 290 455 | Yes  | No      | No        | should be tested , mapped            |
| 1826C2 | Sinamatella Homestead              | MK 278446  | Yes  | No      | No        | should be tested, mapped             |
| 1826C2 | Smith's Mine Hills Dam/ Rock Tower | MK 253 508 | Yes  | No      | No        | should be tested , mapped            |
| 1826C2 | Spear Points at Chompani Dam       | MK 434 301 | Yes  | No      | No        | should be tested                     |
| 1826C2 | Mandavu Dam Terrace Ruin           | MK 237 385 | No   | Yes     | No        | should be tested, mapped, stabilized |
| 1826C3 | Dandari Road, Carved Teak Tree     | LK 999 223 | Yes  | No      | No        | should be recorded, stabilized       |
| 1826C3 | Manzimbomvu Pan                    | MK 000 243 | No   | No      | Yes       | should be surveyed                   |
| 1826C3 | Dandari Pan                        | MK 000 165 | No   | No      | Yes       | should be surveyed                   |
| 1826C4 | Nehimba Village Site               | MK 431 090 | Yes  | Yes     | No        | should be tested, mapped             |
| 1826C4 | Nehimba                            | MK 399 102 | No   | No      | Yes       | should be intensively tested         |
| 1826C4 | Pan South East of Nehimba /        | MK 420 086 | No   | Yes     | Yes       | should be surveyed                   |
| 1826C4 | East Shumba Pan                    | MK 329 199 | No   | Yes     | Yes       | should be surveyed                   |
| 1826C4 | Village Site Enroute to Bumbumutsa | MK 214 178 | Yes  | Yes     | No        | should be tested, mapped             |
| 1826C4 | Nehimba Termite Mound              | MK 413 091 | No   | No      | Yes       | should be re-surveyed                |
| 1826C4 | Big Shumba Pan                     | MK 273 167 | No   | Yes     | Yes       | should be intensively surveyed       |
| 1826D1 | Grassy Pan Near Mtoa Pan           | MK 675 326 | No   | Yes     | Yes       | should be intensively surveyed       |
| 1826D1 | Mzizi West Kopje                   | MK 624 316 | No   | Yes     | Yes       | should be tested                     |
| 1826D1 | Iron Axe Site/Dead Baboon Site     | MK 622 314 | No   | Yes     | No        | should be tested                     |
| 1826D1 | < Mtoa Pan                         | MK 665 335 | No   | Yes •   | Yes       | should be intensively surveyed       |

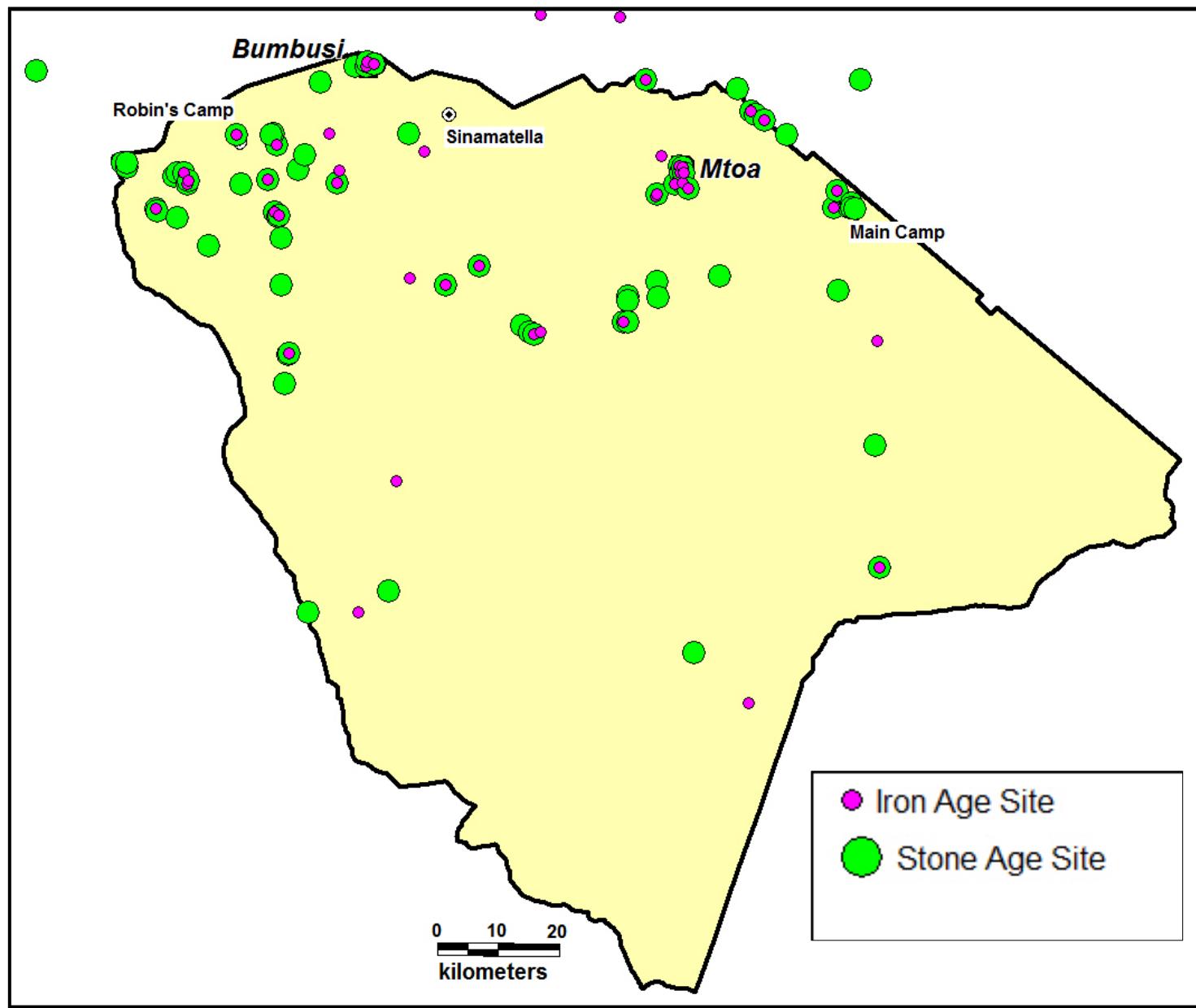
| MAP    | SITE NAME                       | UTM COORD  | HIST | IRONAGE | STONE AGE | COMMENTS                                   |
|--------|---------------------------------|------------|------|---------|-----------|--|
| 1826D1 | Sikumi Forest                   | MK 604 504 | No   | Yes     | Yes       | not in Park                                |
| 1826D1 | Mtoa Ruins                      | MK 666 361 | No   | Yes     | Yes       | should be tested, mapped, stabilized       |
| 1826D1 | Baobab Holes                    | MK 667 351 | No   | Yes     | Yes       | should be mapped, tested                   |
| 1826D1 | Mambanje River                  | MK 778 454 | Yes  | Yes     | Yes       | should be intensively surveyed             |
| 1826D1 | Rock Ring, Baobab Holes Area    | MK 662 352 | No   | Yes     | Yes       | should be tested, mapped                   |
| 1826D1 | Mtoa Ruins to Inyantue Dam Road | MK 631 380 | No   | Yes     | No        | should be surveyed                         |
| 1826D1 | Mzizi Springs                   | MK 652 333 | No   | Yes     | Yes       | should be intensively surveyed, mapped     |
| 1826D1 | Redeposited in Stream Channel   | MK 07 03   | No   | No      | Yes       | (redeposited—upstream source)              |
| 1826D2 | Main Camp Gate Area & Wind Pump | MK 946 296 | Yes  | No      | Yes       | should be tested mapped                    |
| 1826D2 | Sikumi forest                   | MK 961 504 | No   | No      | Yes       | not in Park                                |
| 1826D2 | Sidena Pan                      | MK 945 303 | No   | No      | Yes       | bricksworks should be teste; survey nedeed |
| 1826D2 | Dete Police Road                | MK 838 414 | No   | No      | Yes       | should be intensively tested, mappe        |
| 1826D2 | Borrow Pit 1 km Inside Gate     | MK 943 295 | No   | No      | Yes       | should be intensively surveyed             |
| 1826D2 | Main Camp Gravel Pit            | MK 951 294 | No   | No      | Yes       | should be surveyed, intensively tested     |
| 1826D2 | Livingi Pan                     | MK 921 323 | No   | Yes     | Yes       | should be surveyed                         |
| 1826D2 | Balia Balia Pan                 | MK 916 295 | No   | Yes     | Yes       | should be surveyed; teak trees to be cored |
| 1826D2 | Granite Quarry                  | MK 801 438 | Yes  | Yes     | Yes       | should be surveyed                         |
| 1826D2 | Mtoa toockshelter               | MK 661 362 | No   | Yes     | Yes       | should be tested                           |
| 1826D2 | Railway Line                    | MK 757 489 | No   | No      | Yes       | should be intensively surveyed             |
| 1826D2 | Lion Spoor Site                 | MK 786 448 | No   | No      | Yes       | should be surveyed                         |
| 1826D3 | Bembesi Pan                     | MK 623 174 | No   | No      | Yes       | should be surveyed                         |

| MAP         | SITE NAME                 | UTM COORD  | HIST | IRONAGE | STONE AGE | COMMENTS                               |
|-------------|---------------------------|------------|------|---------|-----------|--|
| %<br>1826D3 | White Hills Pan Area      | MK 625 147 | No   | No      | Yes       | should be intensively surveyed, tested |
| 1826D3      | Giraffe Pan North East    | MK 576 108 | No   | No      | Yes       | should be surveyed                     |
| 1826D3      | Shapi Gravel Pit          | MK 575 150 | No   | No      | Yes       | should be tested                       |
| 1826D3      | Giraffe Pan               | MK 568 107 | No   | Yes     | Yes       | very urgent testing, mapping needed    |
| 1826D3      | Guvalala                  | MK 727 183 | No   | No      | Yes       | should be surveyed                     |
| 1826D3      | East Shapi Swamp          | MK 576 142 | No   | No      | Yes       | should be intensively surveyed.        |
| 1826D4      | Umkauzane                 | MK 988 076 | No   | Yes     | No        | should be surveyed                     |
| 1826D4      | Dopi Gravel Pit           | MK 923 159 | No   | No      | Yes       | should be tested                       |
| 1826B2      | Shakwanki                 | MJ 194 845 | No   | Yes     | No        | should be intensively surveyed tested  |
| 1926A3      | Lememba                   | MJ 181 665 | No   | No      | Yes       | should be intensively surveyed tested  |
| 1926A3      | Tamafupa                  | MJ 048 629 | No   | No      | Yes       | should be surveyed                     |
| 1926A3      | Shabi Shabi               | MJ 131 629 | No   | Yes     | No        | should be intensively tested           |
| 1926B2      | MaSummamalissa Gravel Pit | MJ 984 905 | No   | No      | Yes       | should be surveyed , tested            |
| 1926B3      | Bushman Pan               | MJ 686 565 | No   | No      | Yes       | should be surveyed                     |
| 1926B4      | Setshetshe                | MJ 993 706 | No   | Yes     | Yes       | should be surveyed                     |
| 1926B4      | Libuti                    | MJ 776 482 | Yes  | Yes     | No        | should be surveyed and tested          |
| 1926C1      | Ngwahla (Ngasha)          | MJ 130 388 | Yes  | No      | No        | may be very recent                     |



**Figure: Historical Sites in Hwange National Park**

Data was mapped from the Haynes and Kilomowicz Information – So only accurate to a six figure grid reference



**Figure: Historical Sites in Hwange National Park**

Data was mapped from the Haynes and Kilomowicz Information – So only accurate to a six figure grid reference.

In addition some sites are both Stone Age and Iron Age.



## ANNEX 3: VEGETATION SURVEY SUMMARY

### 1 NON-KALAHARI SAND VEGETATION TYPES

#### Group A - Woodland thicket types on Lower to Upper Karoo sediments

The three communities within this group are confined to small areas in the Sinamatella region, occurring on both sandstones and mudstones of the Karoo Series. They cover an area of 187.35 square kilometres.

*Colophospermum mopane* and *Diospyros quiloensis*, although rarely dominant, are most often represented in the group, *Canthium gfaucum*, *Combretum elaeagnoides*, *C. mossambicense*, *Markhamia zanzibarica* and *Acacia ataxacantha* are common.

##### Type 1 *Combretum* - *Boscia angustifolia* open scrub and thicket on Lower Karoo sandstone.

This scrub or thicket type occurs as small islands of vegetation. It can be seen on low, elongated dome-shaped, sandstone ridges on the eastern sides of the Masuma and Mandavu Dam. This type can be recognised as either open scrub or thicket (2 to 4 m tall) often dominated by *Combretum elaeagnoides*, *C. apiculatum*, *C. ceiastroides* and *C. collinum* with scattered *Lonchocarpus eriocalyx*. Other common species include *Diospyrosquiloensis*, *Colophospermum mopane*, *Canthium pseudorandii*, *Combretum collinum* and *Boscia angustifolia* var. *corymbosa*. Indicator species are *Canthium pseudorandii*, *Combretum collinum* and *Abrus schimperi*.

##### Type 2 *Colophospermum mopane* - *Acacia* woodland adjacent to riverine vegetation

This mopane woodland is found in the low lying Madumabisa mudstone areas adjacent to the riverine vegetation of watercourses such as the Lukozi River and its tributaries.

This type is less diverse than other types in this group, and commonly includes *Diospyros quiloensis*, *Dichrostachys cinerea*, *Combretum mossambicense*, *Terminalia prunioides*, *Erythroxylum zambesiaccum*, *Acacia robusta* and *Acacia ataxacantha* in the well developed understorey. The indicator species *Acacia robusta* is generally associated with seasonally moist habitats in Hwange National Park.

##### Type 3 *Colophospermum mopane* - *Commiphora marlothii* mixed woodland on scree slopes.

This community or vegetation type is easily identified since it occurs only on steep scree slopes of escarpments of Karoo formations in the Sinamatella area. This species rich community (81 species) is a thicket or woodland thicket type, with no one species dominant. Almost always present are *Colophospermum mopane*, *Markhamia zanzibarica*, *Canthium glaucum*, *Combretum elaeagnoides*, *Grewia flavescentis* var. *flavescentis* and *Diospyros quiloensis*.

This type occurs on lithosols of the steep scree slopes of escarpments in the Sinamatella area. The species of woody plants found in this habitat are those which are thicket forming on rocky soils. The most common trees are usually found on rocky outcrops or in rocky areas, such as *Commiphora marlothii* and *Sterculia africana*.

## **Group B - Mixed bushland, thicket and woodland on Basement Complex formations.**

This group of vegetation types is found in the Sinamatella and Robins sub-regions and in the north western area of the Main Camp sub-region, mainly on the Basement Complex.

The group is the most species rich in the Park (185 species). Most of the species present are generally found in rocky habitats or can be found in the middle to highveld where conditions are more moist. For example *Afzelia quanzensis*, *Strychnos madagascariensis*, *Lannea discolor* and *Catunaregam spinosa* (*Xeromphis obovata*) are typically found in rocky areas, and *Diplorhynchus condylocarpon*, *Brachystegia boehmii*, *Euclea divinorum* and *Terminalia sericea* are frequently present in areas of higher rainfall.

### **Type 4 Castle kopje mixed woodland and thicket**

This type is widespread in distribution in the Sinamatella area, occurring in the Mambanje area north west of Dete and on 2 km wide north-east, south-westerly oriented series of rocky kopjes. It is also found west of Sinamatella Camp on and around Bumboosie Hill on Basement Complex.

This is the most diverse of all the vegetation types in the Park (156 species). The community is generally mixed woodland and thicket with *Colophospermum mopane*, *Combretum apiculatum*, *Commiphora mossambicensis*, *Diospyros quiloensis*, *Erythroxylum zambesiacum*, *Kirkia acuminata* being most commonly represented.

The indicator species of the type are *Bridelia mollis*, *Commiphora karibensis*, *Elephantorrhiza goetzei*, *Sterculia africana* and *Afzelia quanzensis*. They are species typically found in rocky areas.

### **Type 5 Colophospermum mopane - Julbernardia-Combretum wooded bushland**

In this mixed bushland to woodland, *Colophospermum mopane* and *Julbernardia globiflora* are commonly co-dominants with *Combretum zeyheri*, *C. apiculatum* and *Terminalia sericea*. *Diplorhynchus condylocarpon*, *Commiphora mossambicensis*, *Diospyros quiloensis*, *Carphelea pubescens*, *Erythroxylum zambesiacum*, *Catunaregam spinosa*, *Pterocarpus rotundifolius* and *Grewia monticola* are found in the understorey. There are numerous species occurring in this type which are found in miombo or *Brachystegia* woodland, for example, *Strychnos madagascariensis*, *Brachystegia boehmii*, *Lannea discolor* and *Pseudofachnostylis maprouneifolia*.

### **Type 6 Combretum - Baphia thicket**

*Combretum - Baphia* thicket covers an extensive area (366.8 square kilometres) from Dete to Shumba, along the watershed, on the ecotone between the Kalahari sands and other geological types. The reddish sandy clay soils on which it occurs are Kalahari sands overlying Basement Complex or Basalt. The topography is usually flat to sloping.

In this diverse thicket to bushland type (130 species), the species most frequently occurring in samples include *Combretum apiculatum* (sometimes dominant) with *C. cefastroides*, *C. elaeagnoides*, *Colophospermum mopane*, *Erythroxylum zambesiacum*, *Baikiaea plurijuga*, *Diospyros quiloensis*, *Pterocarpus rotundifolius*, *Grewia monticola* and *Commiphora mossambicensis*.

## **Group C - *Colophospermum mopane* woodland and thicket on Granitic Gneiss and Madumabisa Mudstones.**

This mopane woodland group (types 7, 8 and 9) covers an extensive area in the Sinamatella region (692,3 square kilometres). In these woodlands dominated by *Colophospermum mopane*, species such as *Diospyros quiloensis* and *Erythroxylum zambesiacum* are almost always present. Although mopane woodland is often thought of as species poor, this is the third most diverse group with 156 woody species. Many of the thicket species are common, including *Combretum elaeagnoides*, *Markhamia zanzibarica*, *Carphelea pubescens*, *Cassia abbreviata*, *Cissus cornifolia*, *Acacia nigrescens*, *Commiphora mossambicensis*, *Combretum apiculatum*, *Dafbergia meianoxylon*, *Commiphora africana*, *C. pyracanthoides*, *Grewia monticola*, *Dichrostachys cinerea* and *Grewia flavescentis* var. *flavescentis*. The indicator species for the group is *Terminalia prunioides*.

### **Type 7 *Colophospermum mopane* - *Combretum* woodland on Basement Complex**

This is the most extensive of the mopane woodland types covering 469 square kilometres. It can be found on the rocky ground of the Basement Complex from the northern boundary of the Park around Inyantue Siding stretching in a belt 1 km to 15 km wide, in a south west, north east orientation, to the edge of the Dandari Vlei.

It varies from woodland to bushland and thicket dominated by *C. mopane* with thicket species such as *Combretum apiculatum*, *C. elaeagnoides*, *Xeroderris stuhlmannii*, *Commiphora mollis*, *Terminalia randii*, *T. stuhlmannii*, *Diospyros quiloensis*, *Erythroxylum zambesiacum*, *Cissus cornifolia*, *Dichrostachys cinerea* and *Grewia monticola*

### **Type 8 *Colophospermum mopane* - *Terminalia prunioides* woodland on Madumabisa mudstones.**

This type, found on Madumabisa mudstone on slightly raised ground, is found only in the Sinamatella sub-region on Karoo mudstones. *Colophospermum mopane* is always present as a tree and dominates this type forming a uniform woodland about 8 to 10 m tall. *Erythroxylum zambesiacum*, *Acacia nigrescens* and *Diospyros quiloensis* trees are scattered throughout this type. In the understorey *Combretum elaeagnoides*, *Terminalia prunioides*, *Erythroxylum zambesiacum*, *Commiphora pyracanthoides*, *Commiphora africana*, *Diospyros quiloensis*, *Grewia monticola* and *Vepris zambesiaca* are found.

### **Type 9 *Colophospermum mopane* - *combretum elaeagnoides* thicket on Basement Complex**

This thicket is found from Deteema to Chingahobe, Dolilo and to below Bumboosie Hill. It covers a large area about 5 km on either side of the Inyantue River and north of Shumba Pans to the eastern edge of the Dandari Vlei. This is a *C. mopane* - *Diospyros quiloensis* - *Combretum elaeagnoides* thicket type with *Erythroxylum zambesiacum*, *Dichrostachys cinerea*, and *Carphelea pubescens*. *Diospyros quiloensis* trees and *Berchemia discolor* are the indicator species.

Other species include *Combretum mossambicense*, *Lonchocarpus capassa*, *Flueggea virosa* and *Combretum imberbe* which are indicative of a sometimes riverine habitat. Thicket species such as *Xeroderris stuhlmannii*, *Canthium glaucum*, *Markhamia zanzibarica*, *Carphelea pubescens*, *Grewia flavescentis* var. *flavescentis*, *Combretum apiculatum* and *C. zeyheri* are commonly found in this community. The presence of species such as *Bauhinia petersiana*, *Combretum collinum*, *C. Zeyheri*, *Pseudolachnostylis maprouneifolia*, *Vitex payos* and *Baphia massaiensis* are indicative of the sandier soils of this type compared to the other mopane types of this group.

## **Group D - *Colophospermum mopane* - *Combretum imberbe* woodland to bushed grassland in SEASONALLY INUNDATED AREAS.**

This group comprises two communities (types 10 and 11) which occur on alluvium and seasonally inundated soils in the Sinamatella, Robins and Dzivanini areas. In the Sinamatella area the first type in this group is found on the banks of the Lukozi River and Tshakabika Rivers and the second type in the Dzivanini area along the Gwabasabuya, Limpande and Dzivanini Rivers. In the Robins area the second type in this group is found on the upper reaches of the Little Toms, Big Toms, Salt Pans, Dolilo and Deteema Rivers, all along the Bumboosie River and surrounding Shumba Pans. *Lonchocarpus capassa*, *Combretum mossambicense* and *Combretum imberbe* (>3 m) are the indicator species for the group.

### **Type 10 Riverine vegetation with *Diospyros mespiliiformis* and *Combretum mossambicense***

This riverine vegetation is found mainly on the banks and terraces of the large rivers in the Sinamatella area on Karoo sediments and the granitic gneisses of the Basement Complex.

It is a diverse, tall woodland type (124 species) with a well developed understorey tending to thicket with species as *Diospyros quiloensis*, *Canthium glaucum* and *Stychnos potatorum*. *Combretum hereroense* is always present as a tree and *Combretum imberbe*, *Diospyros mespiliiformis*, *Lonchocarpus capassa*, *Acacia galpinii*, *Kigezia africana* and *Colophospermum mopane* are common constituents of the canopy. *Ficus virosa* (formerly *Securinega virosa*), *Combretum mossambicense* and *Dichrostachys cinerea* are common in the understorey. The indicator species are *Diospyros mespiliiformis*, *Combretum mossambicense*, *Ficus virosa* and *Diospyros quiloensis*.

### **Type 11 *Colophospermum mopane* - *Acacia* - *Combretum* grassland to woodland in seasonally inundated areas.**

This community which varies from open bushed grassland to bushland, thicket and woodland, is usually dominated by *Colophospermum mopane* with scattered *Combretum imberbe*, *C. hereroense*, *Lonchocarpus capassa* and *Ziziphus mucronata*. Other common species include *Acacia nigrescens* and *Dichrostachys cinerea*.

According to Sweet (1971) some or all of the soils of this type may be sodic. More sampling of the soils and species composition of this type is required. Boreholes yield salty water in the Dzivanini area.

## **Group E - *Colophospermum mopane* bushed grassland to woodland on the watershed, on Basalt and Karoo formations.**

This group consists of a seasonally waterlogged type on deep soils derived from basalt (type 12), two types of shallow soils derived from basalt (typically in the Robins area, types 13 and 14) and two types on deep clay \* one in the Sinamatella area (type 15) and the other (a seasonally waterlogged type) widespread in the Dzivanini area (type 16). It is the most geographically extensive group of the non-Kalahari sand types covering an area of 1,475.4 square kilometres. Only *Colophospermum mopane* is consistently present in almost all samples in this group.

### **Type 12 *Colophospermum mopane* - *Combretum hereroense* bushed grassland to bushland on the watershed.**

Type 12 is widespread in distribution along the watershed, stretching from Dete to Shumba, Dandari Vlei and the Botswana border. It is the most extensive of the non- Kalahari sand vegetation types with an area of 592.4 square kilometres (4% of the Park). This community is associated with seasonally waterlogged soils derived from basalt and Kalahari sands where they meet.

In this mixed bushed grassland type *C. mopane* is almost always present but is not always dominant. Co-dominant species include *Combretum apiculatum*, *C. hereroense*, *C. imberbe*, *C. adenogonium*, *Terminalia sericea* and *Boisanthus speciosus*. Other common species include *Pterocarpus*

*rotundifolius*, *Commiphora mossambicensis*, *Diplorhynchus condylocarpon*, *Daibergia melanoxylon*, *Euclea divinorum*, *Peltophorum africanum* and *Grewia monticola*.

#### **Type 13 *Colophospermum mopane* - *Combretum* bushland on basalt.**

This bushland and bushed grassland type is the typical *C. mopane* bushland of the Robins area and is found along the boundary with the Matetsi Safari Area, west of the Big Toms River and north of Tsamhole.

The species composition within type 13 varies with the topography; i.e. *Kirkia acuminata* is common in rocky areas, on hilltops; while *Diplorhynchus condylocarpon* may be found in more moist conditions; and *Combretum imberbe* *C. hereroense* and *Peltophorum africanum* are typical of seasonally waterlogged location.

The only low trees (about 3 to 4 m tall) usually found in this bushland are *C. mopane*, *Combretum apiculatum* and *C. hereroense*. The indicator species are *Diplorhynchus condylocarpon*, *Pterocarpus rotundifolius*, *Peltophorum africanum* and *Scferecarya birrea*.

#### **Type 14 *Colophospermum mopane* bushland on basalt**

This is the second type of bushland confined only to the basalt of the Robins area. It is found at or near (up to 8 km away from) the contact between basalt and the Basement Complex and Kalahari sand. The topography is undulating with low hills and many seasonal streams. Other than *Colophospermum mopane*, common species of this slightly more dense bushland type include *Combretum apiculatum*, *Commiphora pyracanthoides*, *Acacia nigrescens* and *Daibergia melanoxylon*.

#### **Type 15 *Colophospermum mopane* - *Vepris zambesiaca* woodland on Madumabisa mudstones.**

This mopane woodland type occurs predominantly on Madumabisa mudstones in the Sinamatella area. *Dichrostachys cinerea*, an indicator of disturbance, is always present in this type. The well developed understorey consists of *Diospyros quiloensis*, *Commiphora africana*, *C. pyracanthoides*, *Terminalia stuhlmannii*, *Daibergia melanoxylon* and *Grewia bicolor*.

#### **Type 16 *Colophospermum mopane*-*Acacia* - *Grewia bicolor* stunted woodland in the Dzivanini area.**

This type occurs extensively on deep basalt-derived clays in the Dzivanini area only. It covers an area of 371.5 square kilometres. The topography is flat to gently undulating.

There are only 26 species represented in the samples of this type, the least diverse in the Park. *C. mopane* is the dominant species, with the next most common species *Dichrostachys cinerea*. *Daibergia melanoxyion*, *Acacia sieberiana*, *A. robusta*, *A. niiotica*, *Acacia erubescens*, *Ximenia americana* and *Grewia monticola* are also common. The indicator species is *Grewia* 6/co/orwhich is found as a low shrub with *Boscia matabelensis*.

The soils are mostly grey to black deep, self churning clays which crack when dry. In depressions in these areas, shallow lakes and marshes are formed, the extent of which depend upon the rainfall. In the dry season the areas can be seen as grasslands interspersed in the stunted mopane woodland. Periodic prolonged waterlogging, together with long dry periods from May to October, severely restrict the number of woody species which can survive on the Dzivanini mud flats. Only *Colophospermum mopane* was present in all samples, sometimes as scattered trees or as a stunted woodland.

## 2 KALAHARI SAND TYPES

There are 6 groups (F to K) described below. They cover three quarters of the Park from Main Camp to the Botswana border and south to the edge of the Dzivanini flats. *Baikiaea plurijuga* is the most common constituent of woodlands, and *Terminalia sericea* of bushlands. Indicator species of Kalahari sand types are *Baphia massaiensis*, *Acacia erioioba*, *Terminalia sericea*, *Ochna pulchra* and *Rhus tenuinervis*. *Acacia erioloba*, *A. fieckii*, *Rhus tenuinervis*, *Lonchocarpus nelsii* are found in every Kalahari sand vegetation type. Species which are only found in the Kalahari sand types are *Croton pseudopulchellus*, *Combretum psidioides* and *Guibourtia coleosperma*. The terrain of the Kalahari sands is characteristically flat.

### **Group F - *Combretum imberbe* bushed grassland on periodically waterlogged soils.**

This group is widely distributed in the Kalahari sands and consists of types 17,18 and 19. It extends over 1,302 square kilometres or 9% of the Park.

#### **Type 17 *Colophospermum mopane* woodland - *Combretum* bushed grassland mosaic on ecotone Kalahari sands**

This type is found in an extensive area just south of Shumba Pans, around Mopane Pan and in the Dzivanini area at the edge of the Kalahari sands and adjacent to the Gwabasabuya River and in patches along the Botswana border south of Korodziba Pan. It is a mosaic of *Colophospermum mopane* woodland or bushland interspersed with areas of *Combretum apiculatum*, *C. hereroense*, *C. collinum* and *Acacia nigrescens*.

Only *Colophospermum mopane* and *Acacia nigrescens* are commonly found as trees in representative samples. Common species are *Commiphora africana*, *Grewia flavescentia* var. *flavescentia*, *Terminalia sericea* and *Lonchocarpus nelsii*. The indicator species are *Acacia nigrescens* and *Lonchocarpus capassa*.

The surface soils are mostly sandy clays and the rest clays. They are derived from the underlying geology which is basalt, in the Dzivanini area and possibly in the Mopane Pan to Nehimba areas. There are several species which frequently occur in this type which are more typical of non-Kalahari sand vegetation types such as *Colophospermum mopane*, *Combretum apiculatum*, *Lonchocarpus capassa* and *Acacia nigrescens*.

#### **Type 18 *Acacia* - *Boscia albitrunca* - *Colophospermum mopane* bushed grassland in interdune troughs**

This type is widespread in the Triga Vlei area, Libuti, Josivanini, on the Jupanda, Manga, Kennedy and Linkwasha fossil vleis. It is associated with inter-dune troughs and fossil vlei line topography of the Kalahari sands. It is also found on the ecotone Kalahari sands in an area south of Libuti.near Leasha. It is the most extensive type within this group cove ring an area of 781.8 square kilometres.

This type is dominated by grassland with scattered clumps of trees and bushes. The trees include species such as *Acacia erioioba*, *A. luederitzii*, *Combretum imberbe* and *Colophospermum mopane*, and the bush species are mainly *Combretum hereroense*, *C. apiculatum*, *Acacia erubescens*, *Grewia flavescentia* var. *flavescentia*, *Dichrostachys cinerea*, *Commiphora africana*, *Diospyros lycioides* and *Ziziphus mucronata*. *Boscia albitrunca* is a very noticeable evergreen constituent of this community with its striking gnarled, white trunk.

There are scattered seasonal pans all along the dune troughs, with clumps of *Ziziphus mucronata* and *Diospyros lycioides* often fringing the pan edge. There is also typically a large tree at the pan edge - a 15 to 20 m *Colophospermum mopane*, *Combretum imberbe* or *Acacia erioioba*. The indicator species are *Ziziphus mucronata* and *Boscia albitrunca*.

### Type 19 *Combretum hereroense* - *Hyphaene* bushed grassland on calcrete.

Type 19 is found mainly in the east of the Park, in calcrete areas such as the ten mile drive, Ngweshla, Makwa, at the top of the Kennedy Vlei, Mbiza to Ngamo at the heads of fossil vlei lines and in the Josivanini and Shape areas. It is also found in inter-dune troughs of the northern dunes i.e. from Josivanini north and east to the Mbazu and Mandiseka area in the Park. Some of the larger areas of calcrete, such as Makololo and Ngamo, may have been playa lakes during the third pluvial of the Pleistocene era.

This type is the most diverse of the Kalahari sand types (107 species). The community is characteristically open bushed grassland dotted with *C. imberbe* trees and sometimes tall (25 metre) *Hyphaene* palms, and clumps of *C. hereroense*, *Diospyros hereroense* and *Dichrostachys cinerea* bushes. There is some concern over the regeneration of the *Hyphaene* palms since there are no palms of intermediate height or age (e.g. on the Mbiza or Makololo flats).

Common species include *Terminalia sericea* and *C. zeyheri*. The indicator species are *Burkea africana* and *Combretum imberbe*.

These calcrete areas are more extensive in area than the long, narrow dune troughs in which the *Acacia-Boscia albitrunca* - *Mopane* bushed grassland community is found. At the edges of the calcrete areas, with which this type is usually associated, the bushland becomes thicket and grades into type 30.

*Combretum imberbe* and *C. hereroense* are the most common species of tree, with *Terminalia sericea*, *Maytenus senegalensis* and *Peltophorum africanum* the most common of the tall shrubs. *Lonchocarpus capassa*, *Daibergia melanoxyylon* and *Grewia monticola* are common in the low shrub stratum.

### Group G - *Acacia-Baikiaea* bushland and woodland on Kalahari sands.

This group of bushland and woodland types (20, 21, 22 and 23) is widespread in distribution, occurring from the railway line in the east to the Botswana border. The area covered by the group is about 3,106.6 square kilometres or 21.8% of the Park. It is the most extensive group of vegetation types with 106 woody species.

#### Type 20 *Acacia-Mundulea sericea* bushland

Type 20 is found in the Triga Vlei, Wexcau area, Josivanini, Umkowazaan, Shape and Guvalala area and is associated with inter-dune troughs and eroded dune troughs especially in the Triga Vlei system. It covers an area of 967.2 square kilometres, nearly 7% of the Park.

This bushland is usually dominated by *Acacia* species such as *A. iuederitzii* and *A. ataxacantha*, and sometimes *A. erubescens*. *Colophospermum mopane*, *Lonchocarpus nelsii* and *Boscia albitrunca* may also be dominant or very common, although the latter species if not found in the northern Kalahari sand areas. In the tree canopy layer only three species are commonly represented in samples -*Acacia erioioba*, *Lonchocarpus nelsii* and *A. iuederitzii*. *Mundulea sericea* is almost always present as a tall shrub and *Dichrostachys cinerea*, *Terminalia sericea*, *Combretum coiiinum*, *Grewia flavescens* var. *flavescens*, *Combretum hereroense* and *Ochna cinnabarina* are also very common shrubs.

#### Type 21 *Terminalia sericea* - *Lonchocarpus nelsii* bushland

Type 21 is found in the Guvalala, Nyamandhlovu, Sinanga and Umkowazaanto Libuti areas on flat terrain, in shallow fossil drainage lines and in or adjacent to dune troughs on sandy clay soils. This type has a variable physiognomy, from bushland to thicket and woodland but is most often bushland. *Lonchocarpus nelsii*, *Combretum collinum*, *Terminalia sericea* and *Acacia erioioba* trees are often present. In the tall shrub layer *Dichrostachys cinerea* and *Acacia ataxacantha* are the most frequently encountered species, with others such as *Acacia fleckii*, *Combretum collinum*, *Ochna*

*pulchra*, *Grewia flavesiensis* var. *flavesiensis* (which is always present) *Combretum zeyheri* and *Lonchocarpus nelsii*. The indicator species if *Ochna pulchra*.

This community occurs adjacent to type 23 *Baikiaea* woodland and type 26 *Burkea africana* bushland and woodland. It mainly occurs in an area which was logged from the 1920's until 1944 and has a high elephant density in the dry season. This vegetation may thus be a degraded form of *Baikiaea* woodland as Childe & Walker (1987) have suggested.

### Type 22 *Colophospermum mopane* - *Combretum apicuiatum* bushland

This type occurs in the Manga Two area, Makona, Wexcau, Triga Vlei and Josivanini area in flat, depressed areas on sandy clay soils. It covers an area of only 28.3 square kilometres, the least extensive of the Kalahari sand types.

*Colophospermum mopane* trees are common although not usually dominant. Scattered *Combretum apicuiatum*, *Acacia fleckii*, *Boscia albitrunca*, *Terminalia sericea* and *Lonchocarpus nelsii* and *Combretum collinum* are common constituents. The presence of *Colophospermum mopane* and *Baikiaea plurijuga* together in the same community is unusual. They are usually representative of the shallow clay soils and deep sandy soils respectively.

The indicator species are *Colophospermum mopane* and *Dalbergia melanoxylon*. Other species which differentiate this type from the other types in group G include *Markhamia zanzibarica*, *Erythroxylum zambesiacum*, *Cissus cornifolia*, *Commiphora mossambicensis*, *AHophylus africanus*, *Combretum apicuiatum*, *Euclea divinorum*, *Peltophorum africanum*, *Dichapetalum rhodesicum* and *Pterocarpus angolensis*.

### Type 23 *Baikiaea* - *Combretum* woodland thicket on fossil sand dune crests.

This woodland thicket type is found mainly on fossil sand dune ridges in the central and southern Kalahari sand areas of the Park and on the western edges of most fossil drainage lines in the eastern part of the Park. It occurs west and south of the Dopi fossil drainage line as small patches of woodland surrounded by *Terminalia-Baikiaea* bushland (type 25). It covers an area of 1,329.1 square kilometres in over 600 patches of woodland thicket and is the most fragmented vegetation type.

This type is dominated by *Baikiaea plurijuga* which is present in the canopy layer in all samples of this type. Other trees include *Acacia erioioba*, *Lonchocarpus nelsii* and *Croton gratissimus* the latter two of which may be classified as tall shrubs (over 3 m tall). Common tall shrubs (1-3 m tall) include *Combretum celastroides* (can be over 3 m in height), *Dichrostachys cinerea*, *Ochna cinnabrina*, *Acacia ataxacantha*, *Grewia flavesiensis* var. *flavesiensis*, *Baphia massaiensis*, *Croton gratissimus* and *Acacia fleckii*. Of the low shrub (<1 m tall) species *Grewia aveliana* is the most commonly encountered, with *Rhus tenuinervis*, *Hippocratea indica* and *Croton pseudopulchellus*. The indicator species are *Baikiaea plurijuga*, *Combretum celastroides*, *Grewia aveliana*, *Croton gratissimus* and *C. pseudopulchellus*.

At the edge of this woodland, *Baikiaea* trees may be replaced by pure samples of *Acacia erioioba* trees.

## Group H - Terminalia - Combretum bushland

This group of bushland types (24 and 25) occurs extensively in the Kalahari sand area covering an area of 2,830.7 square kilometres or about 20% of the Park. *Combretum* species (*C. collinum* and *C. zeyheri*) and *Terminalia sericea* dominate these types. Also common are *A. erioioba*, *Baphia massaiensis*, *Ochna pulchra*, *Combretum psidoides*, *Croton pseudopulchellus*, *Erythrophleum africanum* and *Burkea africana*.

### Type 24 *Terminalia sericea* - *Acacia erioioba* bushland

This vegetation is found in or beside fossil drainage lines (especially the Dopi vlei) and in the Triga Vlei where sands have been eroded. It thus has a relatively restricted distribution.

The main difference between this bushland and type 25 bushland is that *Baikiaea plurijuga* is completely absent from this type. *Terminalia sericea*, *Acacia erioioba* and *Burkea africana* are always present (usually as scattered trees), and in the tall shrub layer *Ochna pulchra* is always present with *Baphia massaiensis*, *Combretum psidoides* and *Ancylanthos bainesii* and *Acacia ataxacantha*.

### Type 25 *Terminalia sericea* - *Baikiaea plurijuga* bushland

This *Terminalia sericea* bushland is the most widespread of all vegetation types covering an area of 2,572.4 square kilometres or 18% of the Park. Although *Baikiaea plurijuga* does not occur in every sample representing this type, species which are usually associated with *Baikiaea* do. Thus *Bauhinia petersiana*, *Combretum collinum*, *Baphia massaiensis* and *Croton pseudopulchellus* are almost always present in this type. The latter species is one which differentiates this type from the former *Terminalia* bushland type.

It is found west of Nyamandhlovu Pan and near Caterpillar, to the Botswana border and to the southern-most limit of the Kalahari sand. It occurs on deep redistributed Kalahari sand and on fossil dune crests adjacent to type 23 *Baikiaea plurijuga* - *Combretum celastroides* woodland. Species which occur with the dominant *Terminalia sericea* include *Baikiaea plurijuga*, *Combretum collinum*, *C. zeyheri*, *Ochna pulchra*, *Baphia massaiensis*, *Dichrostachys cinerea*, *Acacia ataxacantha*, *A. fleckii* and *Croton pseudopulchellus*. The indicator species are *Commiphora angolensis*, *Croton pseudopulchellus*, *Baikiaea plurijuga* and *Pterocarpus angolensis*.

## Group I - *Baikiaea plurijuga* woodland and bushland on deep Kalahari sands.

Within this group are two typical *Baikiaea* woodland types and a bushed woodland type. Type 27 is widely distributed in the Main Camp to Mandiseka area in the east of the Park.

Types 26 and 28 are found in the eastern Kalahari and west of the extension of Manga fossil drainage line and between Dina pan, Tibukai and Cement on the Botswana border.

The indicator species for this group are *Vitex payos*, *Guibourtia coleosperma*, *Diplorhynchus condylocarpon* and *Pseudolachnostyhs maprouneifolia*.

### Type 26 *Burkea africana* - *Pterocarpus angolensis* bushland and woodland.

This type is usually found in the eastern edges of fossil vlei lines, on redistributed Kalahari sands. It is often found adjacent to *Baikiaea* - *Guibourtia coleosperma* woodland, Type 27 and is also widely distributed west of the Manga Vlei line.

This bushland to woodland type is dominated by *Burkea africana*, *Terminalia sericea* and *Erythrophleum africanum*. Common shrubs include *Combretum zeyheri*, *C. psidoides*, *Baphia massaiensis*, *Combretum collinum* and *Ochna pulchra* and *Vitex payos*. *Diplorhynchus condylocarpon*, *Bauhinia petersiana*, *Strychnos spinosa* and *Guibourtia coleosperma* are common as low shrubs.

The indicator species is *Combretum collinum*, separating this type from type 27. Other differential species include *Acacia ataxacantha*, *Croton pseudopulchellus* and *Dichapetalum rhodesicum*. *Baikiaea plurijuga* is present in only two thirds of the samples of this type which is similar to type 25.

### Type 27 *Baikiaea plurijuga - Guibourtia coleosperma* woodland

This vegetation type is found only in the eastern Kalahari sand areas, on deep redistributed sand and is often situated adjacent to type 30 and calcrete areas. It is more extensive than type 28 covering an area of 604 square kilometres. It is found around Main Camp and down to Ngamo in the east and as far as Manga Vlei in the west. It is not found west of the Manga Vlei extension in this Park. Since the rainfall is thought to be on average higher in the east of the Park than the west, one could hypothesize that this type is associated with more moist or mesic conditions.

This woodland is dominated by *Baikiaea plurijuga* and *Guibourtia coleosperma*. *Croton pseudopulchellus*, *Erythrophleum africanum* and *Pterocarpus angolensis* are important constituents. *Burkea africana* and *Terminalia sericea* are also often present as trees. *Ochna pulchra*, *Terminalia sericea*, *Combretum zeyheri* and *Pseudolachnostylis maprouneifolia* are common tall shrubs. In the low shrub stratum *Diplorhynchus condylocarpon*, *Strychnos spinosa*, *Vitex payos* and *Pterocarpus angolensis* are common.

The indicator species are *Baikiaea plurijuga*, *Guibourtia coleosperma* (1-3 m) and *Pseudolachnostylis maprouneifolia*. Other species which differentiate this type from type 29 are *Dichrostachys cinerea* and *Acacia erioioba*.

### Type 28 *Baikiaea plurijuga - Croton gratissimus* woodland

This type is very similar to type 27 and is found near Dete, on White Hills and in the west of the Kalahari sand area near Shakwanki and north east of Xibi Amabandi. It is found on deep redistributed Kalahari sand, and is characteristically found on the catenal position between type 27 and ecotone *Baikiaea plurijuga* woodland to bushland.

Indicator species are *Croton gratissimus* (1-3 m) and *Vangueria infausta*. Other species which differentiate this type from types 26 and 27 are *Grewia monticola*, *Rhus tenuinervis* and *Grewia avellana*.

In this woodland type *Baikiaea plurijuga* is almost always present as a tree, with *Guibourtia coleosperma* and *Croton gratissimus*. In the tall shrub layer *Croton pseudopulchellus*, *C. gratissimus*, *Baphia massaiensis*, *Combretum zeyheri*, *C. collinum*, *C. psidoides*, *Ochna pulchra*, *Terminalia sericea* and *Vangueria infausta* are common. In the low shrub layer *Dichapetalum rhodesicum*, *Dichrostachys cinerea*, *Grewia aveliana*, *Bauhinia petersiana* and *Burkea africana* are common.

## Group J - Ecotone *Baikiaea plurijuga* woodland and thicket on red Kalahari sands.

### Type 29 Ecotone *Baikiaea plurijuga - Commiphora mossambicensis* woodland and thicket

Ecotone *Baikiaea plurijuga - Commiphora mossambicensis* woodland thicket is found in the northern reaches of the Kalahari sand - the most extensive tracts of this type being in the Robins sub-region. It covers an area of 855.4 square kilometres within the Park. It is a well developed *Baikiaea* woodland type, in terms of canopy cover and its diverse and dense understorey.

This teak woodland being on the ecotone, has the greatest species diversity of the teak woodland types, with 99 species. In the canopy, which is dominated by *Baikiaea plurijuga*, there is also *Erythrophleum africanum*, *Combretum apiculatum*, *Terminalia sericea*, *Erythroxylum zambesiaca* and *Burkea africana*. In the tall shrub layer *Ochna pulchra*, *Baphia massaiensis*, *Combretum collinum*, *Bauhinia petersiana* and *Terminalia sericea* are common. *Catunaregam spinosa* (formerly *Xeromphis obovata*), *Diplorhynchus condylocarpon*, *Grewia monticola* and *Dichapetalum rhodesicum* are common in as low shrubs.

## **Group K - *Burkea africana* bushland surrounding calcrete areas.**

### **Type 30 *Burkea africana* - *Terminalia brachystemma* bushland**

This Kalahari sand group is restricted in distribution to the east of the Park, from Main Camp to Ngamo, adjacent to or surrounding calcrete areas, along the top of the eastern watershed area. The vegetation is bushland, thicket or woodland dominated by *Burkea africana* and *T. sericea* with *Erythrophleum africanum*, *Combretum imberbe* and *Combretum hereroense*. It is the presence of the latter *Combretum* species, which are tolerant of waterlogged conditions, and which separate this type from type 26 *Burkea* bushland and woodland. The latter type is also found adjacent to calcrete areas. Scattered *Guibourtia coleosperma* and *Combretum imberbe* trees may be found in this type. Other common constituents include *Ochna pulchra*, *Combretum psidioides*, *Annona stenophylla*, *Diplorhynchus condylocarpon*, *Strychnos spinosa* and *Swartzia madagascariensis*. Type 30 is differentiated from Type 29 by the obvious absence of *Baikiaea plurijuga* and the presence of *Terminalia brachystemma*, *Annona stenophylla* and *Combretum imberbe*.

*Hyphaene petersiana* is a notable species in this type but its distribution is patchy (it is not a consistent component of the samples representing this type. Other unusual species to be found here, but rarely so, are *Parinari curatifolia* (found nowhere else in the Park) and *Kigelia africana* (usually only found in riverine fringe in Hwange).

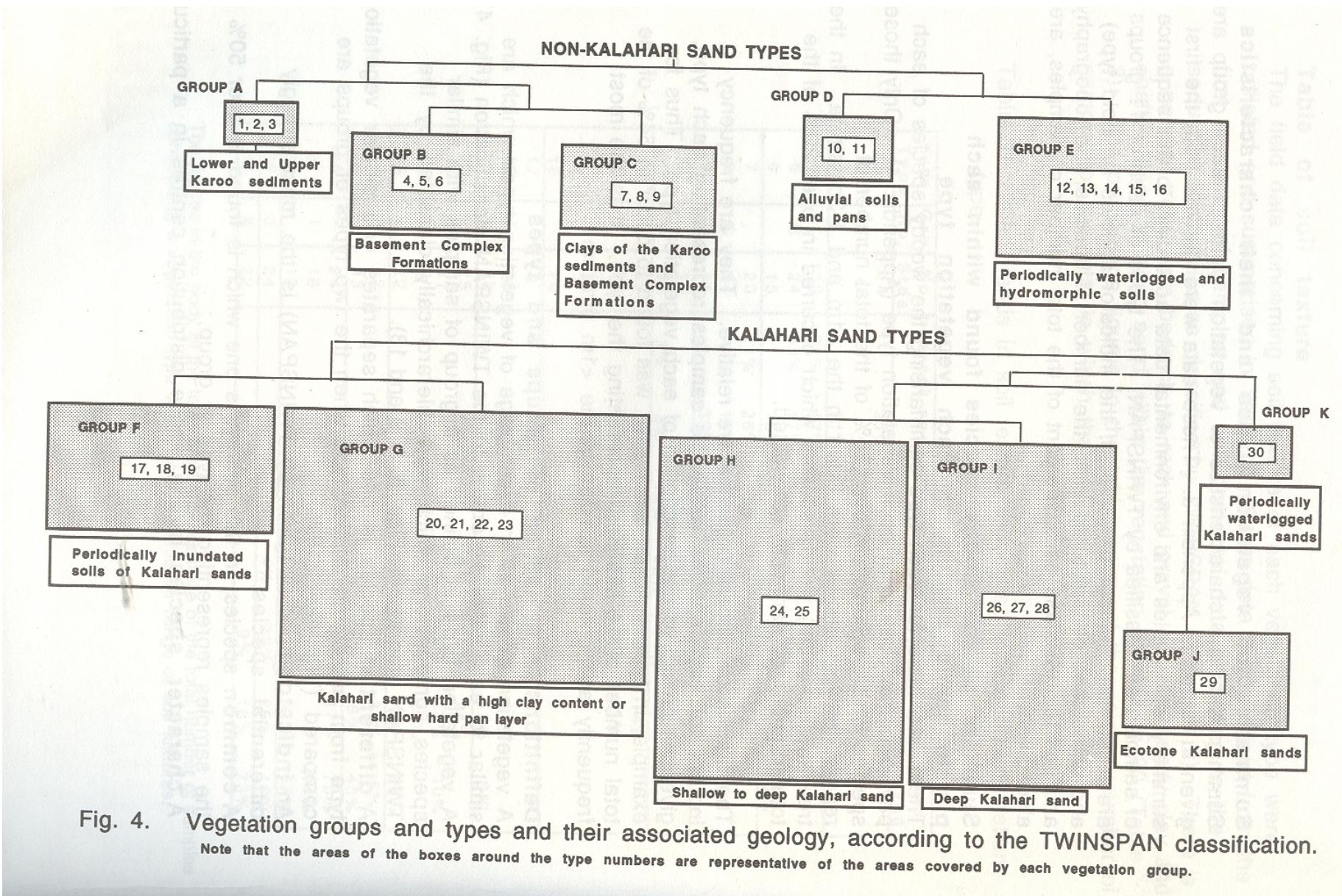
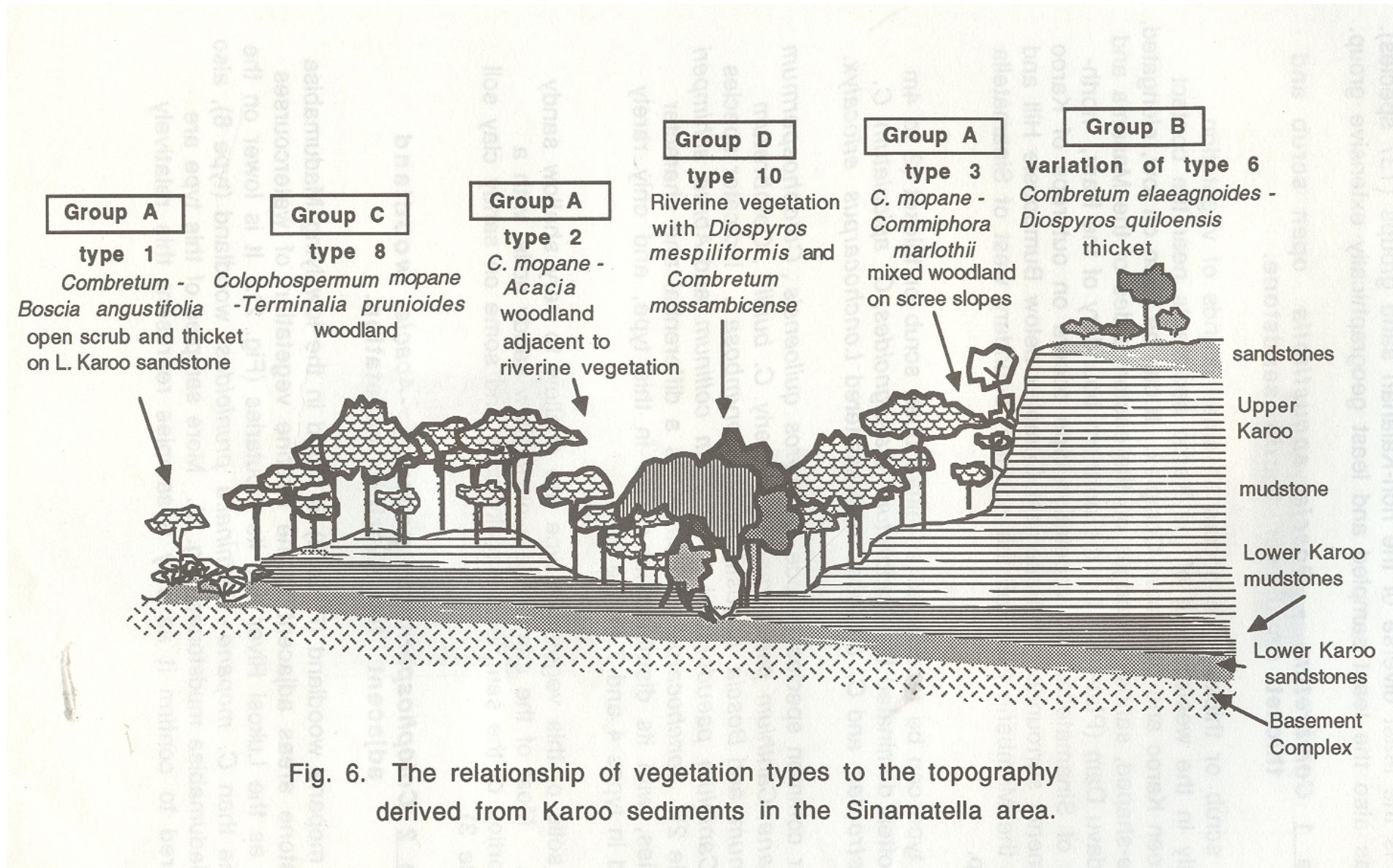


Fig. 4. Vegetation groups and types and their associated geology, according to the TWINSPAN classification.  
 Note that the areas of the boxes around the type numbers are representative of the areas covered by each vegetation group.



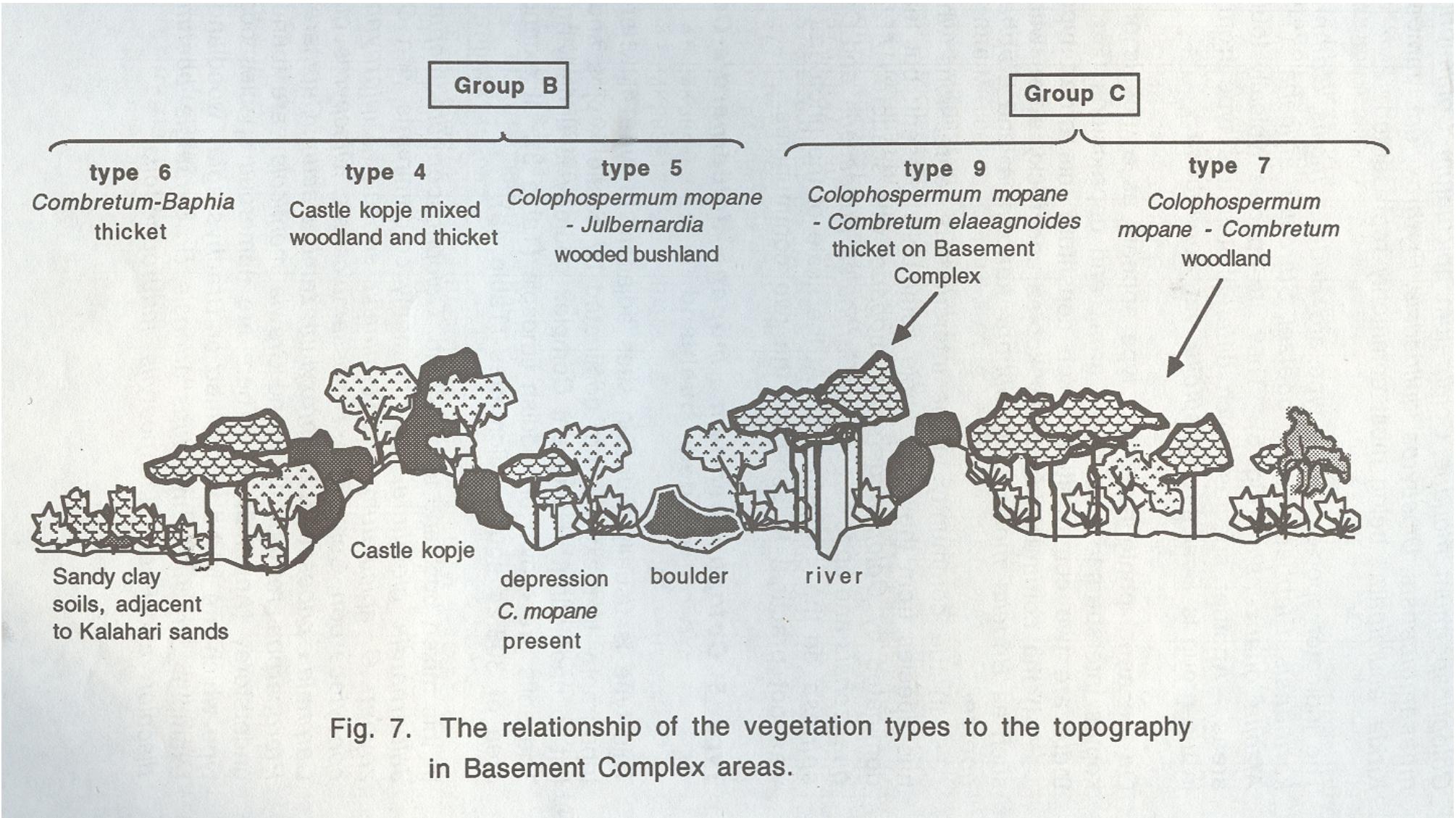


Fig. 7. The relationship of the vegetation types to the topography in Basement Complex areas.

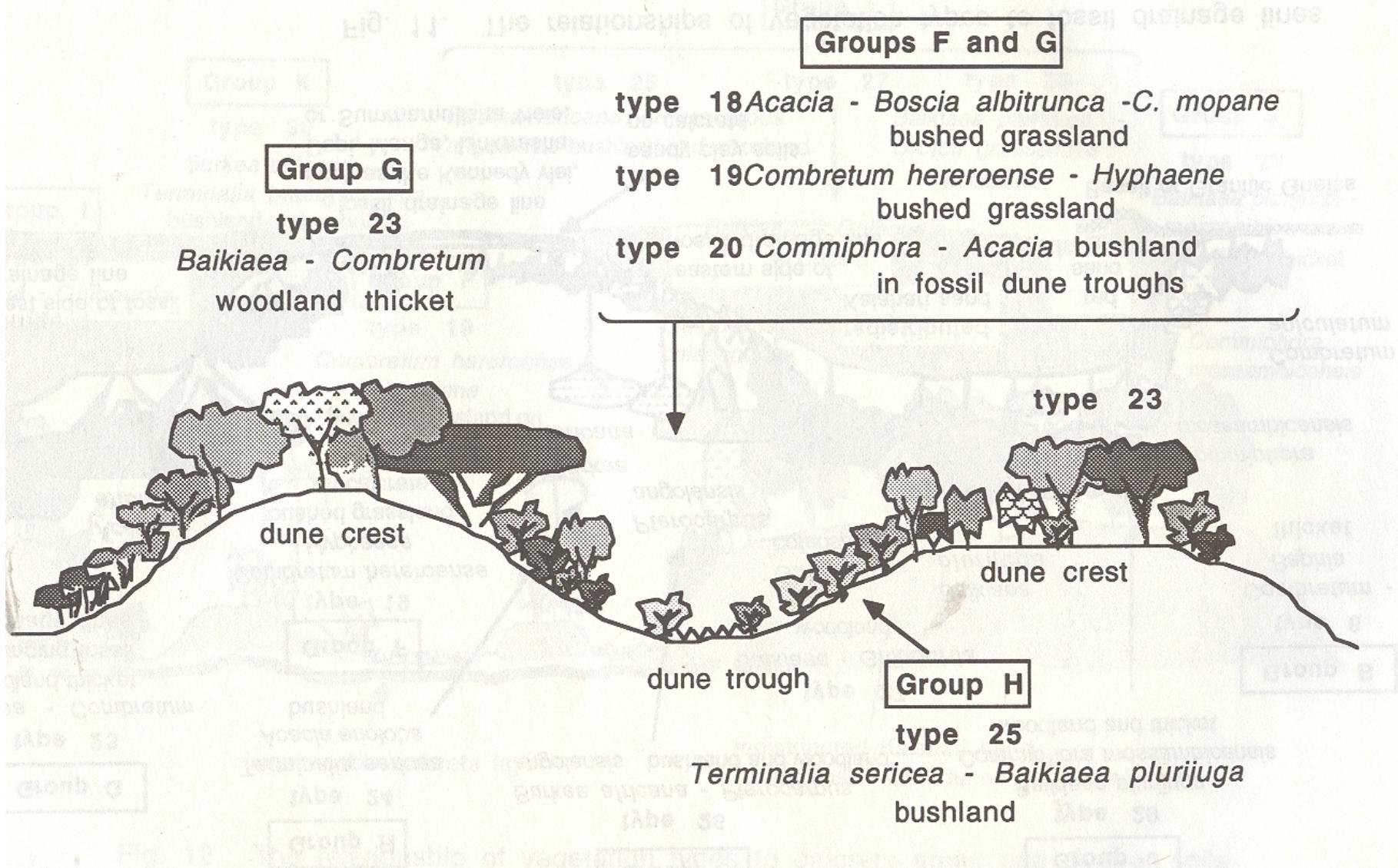


Fig. 10. The relationship of vegetation types to fossil sand dune topography.

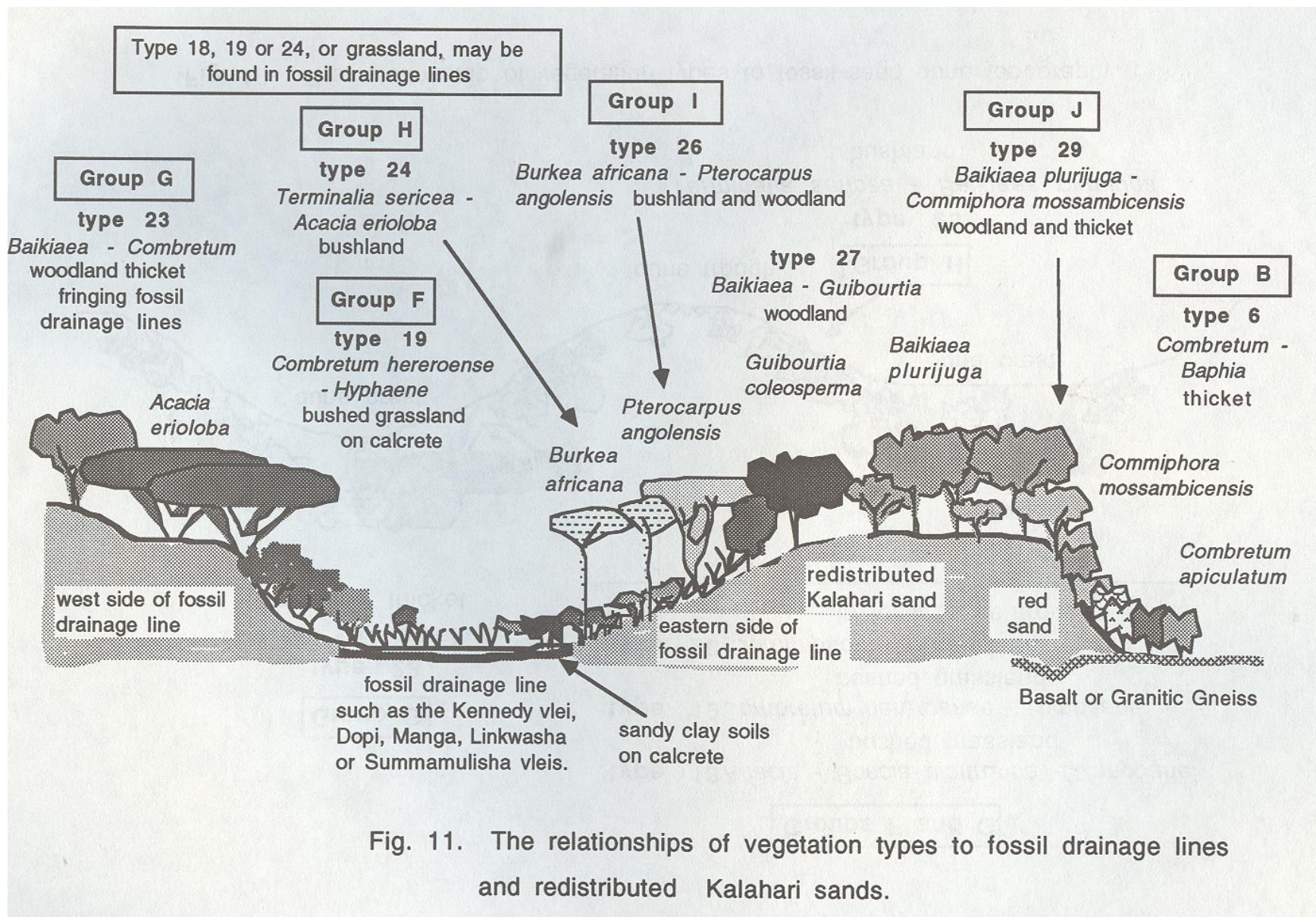


Fig. 11. The relationships of vegetation types to fossil drainage lines and redistributed Kalahari sands.

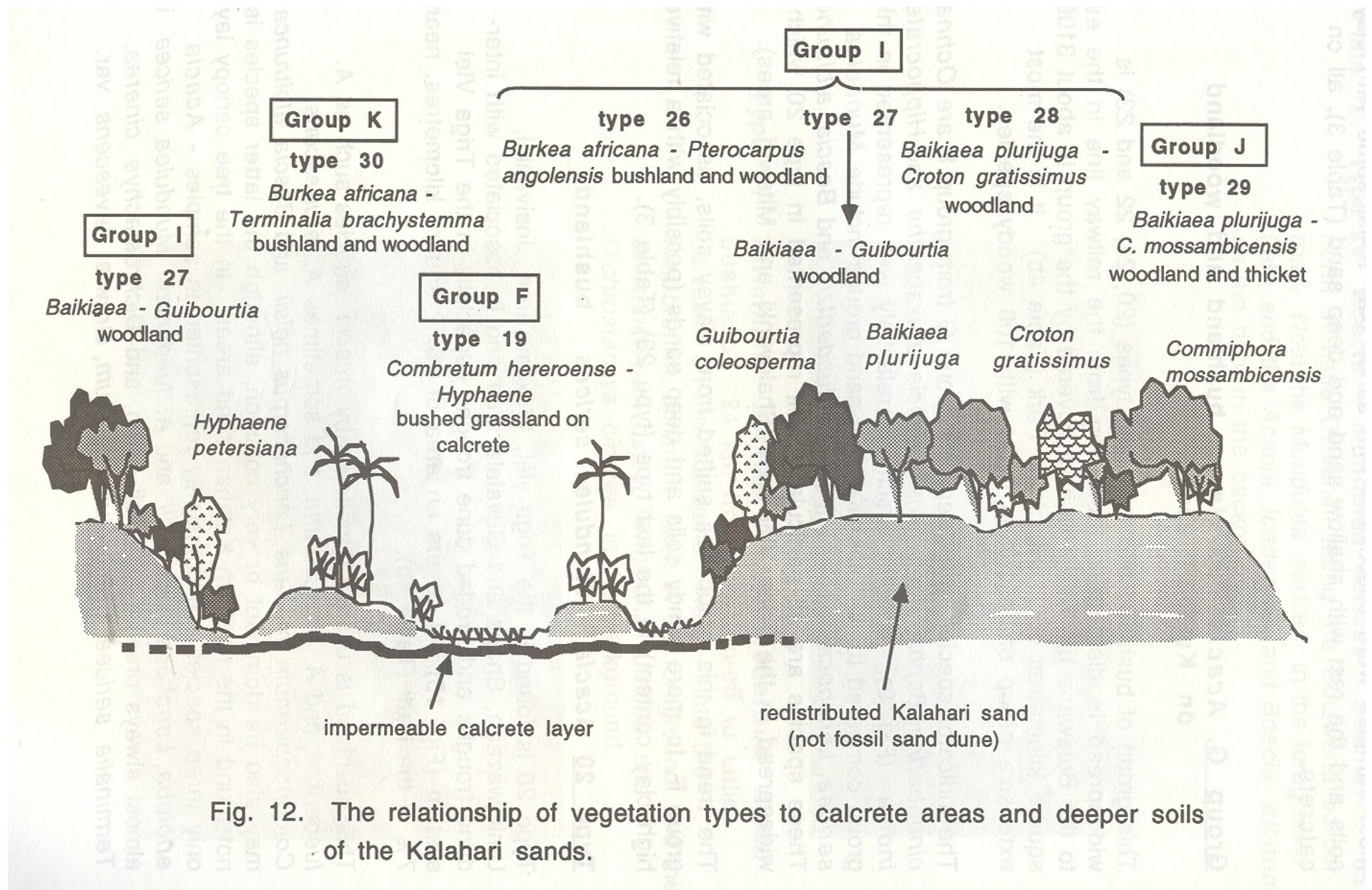


Fig. 12. The relationship of vegetation types to calcrete areas and deeper soils of the Kalahari sands.

## ANNEX 4: PRELIMINARY ARTHROPOD LISTING

Lists from Ecologist, Main Camp

### 1: Bushed Grassland

#### Arachnids

| Order        | Family            | Genus       | Species    |
|--------------|-------------------|-------------|------------|
| .....        | Scolopendromorpha | Scolopendra | morsins    |
| Araneomorpha | Amonoxenidae      | Ammoxenus   | daelidus   |
| Araneomorpha | Amonoxenidae      | Dasylabris  | stimubtrix |
| Araneomorpha | Amonoxenidae      | Ammoxenus   | daelidus   |

#### Insects

| Insects – Bushed Grassland |               |              |              |
|----------------------------|---------------|--------------|--------------|
| Order                      | Family        | Genus        | Species      |
| .....                      | .....         | Paltothyreus | sp           |
| .....                      | .....         | Pogonobasis  | verruciosa   |
| Coleoptera                 | .....         | Adesmia      | sp           |
|                            | Bulprestidae  | Phaenoderus  | magnicollis  |
|                            | Carabidae     | Boeomimetes  | ephippium    |
|                            | Carabidae     | Boeomimetes  | ephippium    |
|                            | cucujionidae  | Paltothyreus | tarsatus     |
|                            | cucujionidae  | Euronycha    | byrrhinus    |
|                            | Elateritidae  | Cardiotarsus | capensis     |
|                            | Melolonthinae | Euronycha    | byrrhinus    |
|                            | Melolonthinae | Zophosis     | rikatlae     |
|                            | Scarabidae    | Copris       | bornemisszai |
|                            | Scarabidae    | Pachylomerns | femorallis   |
|                            | Scarabidae    | Copris       | bornemisszai |
|                            | Scarabidae    | Pachylomerns | femorallis   |
|                            | Tenebrionidae | Zophosis     | rikatlae     |
|                            | Tenebrionidae | Adesmia      | sp           |
|                            | Tenebrionidae | Phanerotoma  | scrobicolle  |
|                            | Tenebrionidae | Tarsocnodes  | molossa      |
|                            | Tenebrionidae | Pachylomerns | femorallis   |
|                            | Tenebrionidae | Hoplocorypha | sp           |
|                            | Tenebrionidae |              |              |
|                            | Tenebrionidae |              |              |
|                            | Tenebrionidae | Zophosis     | rikatlae     |
|                            | Tenebrionidae | Adesmia      | sp           |
|                            | Tenebrionidae | Phanerotoma  | scrobicolle  |
|                            | Tenebrionidae | Stips        | gebieni      |
|                            | Tenebrionidae | Tarsocnodes  | molossa      |
| Diptera                    | Calliphoridae | Hemipyrellia | sp           |
|                            | Calliphoridae | Tarsocnodes  | molossa      |
|                            | Calliphoridae | Hemipyrellia | sp           |
| Hemiptera                  | .....         | Latimbus     | sp           |
|                            | Coridae       | Agonoscemis  | puberula     |
|                            | Pentatomidae  | Agonoscemis  | puberula     |

| <b>Insects – Bushed Grassland</b> |               |                    |                |
|-----------------------------------|---------------|--------------------|----------------|
| <b>Order</b>                      | <b>Family</b> | <b>Genus</b>       | <b>Species</b> |
|                                   | Pentatomidae  | Agonoscemis        | puberula       |
|                                   | Reduviidae    | ....(juvenile).... | .....          |
| Hymenoptera                       | Formicidae    | Paltothyreus       | tarsatus       |
|                                   | Formicidae    | Ammoxenus          | daelidus       |
|                                   | Formicidae    | Hemipyrellia       | sp             |
|                                   | Formicidae    | Paltothyreus       | tarsatus       |
|                                   | Mutillidae    | Dasylabris         | stimubtrix     |
|                                   | Mutillidae    | Sphingonotas       | tricinctus     |
|                                   | Mutillidae    | Dasylabris         | stimubtrix     |
| Isoptera                          | Macrotermite  | Macrotermes        | michaeseni     |
|                                   | Macrotermite  | Macrotermes        | michaeseni     |
| Mantodea                          | Mantidae      |                    |                |
| Orthoptera                        | Acrididae     | Trilophidia        | sp             |
|                                   | Acrididae     | Trilophidia        | sp             |
|                                   | Acridnae      | Sphingonotas       | tricinctus     |
|                                   | Acridnae      | Himatismus         | epitragoides   |
|                                   | Acridnae      | Sphingonotas       | tricinctus     |
| ref 65                            | .....         | Hildebrandti       | sp             |
| .....                             | Eggs          | .....              | .....          |
| .....                             | Eggs          | Phanerotoma        | scrobicolle    |
| .....                             | Eggs          | .....              | .....          |

## 2: Grassland Mosaic

### Arachnids

| Order        | Family            | Genus       | Species  |
|--------------|-------------------|-------------|----------|
| Araneomorpha | Amonoxenidae      | Ammoxenus   | daelidus |
|              | Scolopendromorpha | Scolopendra | morsins  |

### Insects

| Order       | Family        | Genus        | Species      |
|-------------|---------------|--------------|--------------|
| Coleoptera  | Bulprestidae  | Hildebrandti | sp           |
| Coleoptera  | Carabidae     | Boeomimetes  | ephippium    |
| Coleoptera  | cucujidae     |              |              |
| Coleoptera  | Elateritidae  | Cardiotarsus | capensis     |
| Coleoptera  | Scarabidae    | Copris       | bornemisszai |
| Coleoptera  | Scarabidae    | Pachylomerns | femorallis   |
| Coleoptera  | Tenebrionidae | Zophosis     | rikatlae     |
| Coleoptera  | Tenebrionidae | Adesmia      | sp           |
| Coleoptera  | Tenebrionidae | Phanerotoma  | scrobicolle  |
| Coleoptera  | Tenebrionidae | Stips        | gebieni      |
| Coleoptera  | Tenebrionidae | Tarsocnodes  | molossa      |
| Diptera     | Calliphoridae | Hemipyrellia | sp           |
| Hemiptera   | Pentatomidae  | Agonoscemis  | puberula     |
| Hymenoptera | Formicidae    | Paltothyreus | tarsatus     |
| Hymenoptera | Mutillidae    | Dasylabris   | stimubtrix   |
| Isoptera    | Macrotemit    | Macrotemes   | michaesenii  |
| Orthoptera  | Acrididae     | Trilophidia  | sp           |
| Orthoptera  | Acridinae     | Sphingonotas | tricinctus   |

### 3: Thickets

#### Arachnids

| Order        | Family       | Genus     | Species  |
|--------------|--------------|-----------|----------|
| Araneomorpha | Amonoxenidae | Ammoxenus | daelidus |

#### Insects

| Order       | Family        | Genus        | Species      |
|-------------|---------------|--------------|--------------|
| Coleoptera  | cucujidae     | Phaenoderus  | magnicollis  |
| Coleoptera  | Melolonthinae | Euronycha    | byrrhinus    |
| Coleoptera  | Scarabidae    | Pachylomerns | femorallis   |
| Coleoptera  | Tenebrionidae | Zophosis     | rikatiae     |
| Coleoptera  | Tenebrionidae | Adesmia      | sp           |
| Coleoptera  | Tenebrionidae | Phanerotoma  | scrobicolle  |
| Coleoptera  | Tenebrionidae | Tarsocnodes  | molossa      |
| Coleoptera  | Tenebrionidae | Pogonobasis  | verruciosa   |
| Coleoptera  | Tenebrionidae | Himatismus   | epitragoides |
| Diptera     | Calliphoridae | Hemipyrellia | sp           |
| Hemiptera   | Coridae       | Latimbus     | sp           |
| Hemiptera   | Pentatomidae  | Agonoscemis  | puberula     |
| Hymenoptera | Formicidae    | Paltothyreus | tarsatus     |
| Hymenoptera | Formicidae    | Paltothyreus | sp           |
| Hymenoptera | Mutillidae    | Dasylabris   | stimubrix    |
| Mantodea    | Mantidae      | Hoplocorypha | sp           |
| Orthoptera  | Acridinae     | Sphingonotas | tricinctus   |

## ANNEX 5: REPTILES

List from Ecologist, Main Camp

| Common Name                               | Scientific Name                     |
|---|-------------------------------------|
| Puff Adder                                | <i>Bitis arietans</i>               |
| Gaboon Viper Adder                        | <i>Bitis gabonica</i>               |
| Berg Adder                                | <i>Bitis atropos</i>                |
| Horned Adder                              | <i>Bitis caudalis</i>               |
| Common Nite Adder                         | <i>Causus rhombeatus</i>            |
| Black Mamba                               | <i>Dendroaspis polylepis</i>        |
| Green Mamba                               | <i>Dendroaspis angusticeps</i>      |
| Egyptian Cobra                            | <i>Naja haje</i>                    |
| Forest Cobra                              | <i>Naja melanoleuca</i>             |
| Mozambican Spitting Cobra                 | <i>Naja mozambique</i>              |
| Rinkaals                                  | <i>Heamachatus heamachatus</i>      |
| Boomslang                                 | <i>Dispholidus typus</i>            |
| Southern Twigsnake/Southern Vinesnake     | <i>Thelotornis capensis</i>         |
| Olive Grass Snake                         | <i>Psammophis sibilans</i>          |
| Western Yellow Billed Sand Snake          | <i>Psammophis subtaeniatus</i>      |
| Tiger Snake                               | <i>Telescopus semiannulatus</i>     |
| Black Headed Centipede Eater              | <i>Amblyodipsas ventrimaculatus</i> |
| Southern African Python                   | <i>Python sebae</i>                 |
| Mole Snake                                | <i>Pseudaspis cana</i>              |
| Greensnake                                | <i>Philothamnus hoplogaster</i>     |
| Bush Snake                                | <i>Philothamnus semiviriegatus</i>  |
| Common Egg Eater                          | <i>Dasypeltis scabra</i>            |
| Common Slug Eater                         | <i>Duberria lutrix</i>              |
| Schlegels Blind Snake                     | <i>Typhlops schlegelii</i>          |
| Bibrons Blind Snake                       | <i>Typhlops bibronii</i>            |
| Thread /Wormsnake Peters Black Worm Snake | <i>Leptotyphlops scutifrons</i>     |
| Black Thread Snake                        | <i>Leptotyphlops conjuncta</i>      |
| Long Tailed Thread Snake                  | <i>Leptotyphlops longicauda</i>     |
|   |                                     |
| <b>Amphisbaenians/Worm Lizards</b>        |                                     |
| Van Dams Dwarf Worm Lizard                |                                     |
| Kalahari Dwarf Worm Lizard                |                                     |
| Blunt Headed Worm Lizard                  |                                     |
|   |                                     |
| <b>Agamas</b>                             |                                     |
| Southern Tree Agama                       |                                     |
|   |                                     |

| <b>Common Name</b>          | <b>Scientific Name</b>      |
|-----------------------------|-----------------------------|
| <b>Chameleons</b>           |                             |
| Common Flap Neck Chameleon  |                             |
|                             |                             |
| <b>Lizards</b>              |                             |
| Ornate Sandveld Lizard      |                             |
| Ornate Rough Scaled Lizard  |                             |
| Jones Girdled Lizard        |                             |
| Zimbabwe Flat Lizard        |                             |
| Giant Plated Lizard         |                             |
| Rough Scaled Plated Lizard  |                             |
| Speckled Rock Skink         |                             |
| Rainbow Skink               |                             |
| <b>Crocodiles</b>           |                             |
| Nile Crocodile              | <i>Crocodylus niloticus</i> |
| <b>Tortoises</b>            |                             |
| Spekes Hinged Tortoise      |                             |
| <b>Geckos</b>               |                             |
| Cape Gecko                  |                             |
| Van Sons Gecko              |                             |
| Zimbabwe Flat Ghecko        |                             |
| Common Tropical House Gecko |                             |
| Flat Headed Tropical House  |                             |
| Wahlbergs Velvet Gecko      |                             |
| Common Dwarf Gecko          |                             |
| Bradfields Dwarf Gecko      |                             |
| Giant Ground Gecko          |                             |
| Kalahari Ground Geckos      |                             |
| Turners Gecko               |                             |
| Common Barking Gecko        |                             |

## ANNEX 6: BIRDS

This list is from the Ecologist, Main Camp

| Status_key | Habitat_key       | Habitat_key                 | Habitat_key                |
|------------|-------------------|-----------------------------|----------------------------|
| b=breeder  | A=aquatic         | E=emphemeral pans           | KSW=kalahari sand woodland |
| m=migrant  | BV=basaltic vleis | GH=granite hills            | R=rivers                   |
| r=resident | C=camps only      | KSG=kalahari sand grassland | S=shallow soils on basalt  |
| v=vagrant  | D=dams            | KSP=kalahari sand pans      | SB=Southern basalt only    |
|            |                   |                             | T=throughout the park      |

| zim.no | species                   | status | Habitat |
|--------|---------------------------|--------|---------|
| 1      | Ostrich                   | br     | ksw/b   |
| 3      | Black-necked Grebe        | v      | d       |
| 4      | Dabchick                  | bm     | e       |
| 5      | white Pelican             | m      | d       |
| 6      | Pink-backed Pelican       | m      | d       |
| 8      | Reed cormorant            | bm     | e       |
| 9      | African Darter            | br     | d       |
| 10     | Grey heron                | r      | d       |
| 11     | Black-headed heron        | v      | -       |
| 12     | Goliath heron             | br     | d       |
| 13     | Purple heron              | v      | -       |
| 14     | Great white heron         | r      | d       |
| 15     | Little egret              | r      | d       |
| 16     | Yellow-billed egret       | bm     | e       |
| 17     | black egret               | v      | e       |
| 19     | cattle egret              | r      | ksp     |
| 20     | Common squacco heron      | v      | e       |
| 22     | Rufous-bellied heron      | v      | d       |
| 23     | Green-backed heron        | r      | d/r     |
| 24     | Black-crowned night heron | br     | d/r/e   |
| 25     | white-backed night heron  | r      | r/d     |
| 26     | Little bittern            | bm     | e       |
| 27     | Rail heron                | bm     | e       |
| 28     | Hammerkop                 | br     | a       |
| 29     | White stork               | m      | t       |
| 30     | Black stork               | m      | t       |
| 31     | Abduin's stork            | m      | t       |
| 32     | Woolly-necked stork       | m      | e       |
| 33     | African openbill          | bm     | e       |
| 34     | Saddlebill                | br     | t       |
| 35     | African marabou           | bm/r   | t       |
| 36     | Yellow-billed stork       | m      | d       |

| <b>zim.no</b> | <b>species</b>             | <b>status</b> | <b>Habitat</b> |
|---------------|----------------------------|---------------|----------------|
| 37            | Sacred ibis                | m             | ksp            |
| 38            | Glossy ibis                | m             | e              |
| 40            | African spoonbill          | r             | d              |
| 41            | Greater flamingo           | m             | d              |
| 42            | Lesser flamingo            | m             | d              |
| 43            | White-faced tree duck      | bm            | d/e            |
| 44            | Fulvous tree duck          | m             | e              |
| 45            | Egyptian goose             | br            | t              |
| 48            | African black duck         | br            | r/d            |
| 49            | Cape teal                  | m             | ksp            |
| 50            | hottentot teal             | m             | e              |
| 51            | Red-billed teal            | bm            | t              |
| 55            | Cape shoveller             | v             | -              |
| 56            | Sourthen pochard           | m             | e              |
| 57            | African pygmy goose        | bm            | e              |
| 58            | Knob-billed duck           | bm            | ksp            |
| 59            | Spurwinged goose           | bm            | ksp            |
| 60            | Maccoa duck                | bm            | e              |
| 61            | White-backed duck          | bm            | e              |
| 62            | Sectretary bird            | br            | t              |
| 63            | Egyptian vulture           | v             | -              |
| 64            | Hooded vulture             | br            | t              |
| 65            | cape vulture               | m             | ksw            |
| 66            | white-backed vulture       | br            | t              |
| 67            | lappet-faced vulture       | br            | t              |
| 68            | white-headed vulture       | br            | t              |
| 69            | black kite                 | m             | t              |
| 69            | yellow-billed kite         | bm            | t              |
| 70            | black-shouldered kite      | br/m          | t              |
| 71            | african cuckoo hawk        | br            | ksw            |
| 72            | bat halwk                  | r             | t              |
| 73            | honey buzzard              | m             | t              |
| 74            | black eagle                | br            | gh             |
| 75            | steppe eagle               | m             | t              |
| 76            | tawny eagle                | br            | t              |
| 77            | lesser-spotted eagle       | m             | t              |
| 78            | walberg`s eagle            | bm            | t              |
| 80            | african hawk eagle         | br            | t              |
| 81            | ayres`s hawk eagle         | r/m           | t              |
| 83            | martial eagle              | br            | t              |
| 85            | lizard buzzard             | br            | t              |
| 86            | brown snake eagle          | br            | t              |
| 87            | black-breasted snake eagle | br/m          | t              |
| 90            | bateleur eagle             | br            | t              |

| <b>zim.no</b> | <b>species</b>            | <b>status</b> | <b>Habitat</b> |
|---------------|---------------------------|---------------|----------------|
| 91            | african fish eagle eagle  | br/m          | d//r/ksp       |
| 92            | palmnut vulture           | v             | -              |
| 94            | steppe buzzard            | m             | t              |
| 95            | Augur buzzard             | r             | gh             |
| 97            | ovambo sparrowhawk        | br            | t              |
| 98            | little sparrowhawk        | br            | t              |
| 99            | black sparrowhawk         | r             | t              |
| 100           | little banded goshawk     | br            | t              |
| 101           | african goshawk           | r             | r              |
| 102           | garbar goshawk            | br            | t              |
| 103           | pale chanting goshawk     | r             | ksw            |
| 104           | Dark chanting goshawk     | br            | t              |
| 105           | european marsh harrier    | v             | bv/ksg         |
| 107           | montagu`s harrier         | v             | bv/ksg         |
| 108           | Pallid harrier            | v             | bv/ksg         |
| 109           | Gymnogene                 | br            | t              |
| 110           | Osprey                    | m             | d/r            |
| 111           | Peregrine                 | m             | t              |
| 112           | Lanner falcon             | br/m          | t              |
| 113           | European hobby            | m             | ksw            |
| 114           | African hobby             | br/m          | ksw            |
| 116           | Red-necked falcon         | r/m           | ksp            |
| 117           | western red footed falcon | m             | t              |
| 118           | eastern red footed falcon | m             | t              |
| 119           | rock kestrel              | v             | -              |
| 120           | greater kestrel           | v             | -              |
| 121           | lesser kestrel            | m             | t              |
| 122           | Dickinson`s grey kestrel  | br            | t              |
| 123           | coqui francolin           | br            | t              |
| 124           | crested francolin         | br            | t              |
| 125           | shelly`s francolin        | r             | s              |
| 126           | red-billed francolin      | br            | ksw            |
| 127           | natal francolin           | br            | s              |
| 129           | swainson`s francolin      | br            | t              |
| 131           | harlequin quail           | bm            | e              |
| 133           | helmeted guineafowl       | br            | t              |
| 134           | crested guineafowl        | br            | r              |
| 135           | Kurrichane buttonquail    | bm            | e              |
| 136           | Black-rumped buttonquail  | m             | e              |
| 137           | wattled crane             | v             | -              |
| 138           | southern crowned crane    | br/m          | b/ksw          |
| 140           | corncrake                 | m             | e              |
| 141           | African crake             | m             | e              |
| 142           | black crake               | br            | ksp            |

| <b>zim.no</b> | <b>species</b>             | <b>status</b> | <b>Habitat</b> |
|---------------|----------------------------|---------------|----------------|
| 143           | spotted crake              | m             | ksp            |
| 144           | baillon's crake            | m             | e              |
| 145           | stripped crake             | m             | e              |
| 152           | purple gallinule           | m             | e              |
| 153           | lesser gallinule           | bm            | e              |
| 154           | common moorhen             | bm            | e              |
| 155           | lesser moorhen             | bm            | e              |
| 156           | red-knobed coot            | bm            | e              |
| 157           | african finfoot            | r             | e              |
| 158           | kori bustard               | br            | ksg/bv         |
| 159           | denham's bustard           | m             | ksw            |
| 160           | red-crested korhaan        | br            | t              |
| 161           | black-bellied korhaan      | br            | bv             |
| 162           | african jacana             | bm            | e              |
| 163           | lesser jacana              | bm            | e              |
| 164           | painted snipe              | bm            | e              |
| 165           | ringed plover              | m             | d              |
| 166           | white-fronted sandplover   | m             | ksp            |
| 168           | Kittlitz's sandplover      | r/m           | t              |
| 169           | three-banded sandplover    | br/m          | t              |
| 170           | caspian plover             | v             | -              |
| 172           | crowed plover              | br/m          | t              |
| 173           | lesser black-winged plover | v             | -              |
| 174           | blacksmith plover          | br            | t              |
| 176           | african wattled plover     | r             | s              |
| 178           | ruddy turnstone            | m             | d              |
| 180           | common sandpiper           | m             | t              |
| 182           | wood sandpiper             | m             | t              |
| 186           | marsh sandpiper            | m             | t              |
| 187           | greenshank                 | m             | t              |
| 188           | Curlew sandpiper           | m             | t              |
| 189           | little stint               | m             | t              |
| 193           | Ruff                       | m             | t              |
| 194           | Great snipe                | m             | e              |
| 195           | Ethiopian snipe            | m             | e              |
| 200           | Black-crowned avocet       | v             | d              |
| 201           | black-winged stilt         | m             | e              |
| 203           | spotted dikkop             | br            | t              |
| 204           | water dikkop               | br            | d/r            |
| 205           | Temminck's courser         | bm            | t              |
| 206           | three-banded courser       | br            | ksw            |
| 207           | Bronze-winged courser      | br            | t              |
| 208           | Common pratincole          | v             | d              |
| 209           | black-winged pratincole    | v             | d              |

| <b>zim.no</b> | <b>species</b>             | <b>status</b> | <b>Habitat</b> |
|---------------|----------------------------|---------------|----------------|
| 210           | roack prantincore          | v             | d              |
| 212           | Grey headed gull           | m             | d              |
| 214           | caspian tern               | v             | d              |
| 216           | Wiskered tern              | bm            | e              |
| 217           | White-winged black tern    | m             | d/e            |
| 218           | african skimmer            | v             | d              |
| 220           | spotted sandgrouse         | br            | ksw            |
| 221           | yellow-throated sandgrouse | m             | t              |
| 222           | double-banded sandgrouse   | br            | t              |
| 226           | red-eyed dove              | br            | t              |
| 228           | cape turtle dove           | br            | t              |
| 229           | laughing dove              | br            | t              |
| 230           | namaqua dove               | bm            | t              |
| 232           | Emerald spotted wood dove  | br            | t              |
| 235           | African green pigeon       | m             | r              |
| 236           | Brown-necked parrot        | m             | r              |
| 238           | Meyer's parrot             | br            | t              |
| 242           | Grey lourie                | br            | t              |
| 243           | European cuckoo            | m             | t              |
| 244           | african cuckoo             | bm            | t              |
| 246           | red-crested cuckoo         | m             | t              |
| 247           | black cuckoo               | bm            | t              |
| 249           | great spotted cuckoo       | bm            | t              |
| 250           | stripped crested cuckoo    | bm            | t              |
| 251           | jacobin cuckoo             | bm            | t              |
| 253           | emerald cuckoo             | m             | s              |
| 254           | klaas's cuckoo             | bm            | t              |
| 255           | didric cuckoo              | bm            | t              |
| 257           | black coucal               | br            | bv             |
| 259           | senegal coucal             | br            | t              |
| 260           | white-browed coucal        | v             | -              |
| 261           | barn owl                   | br            | t              |
| 263           | wood owl                   | v             | -              |
| 264           | marsh owl                  | r             | bv             |
| 265           | scops                      | r             | s              |
| 266           | white-faced owl            | br            | t              |
| 267           | pearl-spotted owlet        | br            | t              |
| 268           | barred owlet               | br            | r              |
| 270           | spooted eagle owl          | br            | s              |
| 271           | giant eagle owl            | br            | t              |
| 272           | pel's fishing owl          | v             | d              |
| 273           | european nightjar          | m             | t              |
| 274           | rofous-cheeked nighjar     | r/m           | t              |
| 275           | fiery-necked nightjar      | r/m           | ksw            |

| <b>zim.no</b> | <b>species</b>               | <b>status</b> | <b>Habitat</b> |
|---------------|------------------------------|---------------|----------------|
| 276           | freckled rock nightjar       | br/m          | gh             |
| 278           | goboon nightjar              | r/m           | t              |
| 279           | pennant-winged nightjar      | bm            | ksw            |
| 280           | european swift               | m             | t              |
| 281           | african black swift          | m             | t              |
| 282           | white-rumped swift           | bm            | d              |
| 283           | horus swift                  | v             | r              |
| 284           | little swift                 | br            | t              |
| 288           | palm swift                   | r/m           | t              |
| 292           | red-faced mousebird          | r             | r              |
| 293           | narina trogon                | m             | r              |
| 294           | pied kingfisher              | br            | d              |
| 295           | giant kingfisher             | bv            | r/d            |
| 296           | half-collared kingfisher     | v             | r              |
| 297           | malachite kingfisher         | r             | d/r            |
| 298           | pygmy kingfisher             | m             | t              |
| 299           | senegal kingfisher           | m             | s              |
| 300           | brown headed kingfisher      | bm            | t              |
| 301           | chestnut-bellied kingfisher  | bm            | s              |
| 302           | stripped kingfisher          | bm            | t              |
| 303           | european bee-eater           | m             | t              |
| 304           | olive bee-eater              | m             | s              |
| 305           | southern carmine bee-eater   | m             | t              |
| 306           | white fronted bee-eater      | v             | r              |
| 307           | little bee-eater             | m             | t              |
| 308           | swallow-tailed bee-eater     | bm            | t              |
| 309           | european roller              | m             | t              |
| 310           | lilac-breasted roller        | br            | t              |
| 311           | racket-tailed roller         | v             | ksw/bw         |
| 312           | purple roller                | bm            | t              |
| 313           | Cinnamon roller              | bm            | t              |
| 314           | Hoopoe                       | br            | t              |
| 315           | Red-billed wood hoopoe       | br            | t              |
| 316           | African scimitarbill         | br            | t              |
| 317           | Trumpet hornbill             | m             | r              |
| 319           | african grey hornbill        | br            | t              |
| 320           | red-billed hornbill          | br            | s              |
| 321           | yellow-billed hornbill       | br            | ksw            |
| 322           | crowned hornbill             | r/m           | s/ksw          |
| 323           | bradfield's hornbill         | br/m          | ksw            |
| 324           | southern ground hornbill     | br            | t              |
| 325           | black-collared barbet        | r             | s              |
| 326           | african pied barbet          | r             | ksw            |
| 329           | yellow-fronted tinker barbet | r             | ksw            |

| <b>zim.no</b> | <b>species</b>               | <b>status</b> | <b>Habitat</b> |
|---------------|------------------------------|---------------|----------------|
| 331           | crested barbet               | r             | t              |
| 332           | greater honeyguide           | br            | t              |
| 334           | lesser honeyguide            | r             | t              |
| 336           | brown-backed honeyguide      | r             | ksw            |
| 338           | bennett's woodpecker         | r             | t              |
| 339           | golden-tailed woodpecker     | r             | t              |
| 341           | cardinal woodpecker          | r             | t              |
| 342           | bearded woodpecker           | r             | t              |
| 347           | white-tailed bush lark       | m             | ksw            |
| 348           | rufous-naped lark            | br            | t              |
| 349           | flappet lark                 | br            | t              |
| 350           | fawn-coloured lark           | br            | ksw            |
| 351           | sabota lark                  | r             | t              |
| 352           | dusky lark                   | m             | t              |
| 353           | red-capped lark              | m             | ksp            |
| 354           | chestnut-backed finch lark   | m             | t              |
| 355           | grey-backed finch lark       | m             | ksp            |
| 356           | european swallow             | m             | t              |
| 359           | wire-tailed swallow          | v             | r/d            |
| 361           | red-breasted swallow         | bm            | t              |
| 362           | mosque swallow               | r             | s              |
| 364           | lesser stripped swallow      | br            | t              |
| 367           | grey-rumped swallow          | bm            | ksp            |
| 369           | european house martin        | m             | t              |
| 370           | european sand martin         | m             | t              |
| 371           | brown sand martin            | m             | t              |
| 372           | banded sand martin           | m             | t              |
| 375           | eastern black cuckoo-shrike  | br            | s              |
| 376           | white-breasted cuckoo-shrike | r             | ksw            |
| 378           | fork tailed drongo           | br            | t              |
| 380           | european golden oriole       | m             | t              |
| 381           | african golden oriole        | r/m           | t              |
| 382           | eastern black-headed oriole  | rb            | t              |
| 383           | black crow                   | v             | ksp            |
| 384           | pied crow                    | br            | c              |
| 386           | acacia grey tit              | r             | ksw            |
| 388           | southern black tit           | br            | t              |
| 390           | cape penduline tit           | v             | sb             |
| 391           | grey penduline tit           | br            | ksw            |
| 393           | arrow-marked babbler         | br            | t              |
| 395           | pied babbler                 | br            | ksw            |
| 396           | red-eyed bulbul              | v             | ksw            |
| 397           | black-eyed bulbul            | br            | t              |
| 400           | yellow-bellied bulbul        | r             | s              |

| <b>zim.no</b> | <b>species</b>              | <b>status</b> | <b>Habitat</b> |
|---------------|-----------------------------|---------------|----------------|
| 401           | terrestrial bulbul          | r             | r              |
| 405           | kurrichane thrush           | br            | ksw            |
| 408           | groundscraper thrush        | br            | t              |
| 409           | miombo rock thrush          | v             | ksw/bw         |
| 411           | capped wheatear             | bm            | ksw            |
| 412           | familiar chat               | r             | s              |
| 414           | white-headed black chat     | br            | s              |
| 415           | southern ant-eating chat    | v             | ksw            |
| 416           | common stone chat           | v             | bv             |
| 427           | white-browed scrub-robin    | br            | t              |
| 431           | greater whitethroat         | m             | t              |
| 432           | chestnut-vented warbler     | r             | ksw            |
| 434           | icterine warbler            | m             | t              |
| 437           | greater reed warbler        | m             | r/ksp          |
| 440           | sedge warbler               | m             | r/ksp          |
| 441           | lesser swamp warbler        | v             | ksp            |
| 446           | willow warbler              | m             | t              |
| 453           | long-billed crombec         | br            | t              |
| 454           | red-faced crombec           | br            | ksw            |
| 456           | yellow-bellied eremomela    | br            | ksw            |
| 457           | green-capped eremomela      | br            | ksw            |
| 458           | burnt-necked eremomela      | br            | t              |
| 459           | bleating bush warbler       | br            | t              |
| 461           | eastern barred bush warbler | br            | ksw            |
| 464           | fan-tailed cisticola        | br            | t              |
| 465           | desert cisticola            | br            | ksw            |
| 469           | tinkling cisticola          | r             | ksw            |
| 470           | rattling cisticola          | br            | t              |
| 475           | croaking cisticola          | br            | e              |
| 478           | short-tailed cisticola      | br            | t              |
| 480           | tawny-flanked prinia        | br            | t              |
| 481           | black-chested prinia        | r             | ksw            |
| 483           | spotted flycatcher          | m             | t              |
| 487           | lead-coloured flycatcher    | br            | s              |
| 488           | black flycatcher            | br            | t              |
| 489           | marico flycatcher           | r             | kss            |
| 490           | mouse-coloured flycatcher   | br            | ksw            |
| 493           | white-flanked batis         | br            | t              |
| 500           | african paradise flycatcher | bm            | t              |
| 501           | african pied wagtail        | r             | r              |
| 504           | yellow wagtail              | m             | d              |
| 505           | Richard's pipit             | br            | t              |
| 508           | Buffy plain-backed pipit    | r             | s              |
| 510           | Tree pipit                  | m             | t              |

| <b>zim.no</b> | <b>species</b>                 | <b>status</b> | <b>Habitat</b> |
|---------------|--------------------------------|---------------|----------------|
| 512           | Golden pipit                   | v             | -              |
| 516           | Lesser grey shrike             | m             | t              |
| 517           | red-backed shrike              | m             | t              |
| 519           | magpie shrike                  | br            | ksw            |
| 521           | tropicana boubou               | br            | s              |
| 522           | Crimson-breasted shrike        | br            | ksw            |
| 523           | Southern puffback              | br            | t              |
| 524           | Brubru                         | br            | t              |
| 525           | Brown-headed tchagra           | br            | t              |
| 526           | Black-crowned tchagra          | br            | t              |
| 530           | Gey-headed bush shrike         | br            | t              |
| 531           | Orange-breasted bush shrike    | br            | t              |
| 534           | White helmet shrike            | br            | t              |
| 535           | Red-billed helmet shrike       | br            | t              |
| 537           | White-crowned shrike           | br            | ksw            |
| 538           | wattled starling               | bm            | ksw            |
| 539           | Plum-coloured starling         | bm            | t              |
| 540           | long-tailed glossy starling    | br            | s              |
| 541           | Red-shouldered glossy starling | br            | ksw            |
| 542           | Blue eared glossy starling     | r             | s              |
| 545           | African red-winged starling    | br            | ksp/d          |
| 546           | yellow-billed oxpecker         | br            | t              |
| 547           | Red-billed oxpecker            | br            | t              |
| 551           | Coppery sunbird                | v             | -              |
| 552           | Marico sunbird                 | bm            | ksw            |
| 553           | Little purple-banded sunbird   | bm            | ksw            |
| 555           | Miombo double-collared sunbird | v             | ksw            |
| 557           | Southern white-bellied sunbird | bm            | t              |
| 559           | Scarlet-chested sunbird        | bm            | t              |
| 560           | Black sunbird                  | bm            | t              |
| 564           | Yellow white eye               | br            | ksw            |
| 565           | Black buffalo weaver           | br            | ksw            |
| 566           | White-browed buffalow weaver   | br            | t              |
| 567           | House sparrow                  | br            | c              |
| 570           | Grey-headed sparrow            | br            | t              |
| 571           | yellow-throated sparrow        | br            | t              |
| 572           | Scaly-feathered finch          | br            | ksw            |
| 576           | Spotted-backed weaver          | br            | t              |
| 577           | African masked weaver          | br            | t              |
| 578           | Cabanis's masked weaver        | br            | r              |
| 579           | Large golden weaver            | br            | r/d            |
| 581           | Red-headed weaver              | br            | t              |
| 582           | Red-billed quelea              | br/m          | t              |
| 583           | Rednbishop                     | br            | e              |

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| <b>zim.no</b> | <b>species</b>                   | <b>status</b> | <b>Habitat</b> |
|---------------|----------------------------------|---------------|----------------|
| 585           | Golden bishop                    | br            | e              |
| 586           | Yellow-rumped whydar             | v             | -              |
| 588           | White-winged whydah              | br            | e/ksp          |
| 592           | Shaft-tailed widow               | r             | ksw            |
| 593           | Long tailed paradise widow       | r             | t              |
| 594           | Broad-tailed paradise widow      | r             | t              |
| 596           | Pink-backed firefinch indigobird | r             | t              |
| 597           | Red-billed firefinch indigobird  | r             | s              |
| 598           | cuckoo weaver                    | r             | ksp            |
| 599           | orange-winged pytilia            | r             | ksw            |
| 600           | Green-winged pytilia             | r             | t              |
| 606           | Pink-backed firefinch            | br            | t              |
| 607           | Red-billed firefinch             | r             | s              |
| 609           | southern blue waxbill            | br            | t              |
| 610           | Violet-eared waxbill             | br            | ksw            |
| 612           | Black-cheeked waxbill            | br            | ksw            |
| 615           | African quailfinch               | br            | t              |
| 618           | Cut-throat finch                 | br            | s              |
| 623           | Yellow-eyed canary               | m             | ksw            |
| 624           | Black-throated canary            | m             | ksw            |
| 630           | Black-eared seedeater            | m             | ksw            |
| 632           | Golden-breasted bunting          | bm            | ksw            |
| 634           | Cinnamon-breasted rock bunting   | m             | s              |
| 635           | larklike bunting                 | m             | ksw            |
| 637           | Grey wagtail                     | v             | -              |
| 638           | White-headed Roughwing           | v             | -              |
| 639           | Indian Myna                      | Invasive      | KSW            |



## ANNEX 7: MAMMALS

Mammal List from Ecologist, Hwange NP.

| Common Name          | Scientific name                 |
|----------------------|---------------------------------|
| Aardvark             | <i>Orycteropus cafer</i>        |
| Aardwolf             | <i>Proteles cristata</i>        |
| Ant bear             | <i>Orycteropus cafer</i>        |
| Baboon               | <i>Papio ursinus</i>            |
| Bat-eared fox        | <i>Otocyon megalotis</i>        |
| Black rhino          | <i>Diceros birconis</i>         |
| Buffalo              | <i>Cincerus caffer</i>          |
| Bushbaby, Lesser     | <i>galago</i>                   |
| Bushbuck             | <i>Tragelaphus scriptus</i>     |
| Caracal              | <i>Felis caracal</i>            |
| Chacma baboon        | <i>Papio ursinus</i>            |
| Cheetah              | <i>Acinonyx jubatus</i>         |
| Civet cat            | <i>Civettictis civetta</i>      |
| Duiker, Common       | <i>Sylvicapra grimmia</i>       |
| Eland                | <i>Taurotragus oryx</i>         |
| Elephant             | <i>Loxodonto africana</i>       |
| Gemsbok              | <i>Oryx gazella</i>             |
| Giraffe              | <i>Giraffa camelopardalis</i>   |
| Hippo                | <i>Hippopotamus amphibius</i>   |
| Honey badger         | <i>Mellivora capensis</i>       |
| Hyaena, Brown        | <i>Hyena brunnea</i>            |
| Hyaena, Spotted      | <i>Crocutta crocutta</i>        |
| Impala               | <i>Epycerros melampus</i>       |
| Jackal, Black-Backed | <i>Canis mesomelas</i>          |
| Jackal, Side-Striped | <i>Canis adustus</i>            |
| Kudu                 | <i>Tragelaphus strepsiceros</i> |
| Leopard              | <i>Panthera pardus</i>          |
| Lion                 | <i>Panthera leo</i>             |
| Mongoose, Banded     | <i>Munngos mungo</i>            |

| <b>Common Name</b> | <b>Scientific name</b>           |
|--------------------|----------------------------------|
| Mongoose, Dwarf    | <i>Helogale parvula</i>          |
| Mongoose, Selous   | <i>Paracynictis selousi</i>      |
| Mongoose, Slender  | <i>Herpestes sanguineus</i>      |
| Pangolin           | <i>Manis temmincki</i>           |
| Porcupine          | <i>Hystrix africaeaustralis</i>  |
| Roan antelope      | <i>Hippotragus equinus</i>       |
| Sable              | <i>Hippotragus niger</i>         |
| Scrub hare         | <i>Lepus saxatilis</i>           |
| Springhare         | <i>Pedetes capensis</i>          |
| Steenbok           | <i>Raphicerus campestris</i>     |
| Vervet monkey      | <i>Cercopithecus pygerythrus</i> |
| Warthog            | <i>Phacochoerus aethiopicus</i>  |
| Waterbuck          | <i>Kobus ellipsiprymus</i>       |
| White rhino        | <i>Ceratotherium simum</i>       |
| Wild dog           | <i>Lycaon pictus</i>             |
| Wildcat            | <i>Felis libyca</i>              |
| Wildebeest, Blue   | <i>Connochaetes taurinus</i>     |
| Wildpig            | <i>Potamochoerus porcus</i>      |
| Zebra              | <i>Equus burchell</i>            |

**Specially protected species of mammals, reptiles and birds in Zimbabwe**

| Mammals                       | Mammalia                                 | Present in HNP |
|-------------------------------|--|----------------|
| Aardwolf                      | <i>Proteles cristatus</i>                | Yes            |
| African wild dog              | <i>Lycaon pictus</i>                     | Yes            |
| Bat-eared fox                 | <i>Otocyon megalotis</i> Wankie district | Yes            |
| Cheetah                       | <i>Acinonyx jubatus</i>                  | Yes            |
| Gemsbok                       | <i>Oryx gazella</i>                      | Yes            |
| Pangolin                      | <i>Manis temmincki</i>                   | Yes            |
| Rhinoceros - Black            | <i>Diceros bicornis</i>                  | Yes            |
| Rhinoceros - Square-lipped    | <i>Ceratotherium simum</i>               | Yes            |
| Roan antelope                 | <i>Hippotragus equinus</i>               | Yes            |
| Reptiles                      | Reptilia                                 | Present in HNP |
| Python                        | <i>Python sebae</i>                      | Yes            |
| Birds                         | Aves                                     | Present in HNP |
| African Hawk Eagle            | <i>Hieraetus spilogaster</i>             | Yes            |
| All the Bustards and Korhaans | Family Otidae                            | Yes            |
| All the Cranes                | Family Gruidae                           | Yes            |
| All the Flamingoes            | Family Phoenicopteridae                  | Yes            |
| All the Pelicans              | Family Pelecanidae                       | Yes            |
| All the Storks                | Family Ciconiidae                        | Yes            |
| All the Vultures              | Family Aegypiidae                        | Yes            |
| Ayres' Hawk Eagle             | <i>Hieraetus dubius</i>                  | Yes            |
| Bataleur                      | <i>Terathopius ecaudatus</i>             | Yes            |
| Black Eagle                   | <i>Aquila verreauxi</i>                  | Yes            |
| Black-breasted Snake-Eagle    | <i>Circaetus pectoralis</i>              | Yes            |
| Black Sparrowhawk             | <i>Accipiter melanoleucus</i>            | Yes            |
| Brown Snake-Eagle             | <i>Circaetus cinereus</i>                | Yes            |
| Fish Eagle                    | <i>Haliaeetus vocifer</i>                | Yes            |
| Hamerkop                      | <i>Scopus umbretta</i>                   | Yes            |
| Lanner Falcon                 | <i>Falco biarmicus</i>                   | Yes            |
| Martial Eagle                 | <i>Polemaetus bellicosus</i>             | Yes            |
| Osprey                        | <i>Pandion haliaetus</i>                 | Yes            |
| Peregrine                     | <i>Falco peregrinus</i>                  | Yes            |
| Secretary Bird                | <i>Sagittarius serpentarius</i>          | Yes            |
| Tawny Eagle                   | <i>Aquila rapax.</i>                     | Yes            |



## ANNEX 8: FIRE MANAGEMENT PLAN



### HWANGE-MAIN CAMP 2014 FIRE MANAGEMENT PLAN



PREPARED BY: M. NYONI \_\_\_\_\_

DATE \_\_\_\_\_ *(Acting Wildlife Officer-Park Management)*

APPROVED BY: T JURA \_\_\_\_\_

DATE \_\_\_\_\_ *(Area Manager-Hwange-Main Camp)*

## GOAL

- ❖ To prevent and ensure maximum protection of biodiversity ,infrastructure and human life from uncontrolled fires

## OBJECTIVE

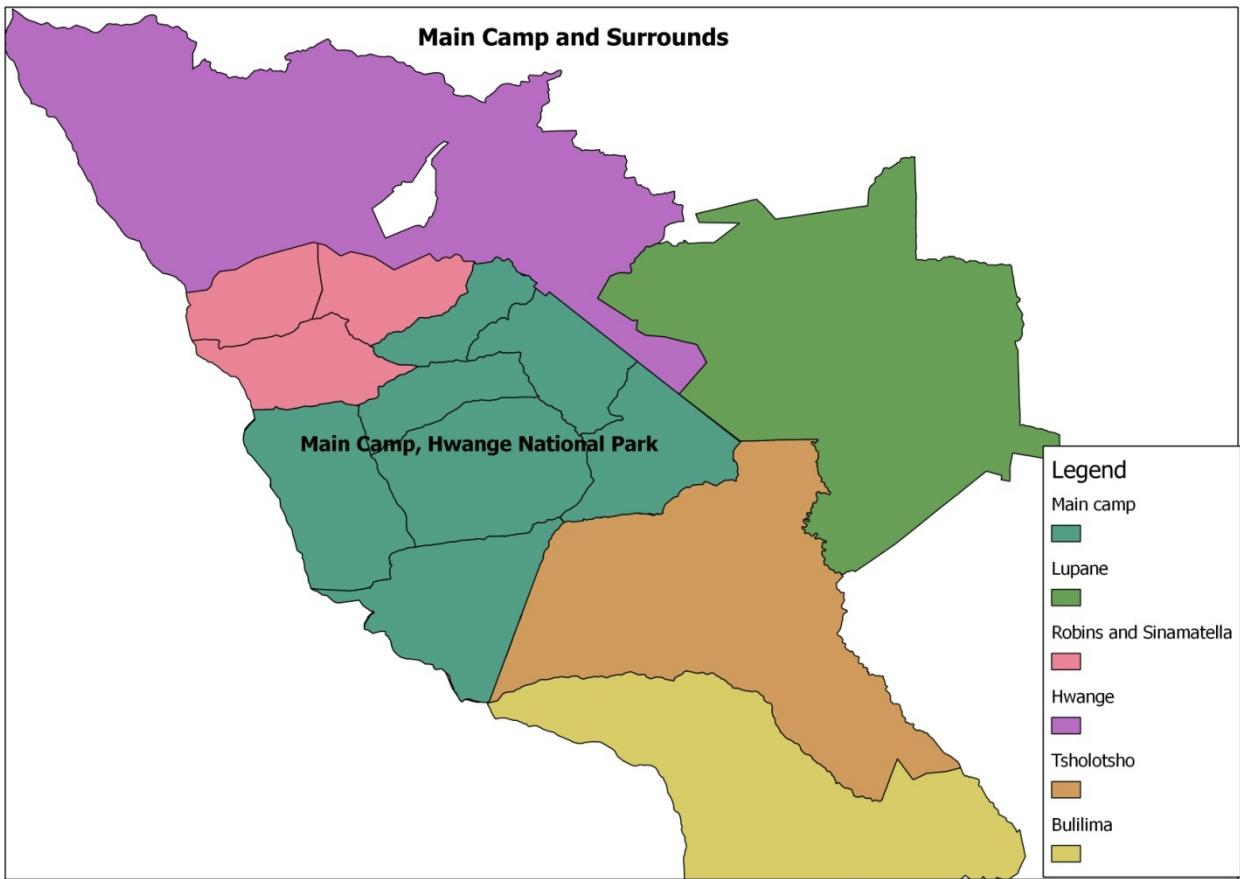
- ❖ Protect all fauna and flora within the park estate from uncontrolled fires
- ❖ Protect all the parks infrastructure from unwanted fires
- ❖ To increase fire awareness and preparedness within and outside the station
- ❖ To ensure timely co-ordination of manpower and firefighting equipment for putting out fires

## INTRODUCTION

Hwange-Main Camp is one of the three management blocks of the 14 651km<sup>2</sup> of Hwange National Park and is 10 650km in extent. The park is bounded by Hwange, Lupane and Tsholotsho communal areas, Ngamo/Sikumi forestry areas the Gwayi ICA, Sinamatella and Robins camps and finally Botswana to the west. All these areas have different land use practices ranging from conservation, subsistence farming, consumptive and non-consumptive tourism. It is against these diverse land use practices that the protected area has to start its fire management action plan through awareness meetings aimed at concertizing these stakeholders on the adverse effects of destruction to infrastructure, loss of biodiversity and human life that unmanned fires can have. Most of the fires year in and out emanate from the periphery of the park where it shares boundaries with the aforementioned areas. Because of this trend the park thrives to be at a high state of preparedness for management of fire outbreaks.

Fire is an important process within many terrestrial biomes. The park uses fire as a management tool so as to achieve different management objectives such as reduction of moribund grass, parasite management, bush encroachment control and manipulation of wildlife movements so as to give over utilized areas time to recover. To this effect different fire regimes are used that is cool and hot fires. The park uses Cool fires just after the rain season for moribund reduction and parasite management and though seldom used are also hot fires which are used at the peak of the dry season for bush encroachment control.

The map below illustrates the position of Main Camp and its surrounding areas



## FIRE WORK PLAN

The table below shows the station's work plan for the year.

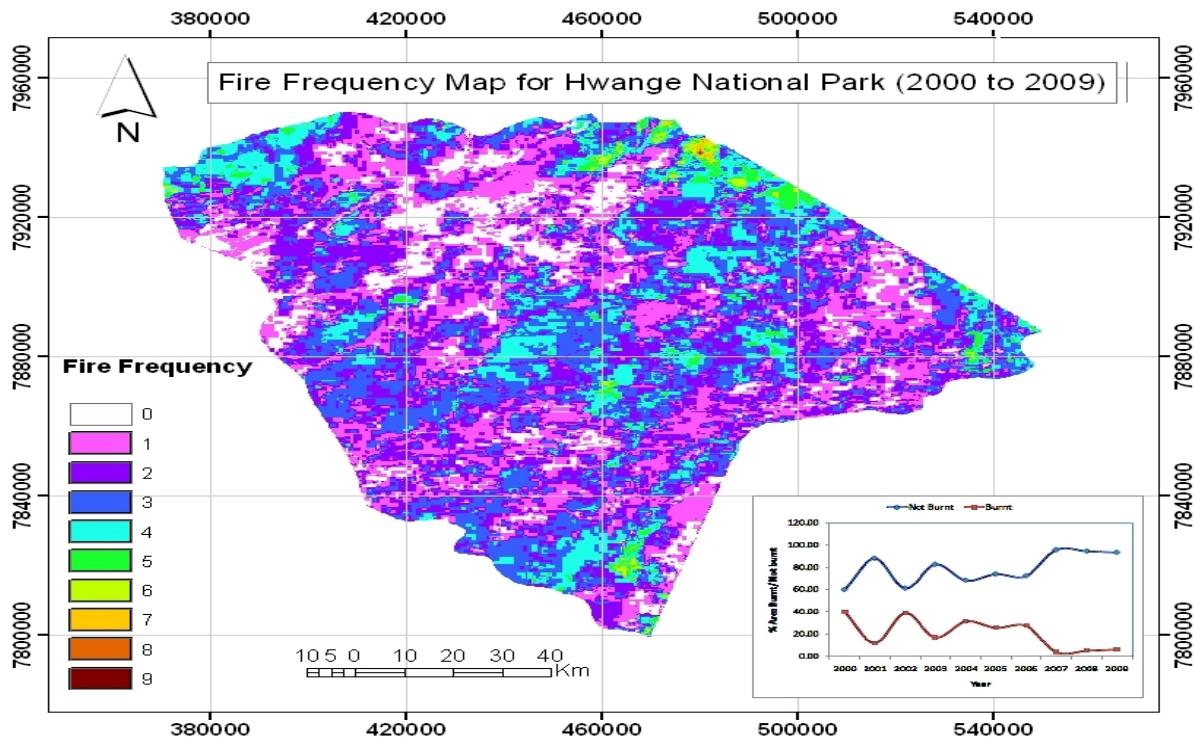
| ACTIVITY                                 | TARGET   | TIME FRAME  |
|--|--|-------------|
| Grading of road networks and Fire guards | Grade road network covering 518km                        | Apr-August  |
|  | Grade 620 km of fire guard network                       |             |
| Clearing of roads and fire guards        | Cover distance of 300km clearing both roads & fireguards | May-October |
| Reseal pot holes on the tarred park road | Reseal 50km of tarred road                               | July – Aug  |
| Mow grass along tourist routes           | Mow 70km of road network                                 | Mar- May    |
| Early burning along major fire guards    | Burn 370km of the fireguards                             | May-June    |
| Block burning                            | Burn area covering x 500km <sup>2</sup>                  | May – July  |
| React to veld fires in the park          | 3 x outbreaks per year x 60 people x 3 days Aug-Oct      | July - Oct  |

The intensity of fire is influenced by five major components which are; fuel size, continuity, compaction, moisture and fuel load as interpreted below;

- **Fuel size**-The amount and type of fuel influences the way and speed of combustion. Fine fuels like leaves and grass burn and spread more easily than heavy fuels like logs, stumps and large trees which burn slowly though with great intensity.

- **Continuity** - The amount of fuel available between fuels on the ground and in trees and the distance between these fuels can influence the rate at which fire spreads. Horizontal and vertical continuity is much faster where fuel sources are close together than when far apart and where a barrier is encountered like for example a road or firebreak.
- **Compaction**- When individual fuel pieces are loosely attached to each other and in adequate quantities they burn more easily because of sufficient oxygen. This results in a faster rate of spread of fire than when fuel is distantly spaced and in heavy fuels.
- **Moisture** - The quantity of moisture in fuel determines the intensity and ease of ignition. Where an area has more moisture in green vegetation, the more heat is required to burn it hence the spread of fire in such a situation will be less and easy to control.
- **Fuel Load**- The amount of fuel available in area influences the behavior and intensity of the fire. More fuel either fine or heavy and without any moisture will result in fast ignition and a fast rate of spread

It is of paramount importance that the aforementioned components are taken note of and subsequent corrective measures are implemented in order to prevent fires or otherwise to successfully put out the fire in the event of an outbreak. ***Below is a fire frequency map of fires that the park has experienced in the past***



## AVAILABLE RESOURCES FOR FIRE MANAGEMENT

The station has the following limited equipment and resources available for fire management and an ideal quantity of equipment has been included as well. In addition to the available resources different stakeholders to the park are always willing to assist with their resources for fire management such manpower, vehicles, mowers, tractors and tow graders

| <b>RESOURCE</b>                              | <b>AVAILABLE</b>                     | <b>IDEAL</b> |
|--|--------------------------------------|--------------|
| <b>Road &amp; Fire Management Equipment;</b> |                                      |              |
| 1. Motorized grader                          | 0                                    | 1            |
| 2. Tractor                                   | 1(Requires new tyres front and rear) | 2            |
| 3. Tipper truck                              | 1-Non-runner                         | 1            |
| 4. Land Rover                                | 5                                    | 5            |
| 5. Tow grader                                | 1(Requires new set of blades &tyres) | 2            |
| 6. Disc harrow                               | 0                                    | 60           |
| 7. Tractor drawn mower                       | 1                                    | 20           |
| 8. Shovels                                   | 10                                   | 20           |
| 9. Racks                                     | 5                                    | 20           |
| 10. knapsacks                                | 0                                    | 10           |
| 11. Pick axes                                | 0                                    | 30           |
| 12. Wheelbarrows                             | 0                                    |              |
| 13. Fire beaters                             | 30                                   |              |

The station employees thirty contract works for fire management duties and all members of staff are on call at any time should the need arise to put out unwanted fires. Different stakeholders also bring in their manpower when requested to beef up the available manpower.

## WATER POINTS

Water is a very important component for fire suppression however the park has no natural water points during the dry season when we experience wild fires. All the big dams in the southern part of the park no longer hold water that lasts for the whole duration of the dry season as a result of siltation and dam wall busts. To this effect the only available water sources are artificial game water supply boreholes which can be used for human use and fire fighting. High fire frequency areas along the park's railway boundary from mamabnje to Ngamo gate can access water from Dete police, livingi, makwa, kennedy 1 and Ngamo. Fires along the Tsholotsho game fence boundary can access water from wexau ,mfokazana, madiseka, siccheche and mpisi boreholes. Water requirements for interior fires can be accessed from boreholes along management routes as well as from safari operators with concessions within the park at wilderness, Somalisa, The Hide and Nehimba safari camps.

## STAKEHOLDER PARTICIPATION

The park does not live in isolation as such maintains a very good working relationship with its stakeholders who are always forthcoming with assistance for firefighting. Concession lease holders in the park have the mandate to grade and maintain roads and fireguards in their concessions. Constant routine checks must however be conducted to see if these operators are complying with fire management requirements. Researchers are also very helpful to the station for monitoring and generation of vegetation and fire maps whose input is incorporated in adaptive management.

## CO-ORDINATION

The park management officer at the station is responsible for coordination and resource mobilization for fire management. Communication is thus very important and key to the successful management of all unwanted fires. It is mandatory for all stakeholders and the park itself in compliance with forestry and EMA acts to inform all interested and affected parties of any intention to conduct controlled burns.

The following park officers can be contacted for reporting any fire outbreaks in the park;

| Name of Officer &Designation                   | Contact Details |
|--|-----------------|
| Mr. T Jura-Area Manager                        | 0774 011 397    |
| Mr. P Sibanda-Senior Wildlife Officer          | 0774 473 526    |
| Mr.E Makuwe-Ecologist                          | 0774 135 874    |
| Mr. Nyoni-Acting Park Management Officer       | 0772B 465 492   |
| Mr.J Dube-Wildlife Officer                     | 0773 829 149    |
| Mr.P Mugwidi-Tourism Services Officer          | 0772 572 038    |
| Mr.S Mudimba-Senior Ranger Scientific Services | 0772 465 725    |
| Mr.M Mawoneke-Senior Ranger Operations         | 0773 140 830    |

## Stakeholder Contacts

| Contact Person / Organisation        | Contact Details                  |
|--------------------------------------|----------------------------------|
| Mr. Gomwe-Area Manager-Sinamatella   | 0712 640 086/ Radio Call Sign 70 |
| OIC-Dete ZRP                         | 018-351                          |
| NRZ-Dete                             | 018-392,379                      |
| Garry-Friends of Hwange              | 0772 363 338                     |
| Arnold Tshipa-Wilderness Safaris     | 0779 281 042                     |
| Nick-Somalisa                        | 0772 126 986                     |
| Martin Pieters-Nehimba               | 078121842                        |
| Ian Godfrey-The Hide Safaris         | 0774 374 973                     |
| Zondo-Imvelo Safais/Matupula Hunters | 0772 330 598                     |
| Paradzai GumboLodzi Hunters          | 0775 582 026                     |
| Foggie Wilson-PDC                    | 0772 465 555/018-710             |
| Ivory Lodge                          | 0774 665 458                     |
| Hwange Safari Lodge                  | 018-750/333                      |
| Zakhele Mpala-CNRS                   | 0772 465 534                     |
| Brent-Lion Reserach                  | 0774 160 369                     |
| Paul -DART                           | 0774 749 773                     |
| Masunda-Gwayi ICA                    | 0774 400 972                     |

## FIRE TOWERS

The park does not have any fire towers as such fire reporting is everyone's responsibility, available means of reporting are; radios which are used by deployed patrolling rangers & safari operators, mobile phones, telephones and the internet is also used for reporting purposes by the different stakeholders. In addition to all the available means of reporting most stakeholders are subscribers to FIRMS an internet program that uses satellites to detect and give reports on any fire occurrences. Some concessionaires (Wilderness & Somalisa) have airstrips at their camps as such when a fire is seen while flying into or out of the camp reports are made to the station.

## FIRE ALARM

The station has a manual bell that is used as a fire alarm. The senior ranger is responsible for ringing the bell to which all persons in the camp have to respond to by meeting at the rendezvous point for further instructions. The bell is only used for fire emergencies to ensure that people respond quickly to the call.

## SUPPRESSION ACTIVITIES

The ultimate goal of this plan is to prevent and ensure maximum protection of biodiversity, infrastructure and prevention of loss of human life from uncontrolled fires. This will be achieved by having sound knowledge of fire behavior and employing fire suppression measures that are safe and effective. Three major aspects will be considered when fighting all wild fires. These are reconnaissance of the fire before and on arrival at the scene and the actual attack of the fire.

**Reconnaissance of the fire before arrival at the scene-** The firefighting team leader has to have the following information before leaving the station;

- ✓ Location of the fire
- ✓ Reported extent of the fire
- ✓ Rate of spread
- ✓ Access routes
- ✓ Cause of the fire
- ✓ Possible threats, habitat, life and infrastructure
- ✓ Getting an updated weather update.

This information is important for logistical planning, resource and equipment mobilization for fire fighting.

**Arrival on the scene-** Ascertain the following;

- ✓ Role call of manpower to be deployed
- ✓ Size of the fire
- ✓ Location of the head fire, its direction and what is on its path
- ✓ Point of origin and cause
- ✓ Time of day
- ✓ Threats
- ✓ Weather at the fire i.e wind speed and direction
- ✓ Fire behavior i.e height of flames ,rate of spread and intensity
- ✓ Fuel type and arrangement

**Planning the attack-** The following considerations need to be made;

- ✓ Safety of manpower and general public e.g visitors to the park
- ✓ Decide on where to make the initial attack
- ✓ Choose method of attack, either direct or indirect
- ✓ Know the location of control lines like existing firebreaks
- ✓ Estimate probable spread and behavior
- ✓ Determine possible danger spots
- ✓ Brief and keep personnel together
- ✓ Focus on task at hand

## Post suppression strategy

After the fire has been put out, the team leader has to;

- ✓ Make a roll call of deployed manpower
- ✓ Carry out a mop-up operation and surveillance to ensure that the fire is completely extinguished
- ✓ Carry out an audit and document the extent of the damage
- ✓ Map out the area
- ✓ Report compilation and submission to the Park's Area Manager

## ANNEX 9: PLACE NAME MEANINGS IN HWANGE

From Gary Haynes – The Forest with a Desert Heart (Unpublished). His sources include : *Lore and Legend of Southern Rhodesia Place Names* (1960); Child and Reese (1977); 1917 letters from Native Commissioner H. Posselt (NAZ A 3 27/4/16); Goldsmith and Carter (1981).

Additional material from an internal report by Bruce Austin (Provincial Warden in 1975)

*This is a compendium of only some names of pans, features, and rail sidings along the Park's eastern fringe. Quite a few of these have changed spelling more than once in the last 100 years, and the translations have been contested by native speakers of various languages. Alternative spellings provided here are not necessarily exhaustive. The language of attributed origin is indicated in parentheses.(Haynes)*

- Balla Balla, Mbalabala (pan) – “kudu” (Ndebele)
- Bulungeti – Corrupted from Hulungeti (*Combretum imberbe*)
- Bumbumutsa – Bumblebee’s waterhole (Sarwa Bumbum [bumblebee] and Tsa [waterhole])
- Chivisa, Chebisa, Chembizi (pan) – “zebra call,” “zebra place” (Nambya; also Ndebele, “place of horse/zebra”))
- Cibilamabandi – Cibi = pan; LaMabandi was nickname of an early ranger (Jordaan) who always wore a particular type of broad belt.
- Cidumci – “scatter” Sarwa. Probably refers to bushmen being apprehended by scouts?
- Chingahobe – Receiving with gratitude (with both hands) (Kalanga)
- Dandari (pan) – “fallen log” (Danda=log); however, danda may mean “bow” (Tyua)
- Danga (pan) – “kraal” (Kalanga/Shona) (umDanga = enclosed yard or market)
- Dete (formerly Dett) (town) – “marsh, bog” (probably from ndetima, or itete, Ndebele), referring to the formerly wet vlei, now much drier after years of burning and overgrazing by livestock
- Deteema (pan, dam, ruins)–possibly from dedema, “shiver” (Nambya, Karanga)
- Dotama – Liquid which drips (Sarwa) or “move about” (Shona)
- Entubu (rail siding) – once called Nekatombi after a Nambya chief, then changed to Inyankulu, which was confused with Inyantue (river and rail siding), before settling on entubu, “gateway” (Nambya)
- Garakamwe – Stay once (Shona)
- Guvalala (pan) – “sleep there” in Fanagalo (a creole language of oversimplified Bantu words used by Europeans to communicate with servants); however, other roots are possible, such as ukubulala (“to kill”, Ndebele), or gu bulala (“place of killing,” Ndebele). Austin includes “squatting down rapidly” by a hunter (Kalanga root). Or to “shed off the dust” perhaps by washing, or to slough off the skin like a snake (Nhanzwa)
- Gugugu – Refers to a fallen hollow baobab in which hyenas breed. The young hyenas run around inside the hollow log making a sound like gugugu.

- Gwayi, Gwaai, iGwayi (river east of Hwange) – “tobacco” (Ndebele); also attributed as ukayi? (meaning “where” in Sotho language), asked by Basuto hunters looking for water in the Kalahari sands
- Gomo – Komo – striped like a leopard tortoise
- Hwa Hwa Du – Named by Austin after camping here and hearing an ant bear moving around and then stopping repeatedly. The name is an onomatopoeic word with Hwa Hwa for the rustling and Du for the silence.
- Hwecau – The place of the white buffalo
- Ingwe (rail siding) – “leopard” (Ndebele)
- Intundhla, Ntundhla (rail siding) – “giraffe” (Ndebele)
- Inyangadezendifhlovu – Horns or tusks (Shona) and elephant (Ndebele)
- Jupanda – Named by a park warden (Dave Rushworth) and was a combination of the names of his wife and two daughters (Julianne, Patrisha and Linda)
- Kennedy (vlei, pans, rail siding) – named after a farmer who lived nearby; adopted as the rail siding name in 1917 instead of an African name
- Kokori (rail siding) – located on Kennedy’s farm; the original suggestion was “Teak,” changed to Dingane after a local chief, then Kokori after a name of a vlei; adopted for the siding name in 1914
- Korodziba – Hollow tree that holds water (Sarwa)
- Leasha – Something which has been thrown away
- Libuti – “gathering place” (Karanga)
- Limemba – A permanent water point. Derived from rich person in Ndebele? Refers to the wealth of the water
- Limpande – The place of the rain tree (*Lochocarpus capassa*) (Kalanga)
- Linkwasha (vlei, pan) – “son-in-law’s property” (Kalanga)
- Longone’s Pan – Named after an extremely tall water engineer
- Magesanyati – Shallow muddy pan – the place where the buffalo wash
- Makololo (pan, vlei) – “rain tree” (Tyua); also a tribal name (*Lochocarpus capassa*)
- Makona (pan) – “corners”
- Makukumalo – Named after the first assistant to Ted Davison (Jim Hill). Describes his way of walking “like an angry dog with back arched and hackles up or a porcupine raining its quills”
- Malindi (rail siding) – “holes,” referring to springhare burrows in the loose Kalahari sands (Ndebele); also a chief’s name (Karanga/Shona)
- Mambanje (river, rail siding) – a river’s name, suggested as a siding name by Posselt 18 Feb. 1916

- Mandavu (dam) – “long beard” (Shona, Nambya)
- Manga (pan, vlei) – an East African word for “maize”; or perhaps “liar” (Ndebele) Manzibomvu – “red water” (Ndebele). Austin records Mhanga – the cracks of a heel referring to when the pan dies out and the mud cracks
- Mangisihole – Englishman’s Pan (Mangisi = Englishman and Hole)
- Manzimbomvu – Red or discoloured water (Ndebele)
- Matijole – an old man’s name who once lived here (Tonga)
- Mbejane (pan) – “rhinoceros” (?) (Ndebele)
- Mitswiri, Mtswiri (pan) – the leadwood tree, *Combretum imberbe*
- Msetje - “sandy” (Ndebele); or “sand” (Shona)
- Mtoa, Mutowa (pan, ruins) – the rubber tree, *Diplorhynchus condylocarpon* (Nambya)
- Muvalasangwana – “gardenia tree” (Ndebele) *Gardenia spatulifolia*
- Nemtunga – Teach someone how to whistle (Sarwa)
- Nantwich (camp) – farm named for a town in England
- Ngamo – A place that gleams and glitters (Nhanzwa)
- Nyamandhlovu (pan) – “elephant meat” (Ndebele)
- Nyorka (Nyoka, iNyoka) (pan) – “snake” (Ndebele)
- Robins (camp) – named for Herbert George Robins, who bequeathed his land to the government upon his death in 1939
- Secheche – Place of the polecat (Sarwa)
- Shabi Shabi (seepage) – little red mushrooms/fungus growing around teak trees in the Kalahari Sand (Tyua)
- Shakwanki, Tsokwanga, Chekwanki (seepage) – “cold ear/cracked from cold and dry” (chekwa = “ear”; Tyua)
- Shapi (pan) – “whose milk” (Tyua – pi = “milk” and sha = “female”); however, disputed by some as a misspelling of Tshabe = “run away” (Karanga)
- Shumba (pan) – “lion” (Karanga, Nambya)
- Sinamatella (camp) – “sticker bush” or tree (namatila, namathela = “be sticky”, Nambya, Ndebele)
- Summamalissa, Masummamalissa, Summamalisha (pans, vlei) - referring to the masuma tree (*Diospyros*, Zambezi ebony)
- Tamafupa, Tshamafupa (seepage) – “place of bones” (Tyua)
- Tamasanka (pan, seepage) – “tall reed” (Tyua)

- Tamboyentundhla, Mathamboentundhla (pan) – “giraffe bones” (Ndebele)
- Tsamhole (pan) – “waterhole belonging to two people”; disputed by some: tsa = “waterhole” and mhole = “breast” (Tyua)
- Tsamtsa – (Tswametsa) Tswam = elephant and tsa = pan. Elephant Pan (Sarwa)
- Tshemasi – Named by an early game scout. Masi is stingless mopani bee. Means the place where bees are numerous.
- Tshomopane – Pan surrounded by mopane
- Tsanga – “reed” (Kalanga/Shona)
- Tshabema – “Is it yours?” Question asked by cattle owners who have been raided (SiKaukau dialect)
- Tshakabika (warm springs, pan) – “cook in liquid” (Kalanga or Nambya)
- Tshebe Tshebe (pan) – “sandy,” loose sand (Ndebele)
- Tshekwanga – Probably derived from tsokwanga (water which bubbles out of the ground) (Kalanga)
- Tshontande (river, rail siding) – a river’s name, suggested as a siding name by Posselt 18 Feb. 1916
- Tswantsa – “elephant’s water hole” (Tyua: tsa = “waterhole”)
- Tuntshegumbo – From a story about hunters camped here, one with an injured leg. During the night one of the men kicked the injured man who remarked “you have kicked me, Tshegumbo” (Tshegumbo being the name of the kicker)
- WeXau, Hwecau (pan) – “place of white buffalo” (Tyua, but disputed by some)
- Zibanini, Zivanini, Sibaniini (river, pans) – “maiden’s pool” (Karanga), or Dze-banani – “children’s pool” (Tswana)



## ANNEX 10: PAN INVENTORY

# HWANGE NATIONAL PARK



## PAN INVENTORY

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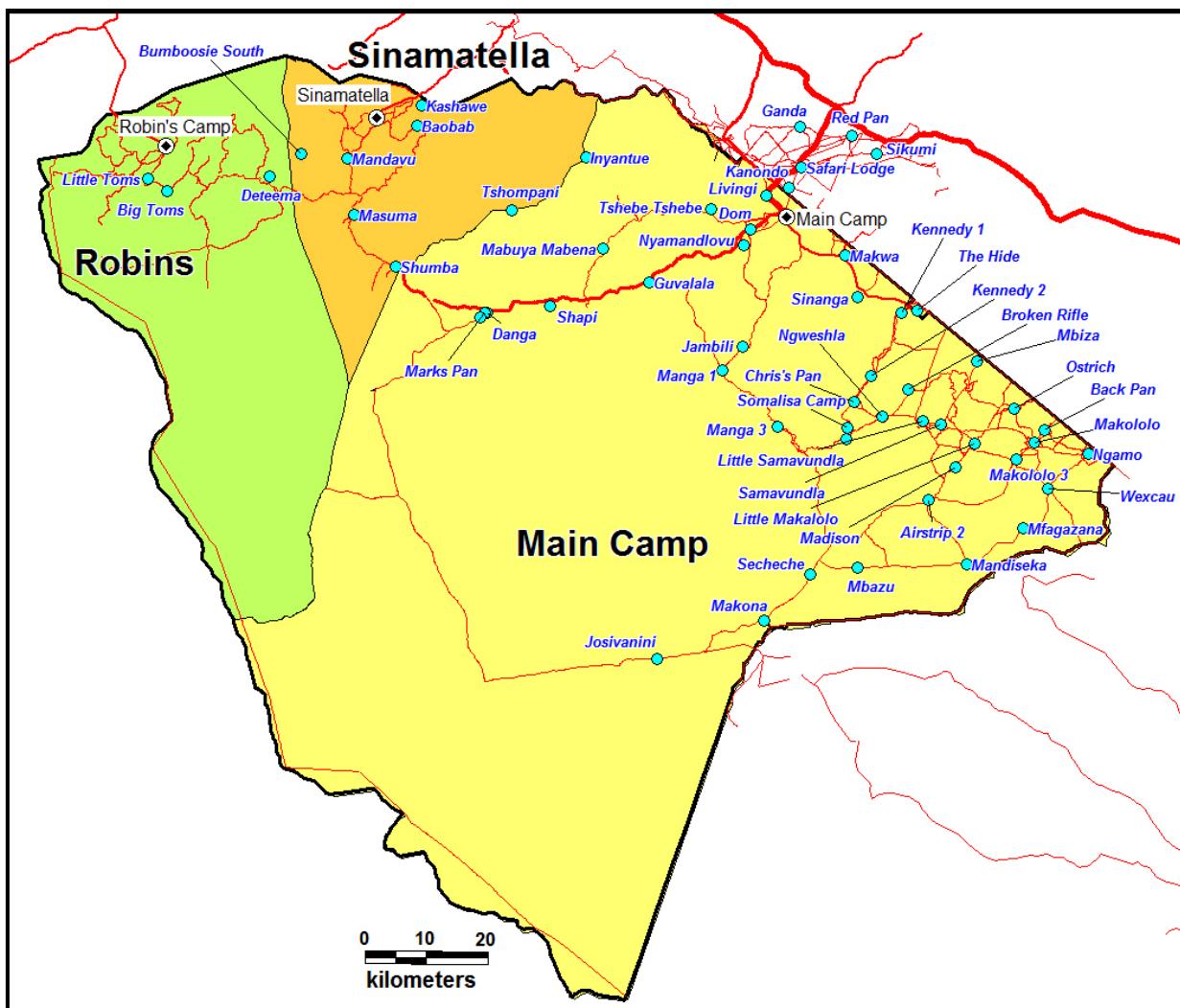
# 1 INTRODUCTION

This is a preliminary analysis of the important pans in Hwange. It is hoped that it will be of use for the implementation of the new General Management Plan. It is expected that it will be continuously updated. Where possible the picture includes a ground-level photograph and a Google image. In all Google images north is at the top. The dates on the images can vary and so may not reflect the situation in 2014 (e.g. Chris's Pan was still to be established when the Google image was taken).

In addition, most of these photographs were taken after an exceptional rainy season over most of Hwange. The levels may not be representative of the levels seen in other years at the same dates. All Google images of pans have north at the top of the page.

## 1.1 PUMPED PANS

This section is an inventory of the pans that were being pumped during 2014.



**Table : Pumped Pans - 2015**

| Pan           | Responsibility     | Comments   |
|---------------|--------------------|--|
| Baobab        | Bhejane            | Solar  |
| Bumbumutsa    | Bhejane            | diesel   |
| Bumbusi South | Bhejane            | Solar  |
| Inyantue vlei | Bhejane            | solar  |
| Mbala gate    | Bhejane            | solar  |
| Mashambo      | Bhejane            | ZESA   |
| Inyantue dam  | Bhejane            | solar  |
| Masuma        | Bhejane            | Diesel (Assistance from Makomo)                  |
| Tshompani pan | Bhejane            | solar  |
| Shumba        | Bhejane / FOH      | Bhejane Trust solar + Friends of Hwange Windmill |
| Camp Hwange   | Camp Hwange        |  |
| Big Shumba    | Camp Hwange        |  |
| Guvalala      | WEZ / Friends of H | Solar + diesel                                   |
| Kennedy 1     | Friends of Hwange  | Solar  |
| Kennedy 2     | Friends of Hwange  | Solar + diesel                                   |
| Makwa         | Friends of Hwange  | Solar  |
| Sinanga       | Friends of Hwange  | Solar  |
| Shapi         | Friends of Hwange  | Windmill   |
| Ngweshla      | Friends of Hwange  | Solar x 2 Previously pumped by Wilderness        |
| Mbiza         | Friends of Hwange  | solar  |
| Jambili       | Friends of Hwange  | diesel   |
| Livingi       | Friends of Hwange  | diesel   |
| Manga 1       | Friends of Hwange  | diesel   |
| Nyamandlovu   | Friends of Hwange  | diesel   |
| Tshebe Tshebe | Friends of Hwange  | diesel   |
| Mabuya Mabena | Friends of Hwange  | Solar  |
| Dopi          | Friends of Hwange  | diesel   |
| Caterpiller   | Friends of Hwange  | diesel   |
| Tshompani dam | Friends of Hwange  | Windmill   |
| Josivanini    | Imvelo Safaris     |  |
| Madiseka      | Imvelo Safaris     |  |
| Makona        | Imvelo Safaris     |  |
| Mbazu         | Imvelo Safaris     |  |
| Mfagazana     | Imvelo Safaris     |  |
| Secheche      | Imvelo Safaris     |  |
| Stoffies      | Imvelo Safaris     |  |
| Major         | Imvelo Safaris     |  |
| Danga         | Nehimba            |  |
| Nehimba       | Nehimba            |  |

| Table : Pumped Pans - 2015 |                |               |
|----------------------------|----------------|---------------|
| Pan                        | Responsibility | Comments      |
| Chris's Pan                | Somalisa       |               |
| Manga 3                    | Somalisa       |               |
| Somalisa                   | Somalisa       |               |
| Somalisa Camp              | Somalisa       |               |
| Umkazaan                   | Somalisa       | Solar. Saline |
| The Hide                   | The Hide       |               |
| Airstrip 2                 | Wilderness     |               |
| Back Pan                   | Wilderness     |               |
| Broken Rifle               | Wilderness     |               |
| Kashawe                    | Wilderness     |               |
| Little Makololo            | Wilderness     |               |
| Little Samavundla          | Wilderness     |               |
| Madison                    | Wilderness     |               |
| Makololo 3                 | Wilderness     |               |
| Ngamo 1                    | Wilderness     |               |
| Ostrich                    | Wilderness     |               |
| Samavundla                 | Wilderness     |               |
| Wecau                      | Wilderness     |               |
| Big Toms                   | ZPWMA          |               |
| Borehole 5                 | ZPWMA          | ZESA          |
| Deteema                    | ZPWMA          |               |
| Dom                        | ZPWMA          | solar         |
| Little Toms                | ZPWMA          |               |
| Mandavu                    | ZPWMA          |               |
| Manzimbomvu                | ZPWMA          |               |

| Table : Pan pumping systems |   |
|-----------------------------|---|
| Type                        | Pan                                     |
| Windmill                    | Shapi, Mbiza, Shumba, Kennedy 1         |
| Solar                       | Boabab, Bumbusi South, Tshompani        |
| ZESA                        | Davisons, Borehole 5, Kashawe, The Hide |
| Diesel                      | All others                              |



## PUMPED PANS

### NYAMANDLOVU



**Drilled:** 1936 (50m)

**Responsibility:**  
ZPWMA

**Comments:** The flagship pan for the park with easy access from Main Camp (important to exit the gate before closing time). Very popular viewing platform

FoH has drilled a new borehole and will be installing a solar pump.



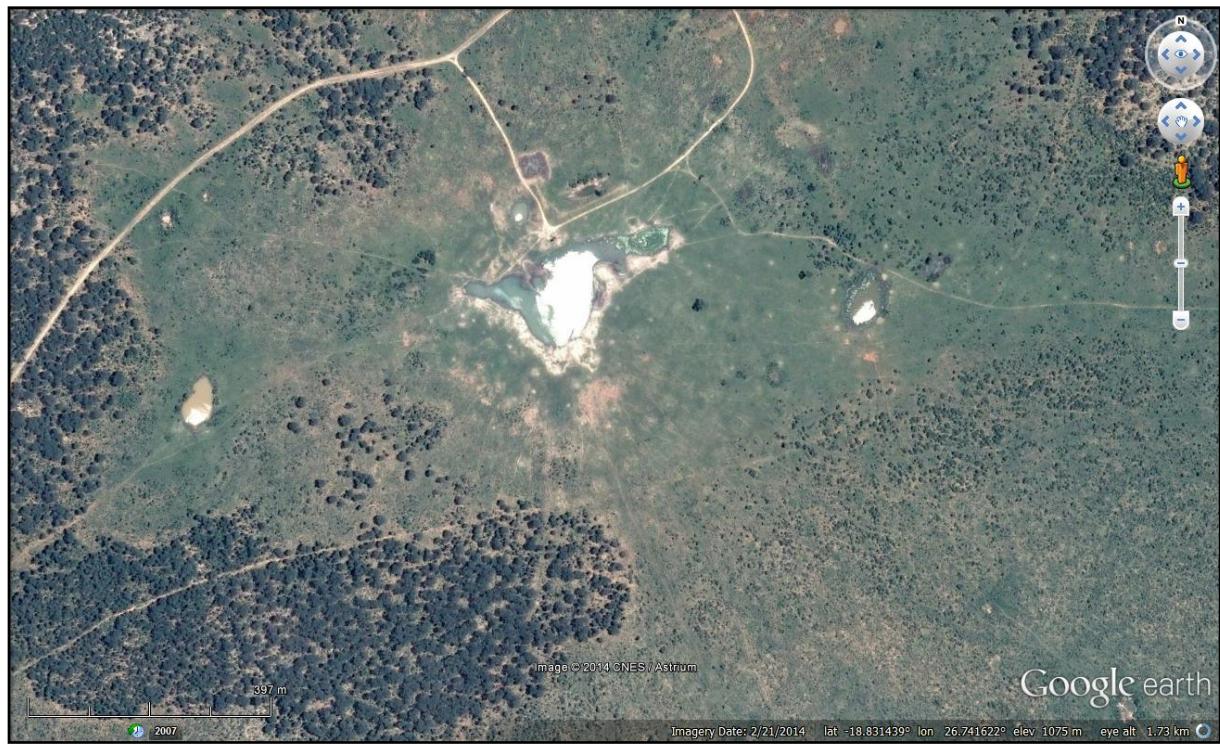
## GUVALALA



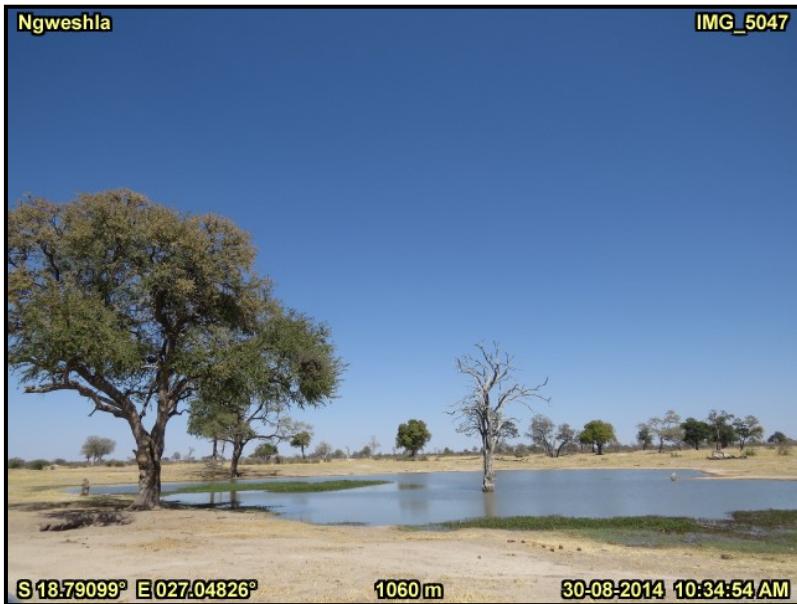
**Drilled:** 1952, 1965  
(100m)

**Responsibility:** WEZ,  
Friends of Hwange

**Comments:** Also with  
viewing platform  
where clients can  
sleep. Water is saline?



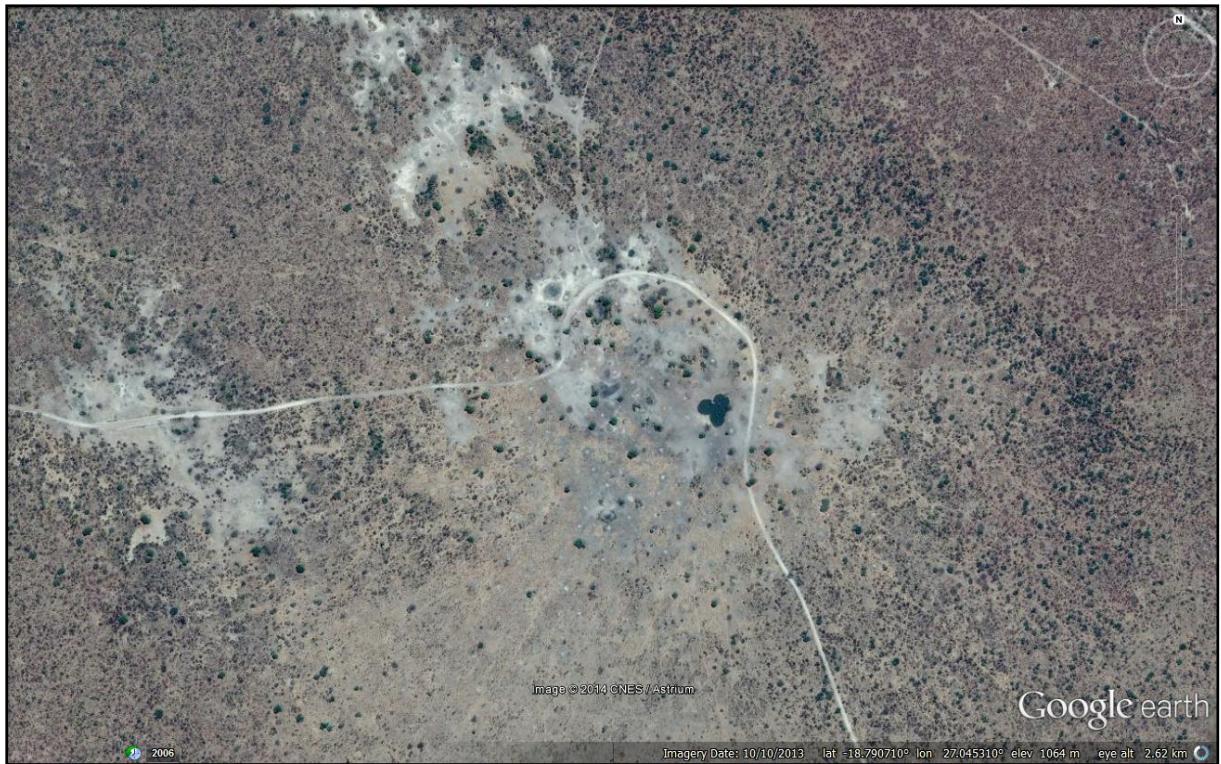
## MAKWA



**Drilled:** 1950 (56m)

**Responsibility:**  
Friends of Hwange

**Comments:**



## KENNEDY 1



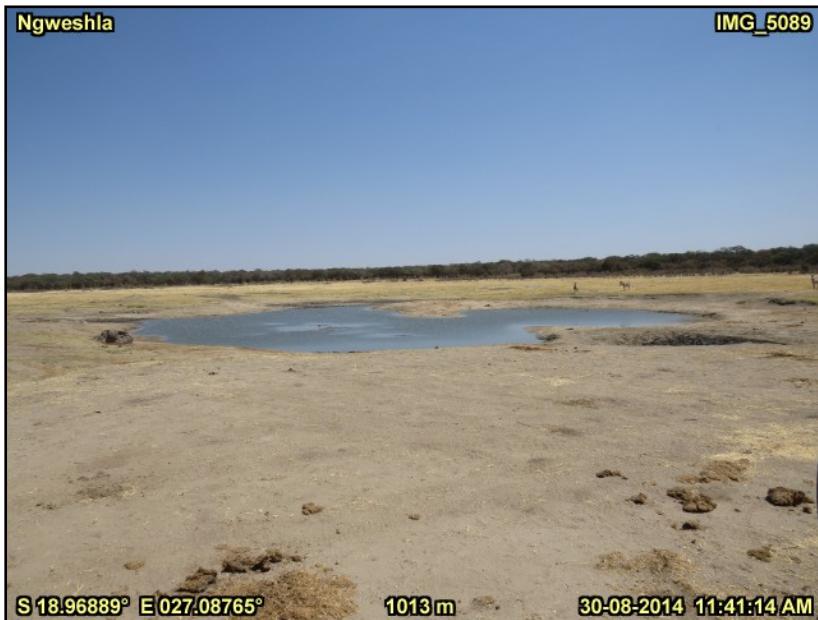
**Drilled:** 1944 (45m)

**Responsibility:**  
Friends of Hwange

**Comments:** Is this  
being pumped in 2014  
(or is the water going  
into another pan)



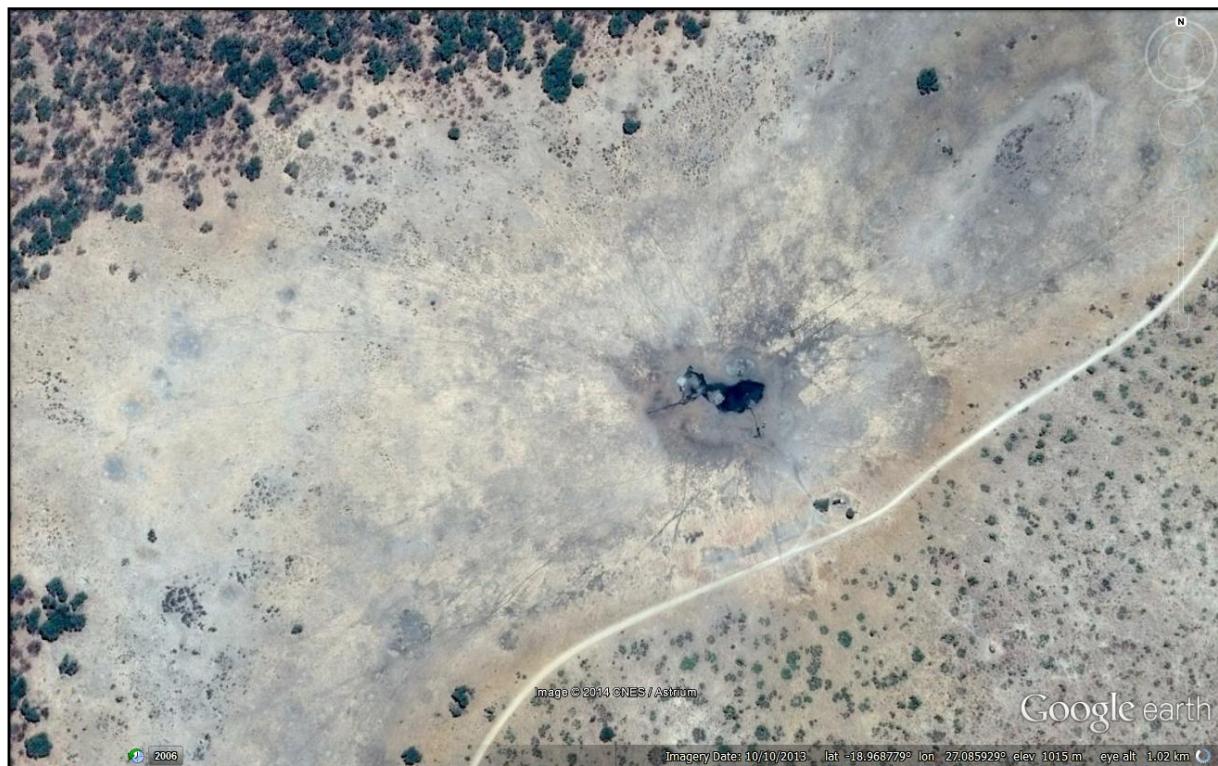
## KENNEDY 2



**Drilled:** 1957 (65m)

**Responsibility:**  
Friends of Hwange

**Comments:** Currently pumped by solar,  
donated by FoW?



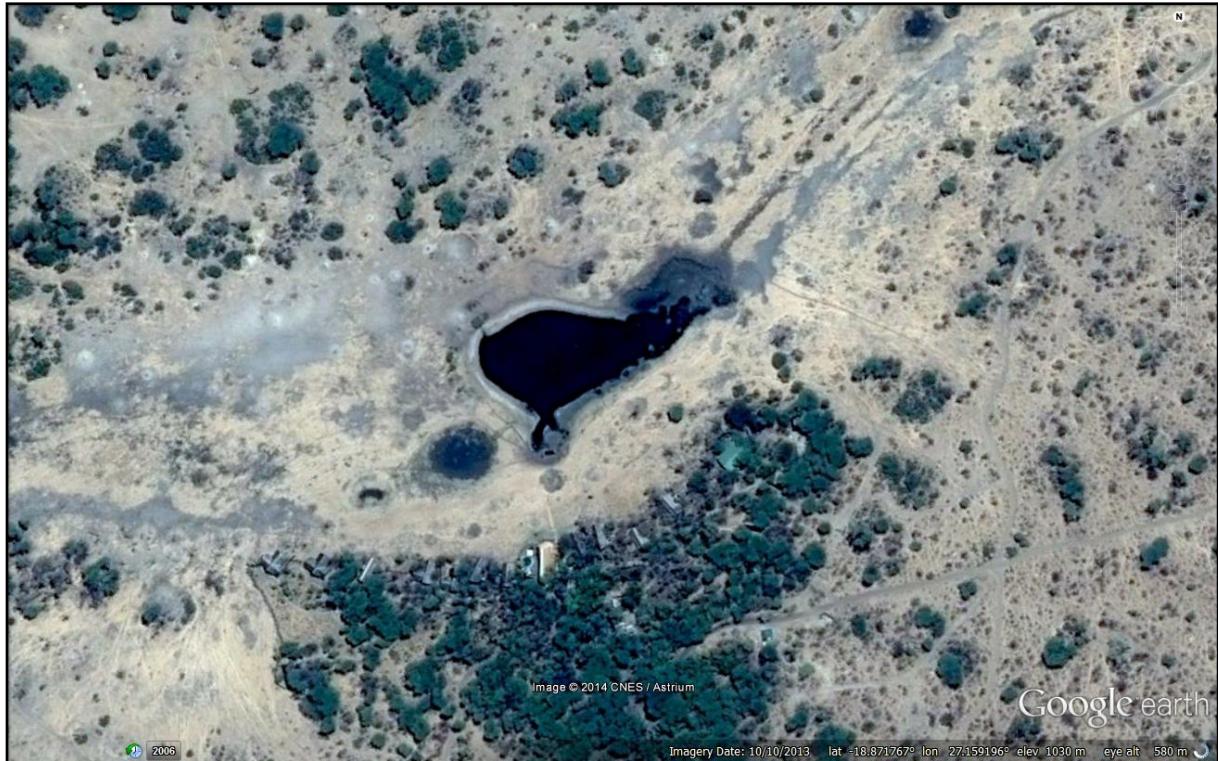
## THE HIDE



Drilled:

**Responsibility:** The Hide

**Comments:**



## INYANTUE

**Drilled:** 1970

**Responsibility:**  
ZPWMA

**Comments:**

## TSHOMPANI

**Drilled:** 1968 (39m)

**Responsibility:**  
ZPWMA

**Comments:**  
Windmill from FoH.  
Solar installation  
underway via  
Bhejane Trust



## NGWESHLA



**Drilled:** 1935 (41m),  
1950 (78m)

**Responsibility:**  
Previously Wilderness  
but now taken over by  
FoH

**Comments:** An  
important waterhole on  
the tourist circuit. Two  
new solar units will be  
installed



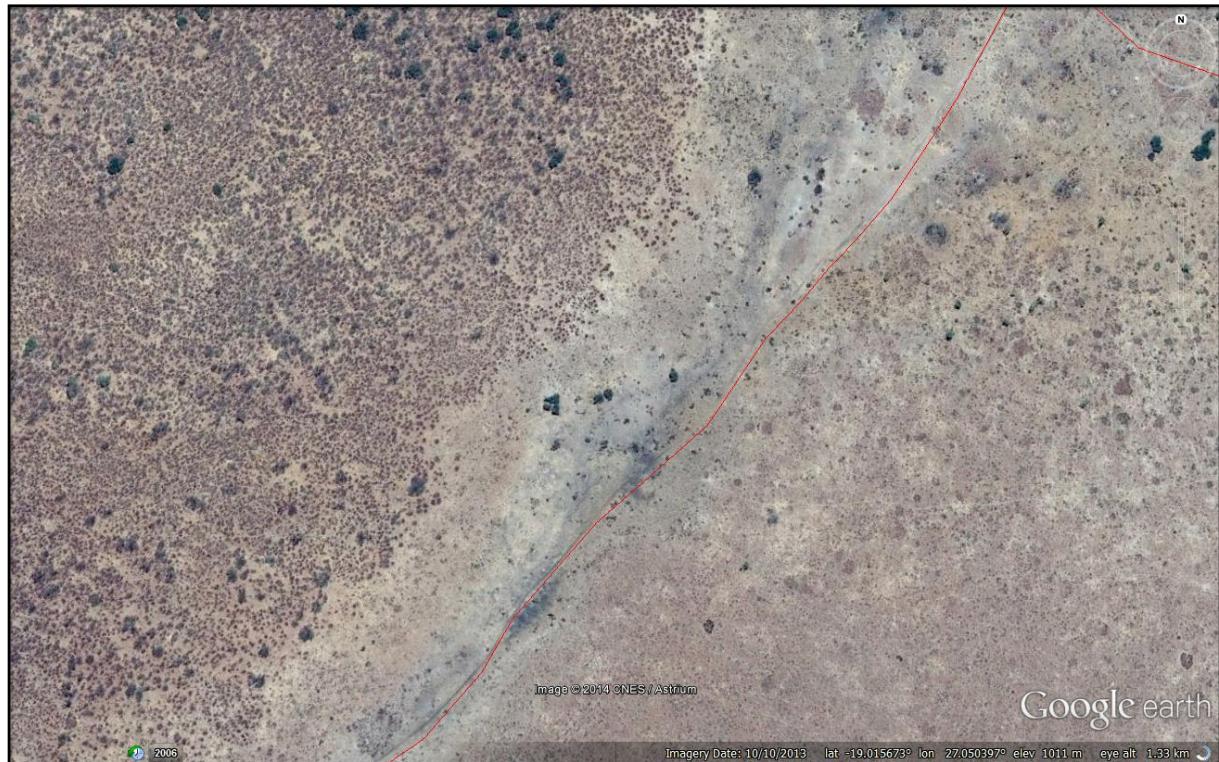
## CHRIS'S PAN



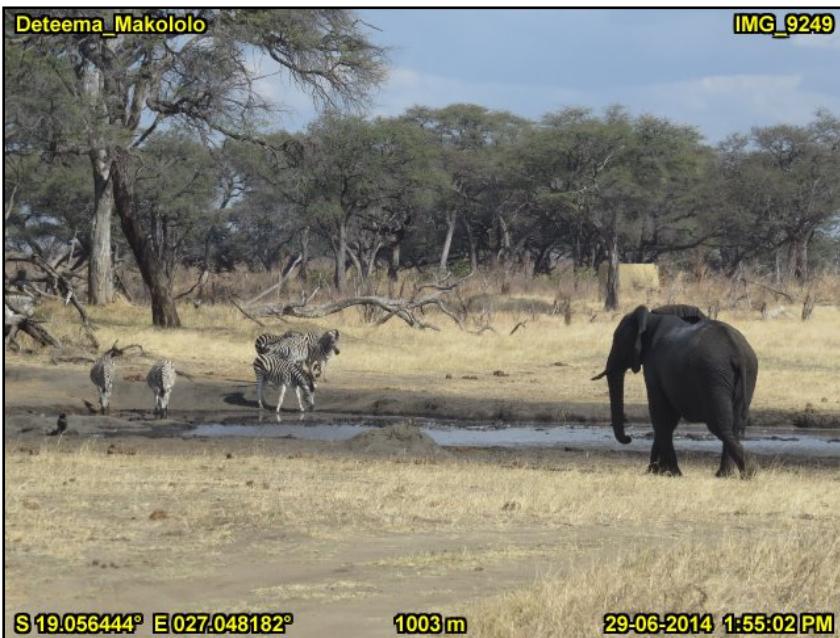
**Drilled:** 2012?

**Responsibility:**  
Somalisa Camp

**Comments:** Newly established hole to improve tourism



## SOMALISA



**Drilled:** 1967 (68m)

**Responsibility:**  
Somalisa Camp

**Comments:** Was closed in the 1970s



## SOMALISA CAMP



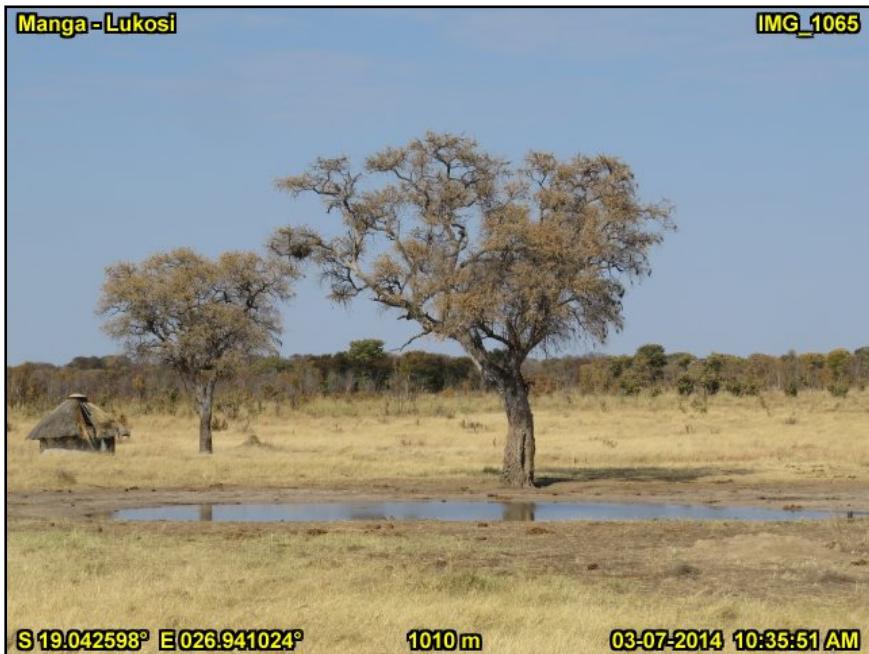
**Drilled:** 2012?

**Responsibility:**  
Somalisa Camp

**Comments:** Two waterholes to provide game viewing experience at the camps (Somalisa and Somalisa Acacia)



MANGA 3



**Drilled:** 1984 (100m)

## **Responsibility:** Somalisa

## **Comments:**



# UMKWAWUZAAN



**Drilled:** 1973 (70m)

## **Responsibility:** Somalisa

**Comments:** Saline?  
Pumped by solar.  
Recent operation  
started in 2014

S 18.92575° E 026.98832°

1018 m

26-10-2014 5:10:40 PM



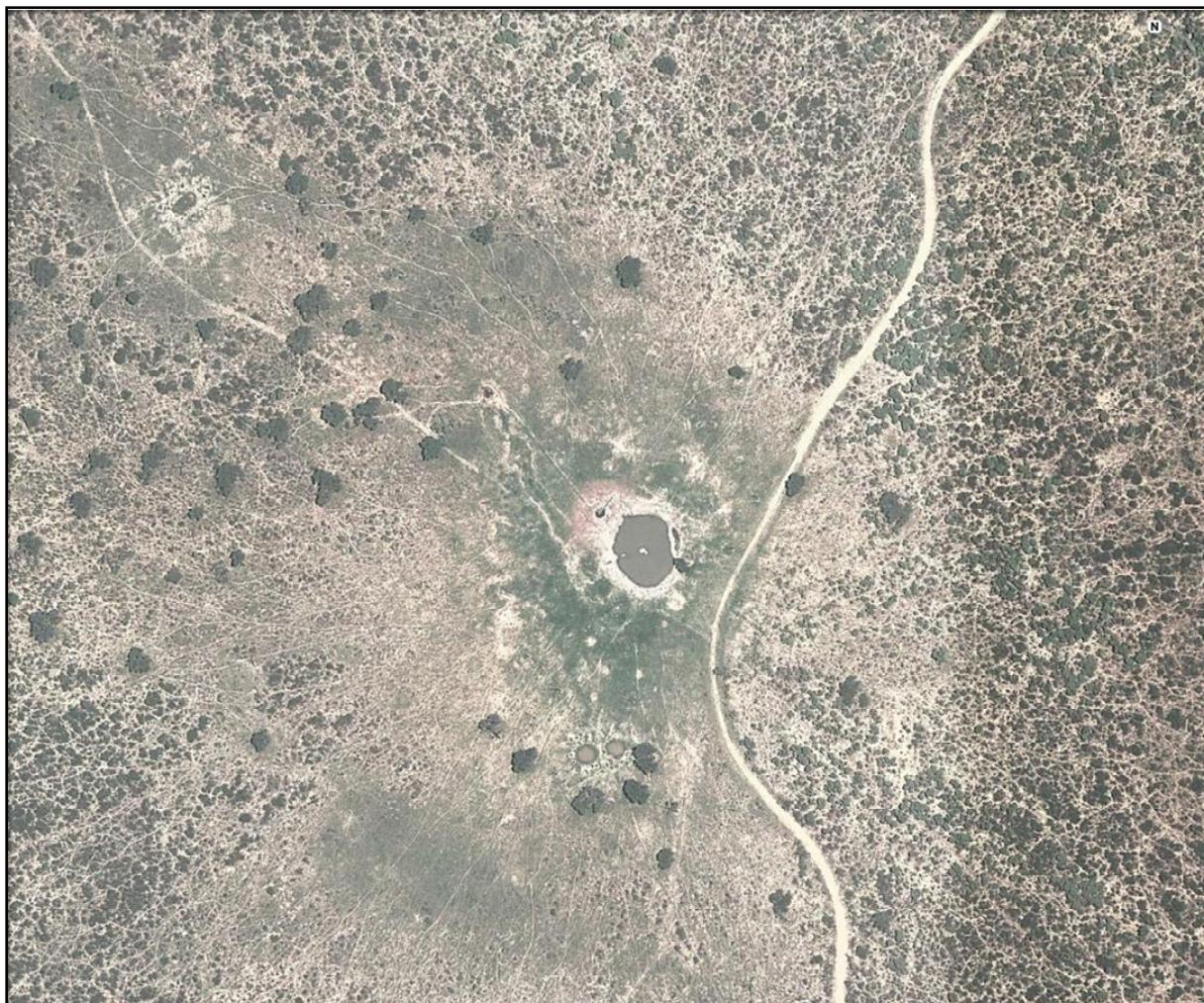
## MANGA 1



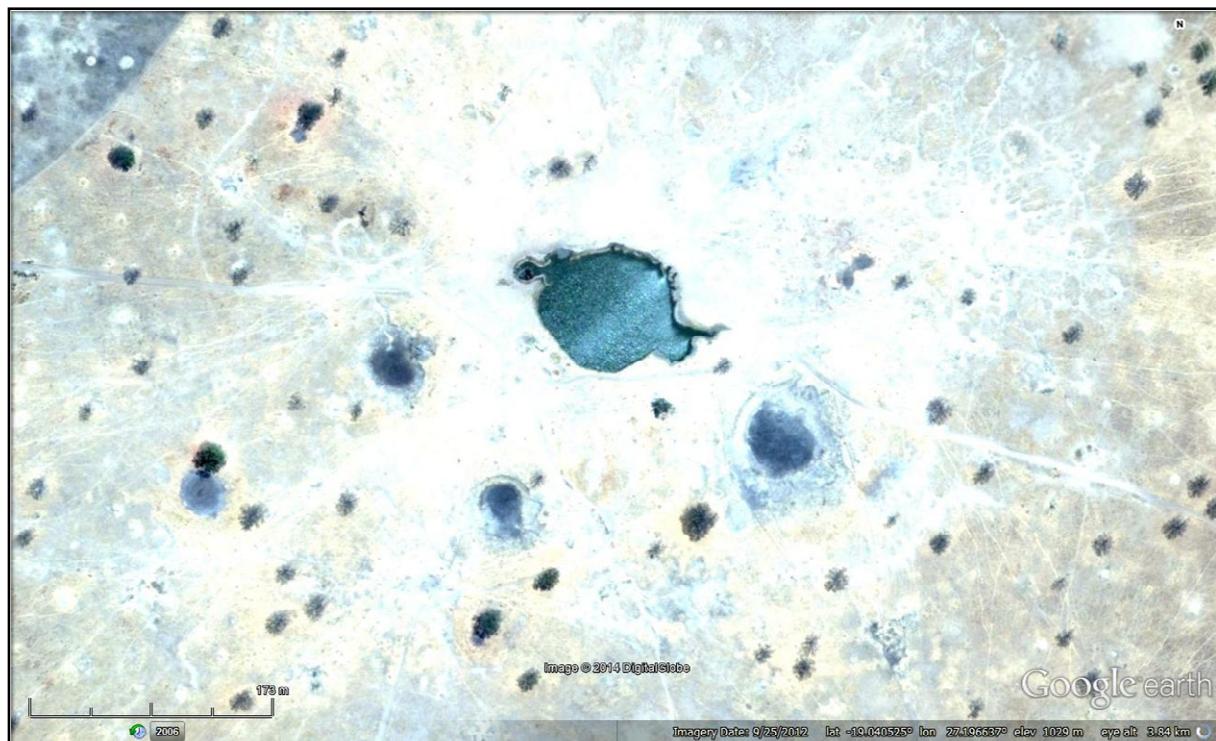
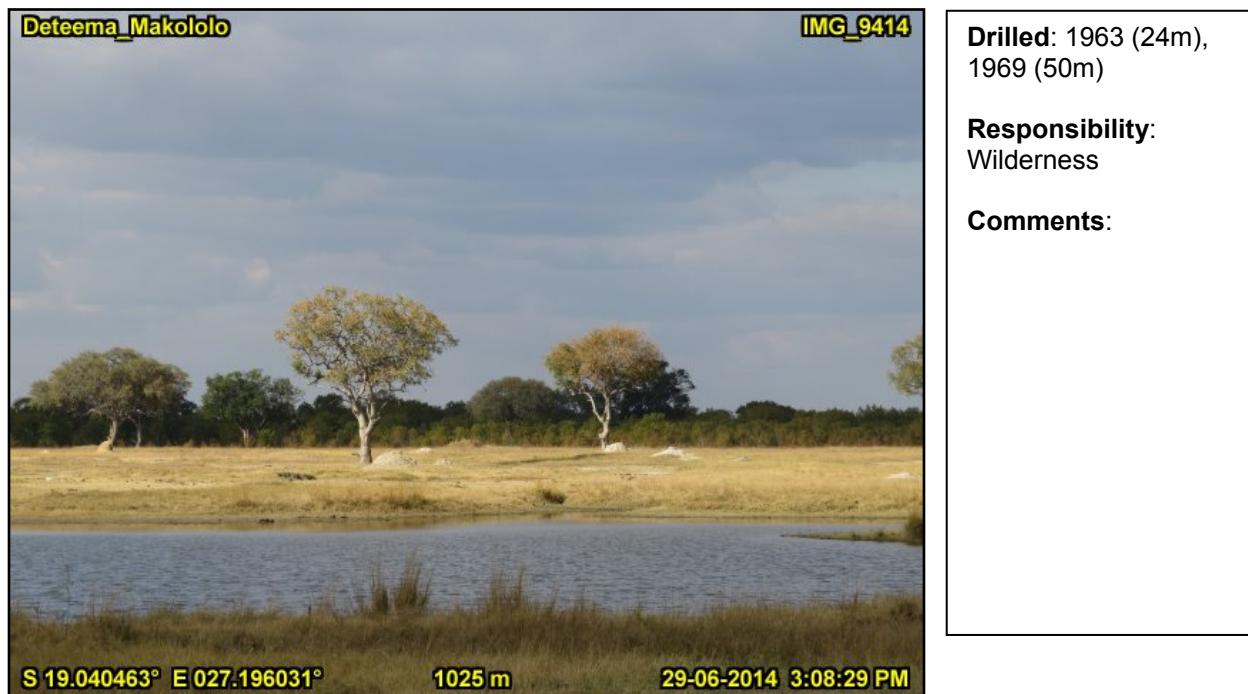
Drilled: 1984 (81m)

Responsibility:

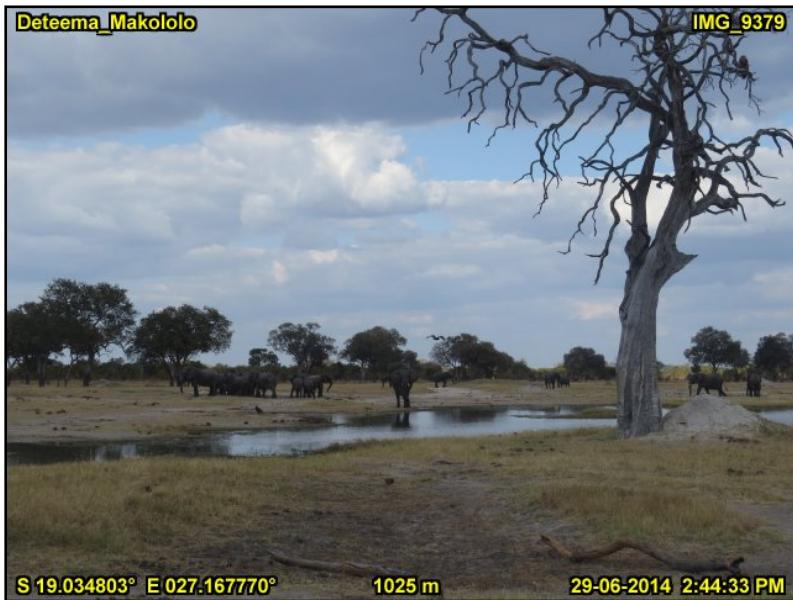
Comments:



## SAMAVUNDLA



## LITTLE SAMAVUNDLA



**Drilled:**

**Responsibility:**  
Wilderness

**Comments:**



## SCOTTS PAN

**Drilled:**

**Responsibility:**  
Wilderness

**Comments:**



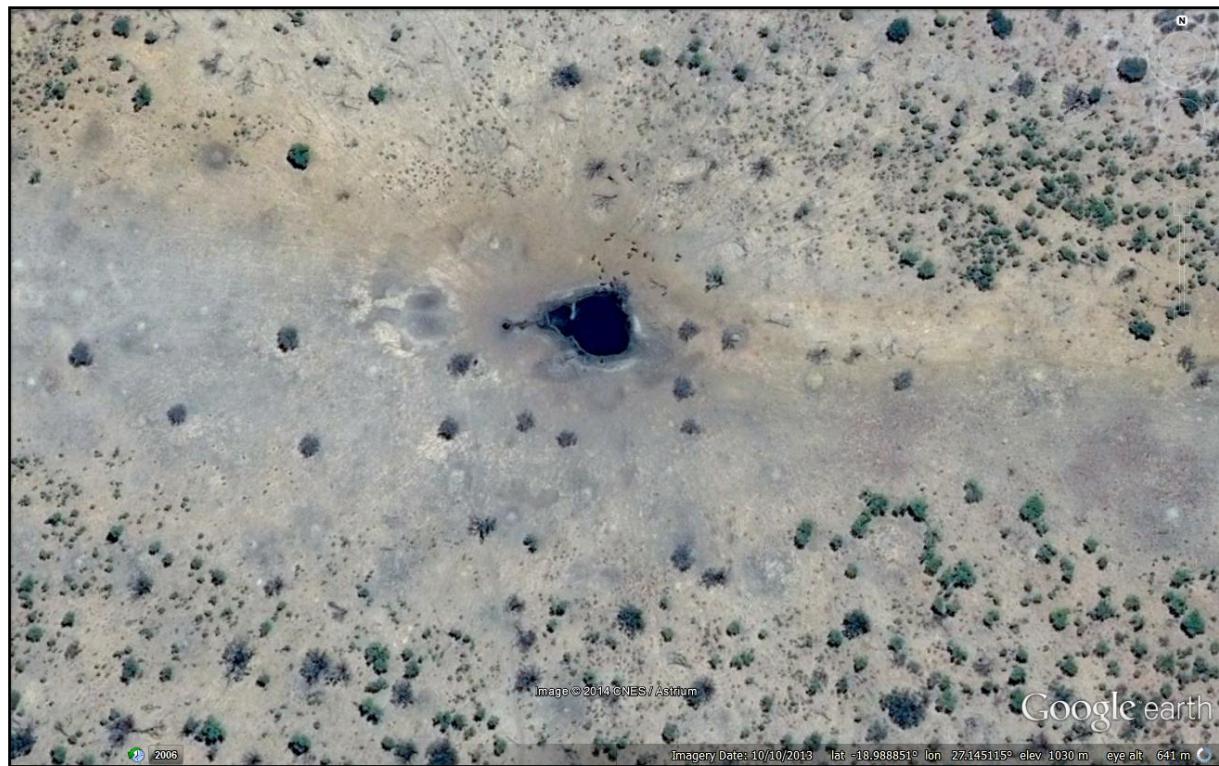
## BROKEN RIFLE



**Drilled:**

**Responsibility:**  
Wilderness

**Comments:**

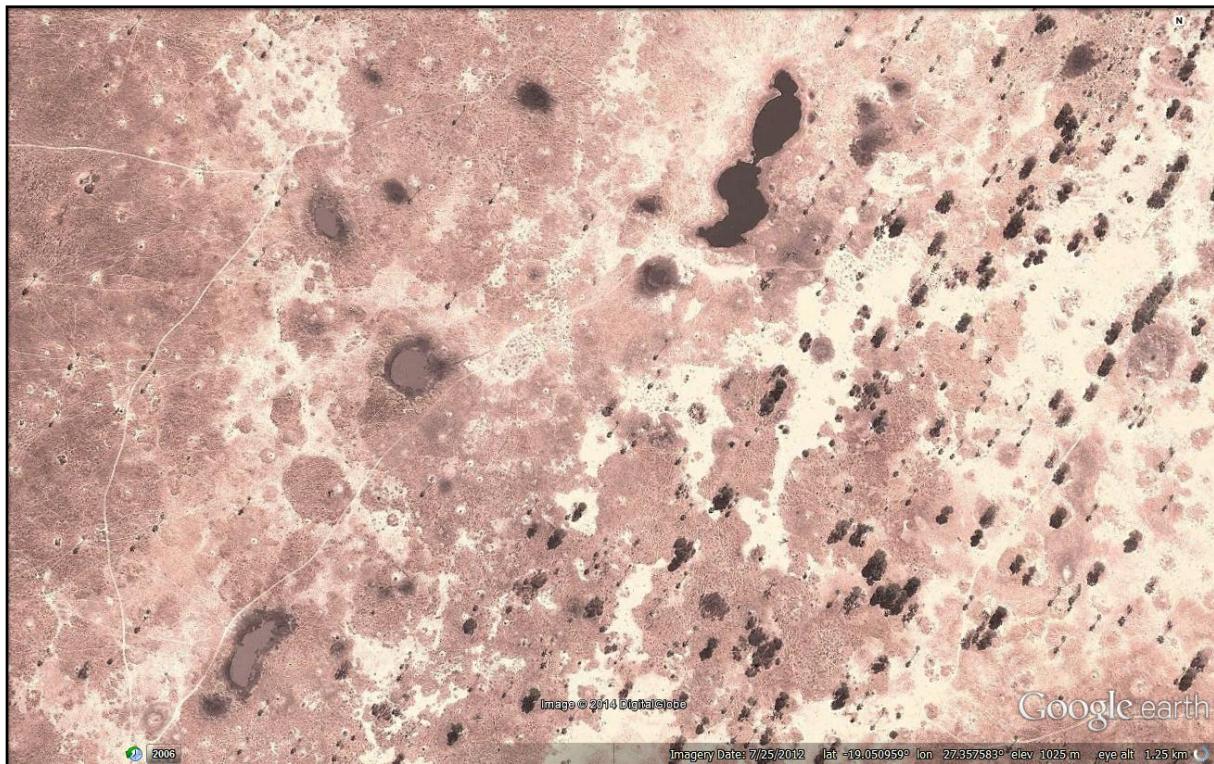


## BACK PANS

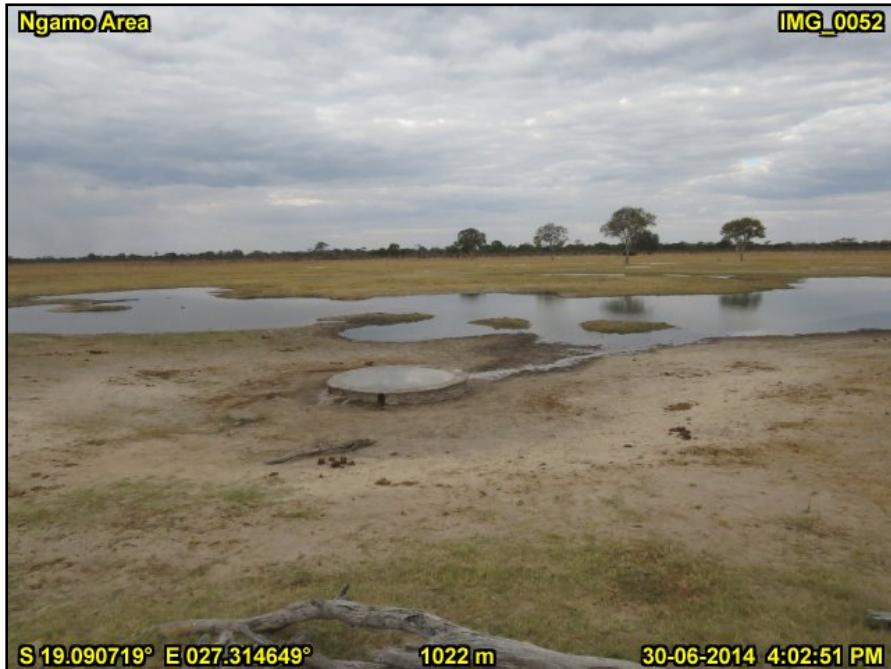
**Drilled:**

**Responsibility:**  
Wilderness

**Comments:**



## MAKOLOLO 3



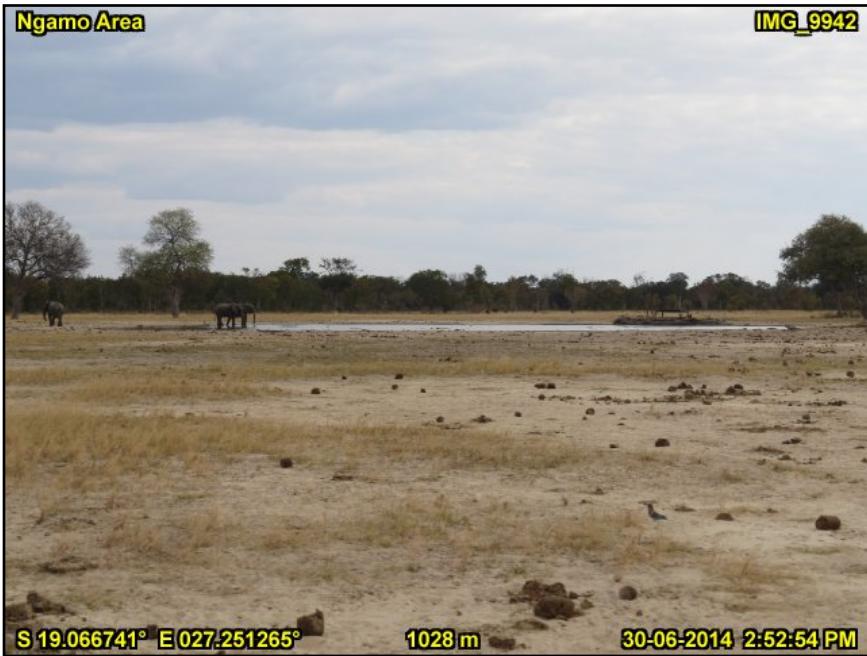
Drilled:

Responsibility:  
Wilderness

Comments:



## LITTLE MAKOLOLO



**Drilled:**

**Responsibility:**  
Wilderness

**Comments:** In front of  
Little Makololo Camp



## MAKALOLO 1



**Drilled:**

**Responsibility:**  
Wilderness

**Comments:**

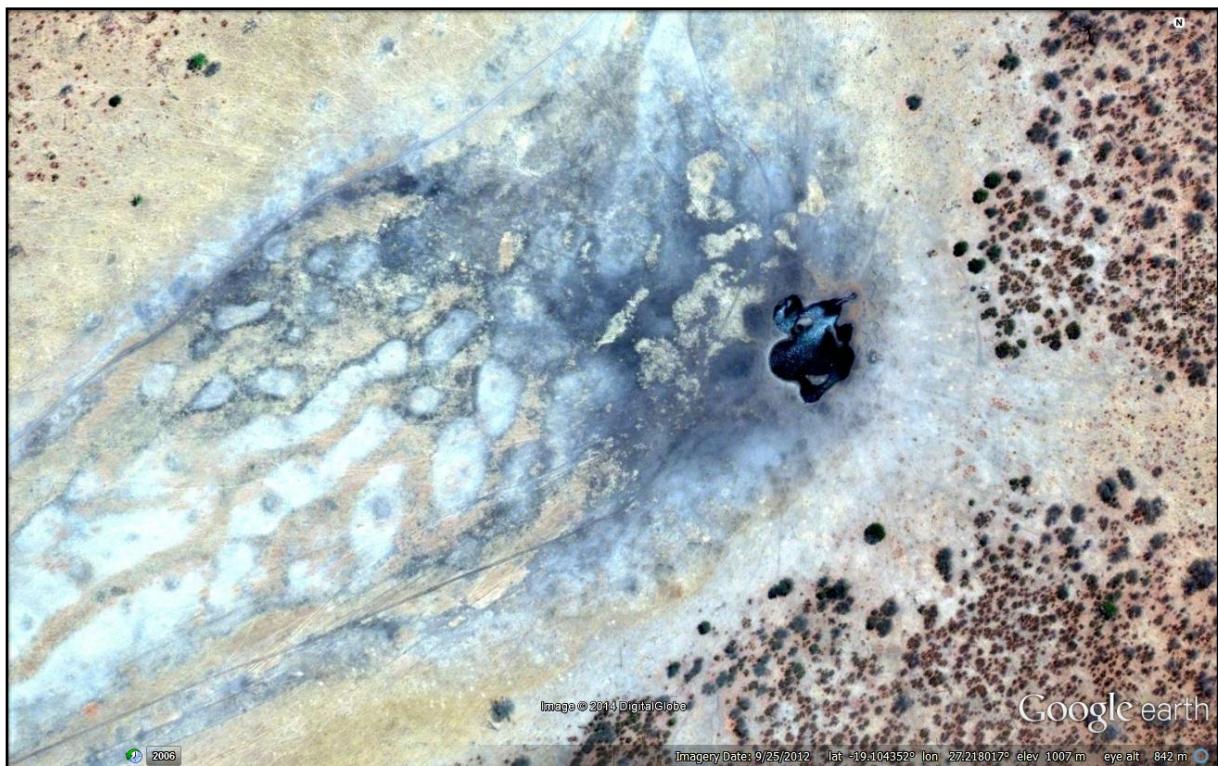


## MADISON

**Drilled:**

**Responsibility:**  
Wilderness

**Comments:**



## AIRSTRIPE 2

**Drilled:**

**Responsibility:**  
Wilderness

**Comments:**



## OSTRICH



**Drilled:**

**Responsibility:**  
Wilderness

**Comments:** Is in front  
of Davison's Camp.  
Pumped by ZESA



## MBIZA



**Drilled:** 1957

**Responsibility:**  
Recently relinquished  
by Wilderness

**Comments:** Windmill  
Pump



## STOFFIES



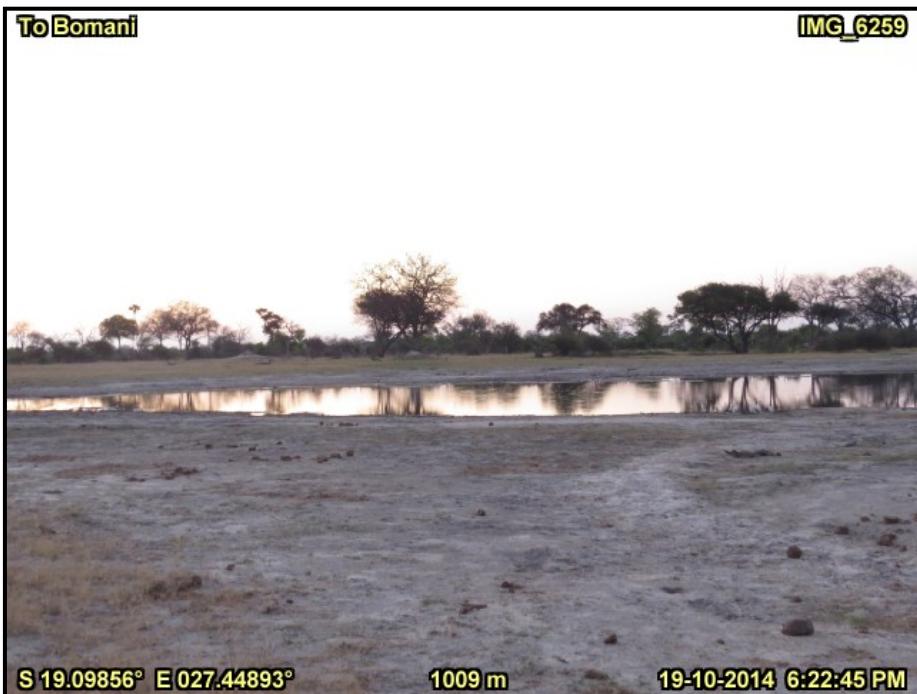
**Drilled:**

**Responsibility:**  
Imvelo

**Comments:** Fed by pipeline from outside park. Google imagery prior to pan establishment



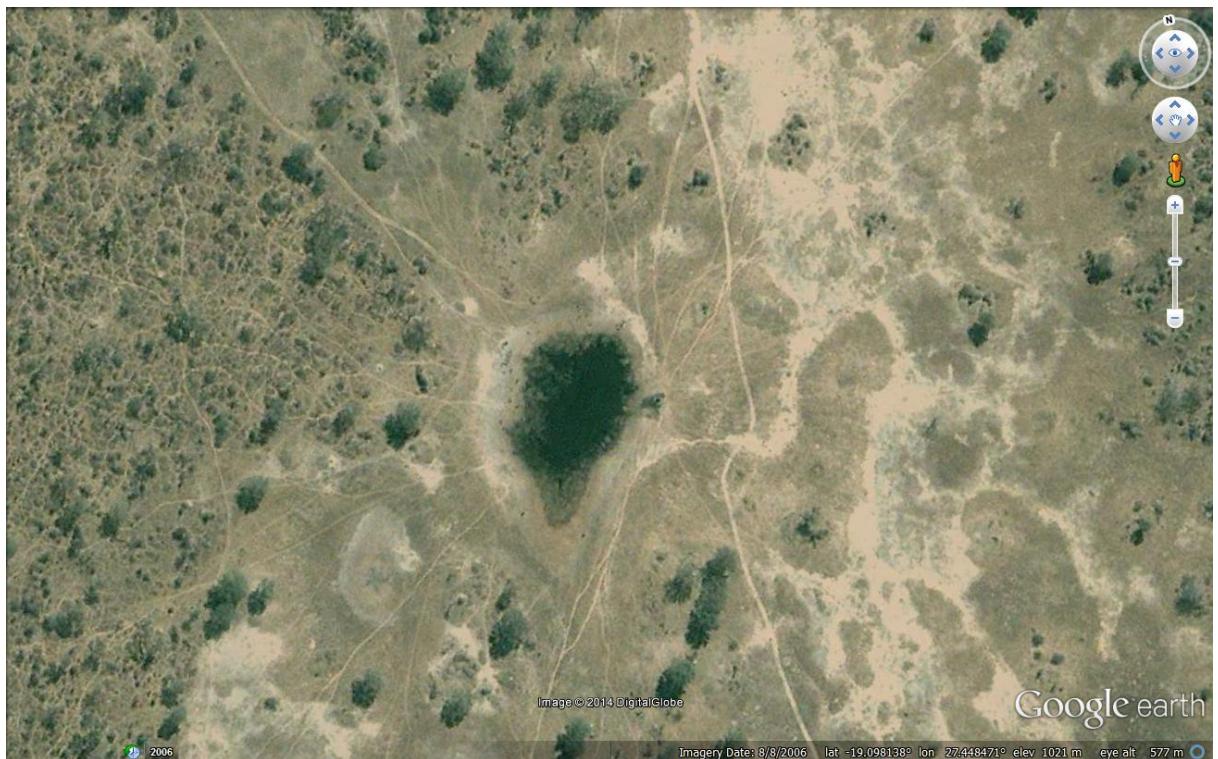
## MAJOR



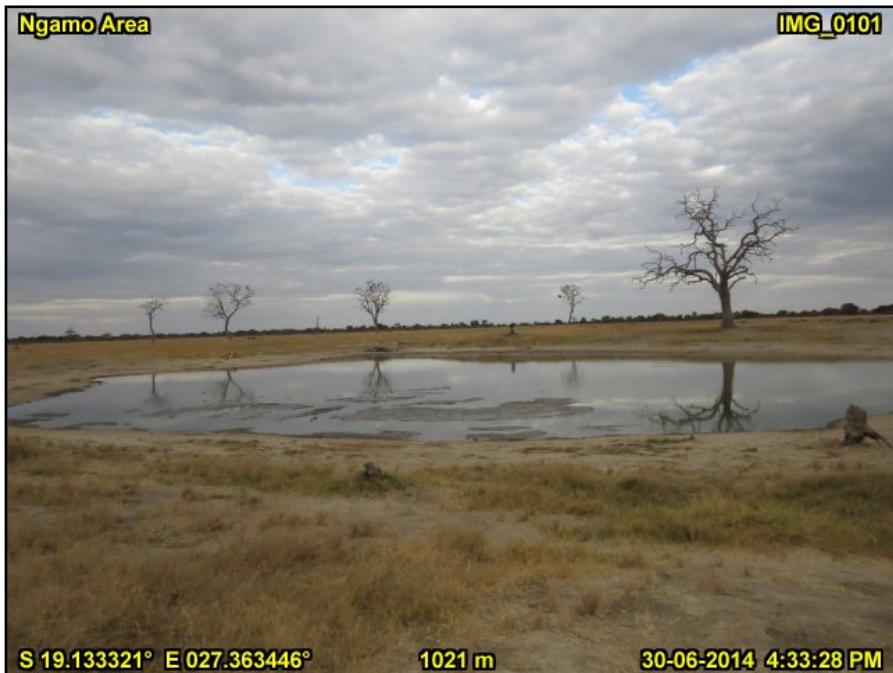
Drilled:

**Responsibility:**  
Imvelo

**Comments:** Fed by pipeline from outside park



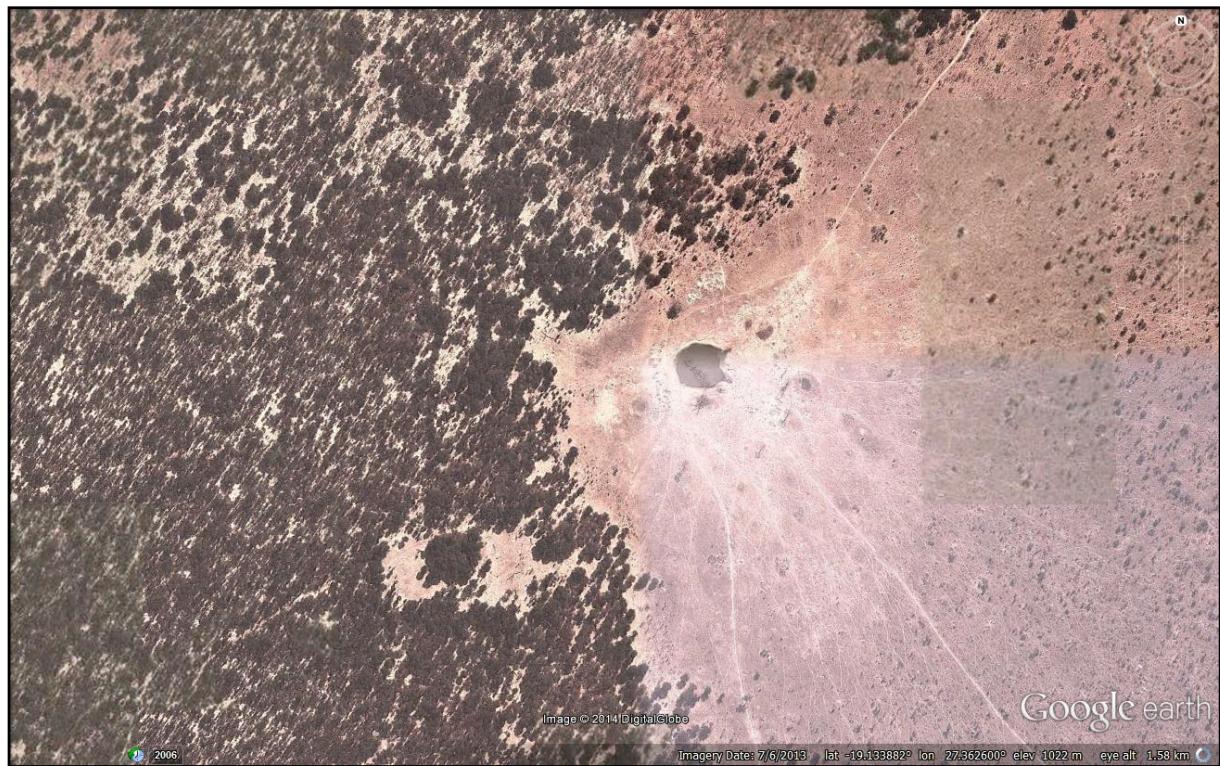
## WECAU



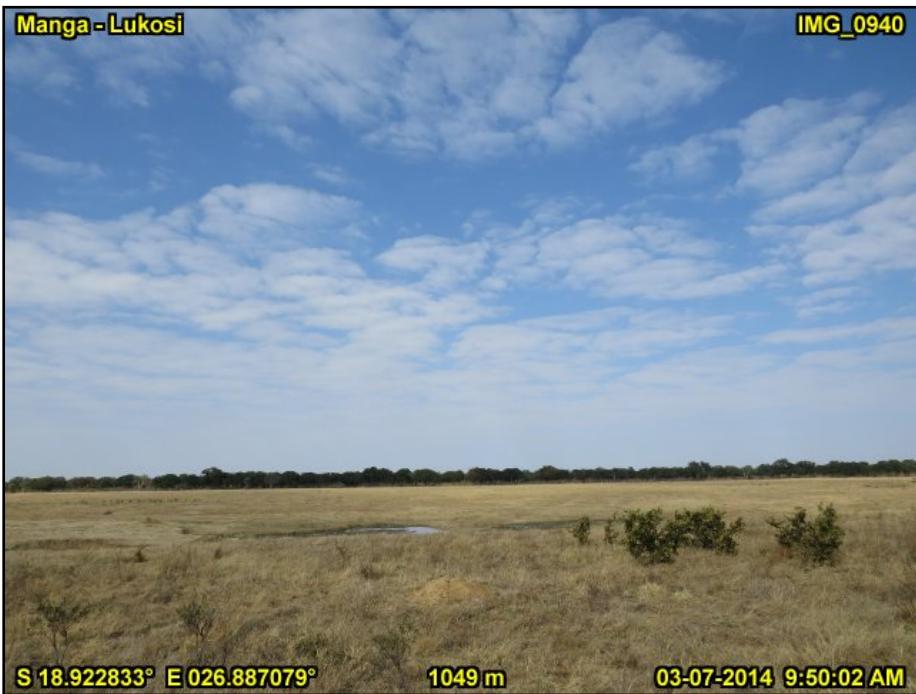
**Drilled:** 1963 (47m)

**Responsibility:**  
Wilderness

**Comments:** Is in front  
of Wecau anti-  
poaching camp



JAMBILI



**Drilled:** 1956 (60m)

## **Responsibility:** Friends of Hwange

**Comments:** In front of Jambili Picnic Site



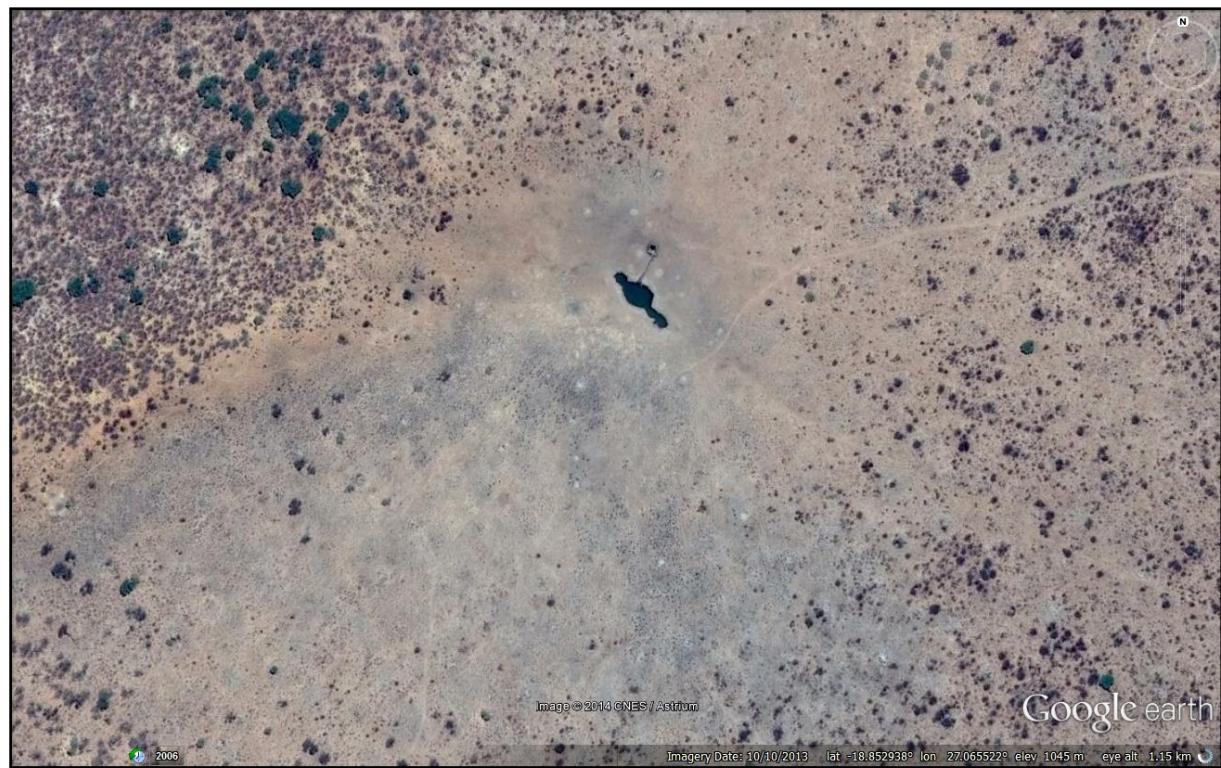
## SINANGA



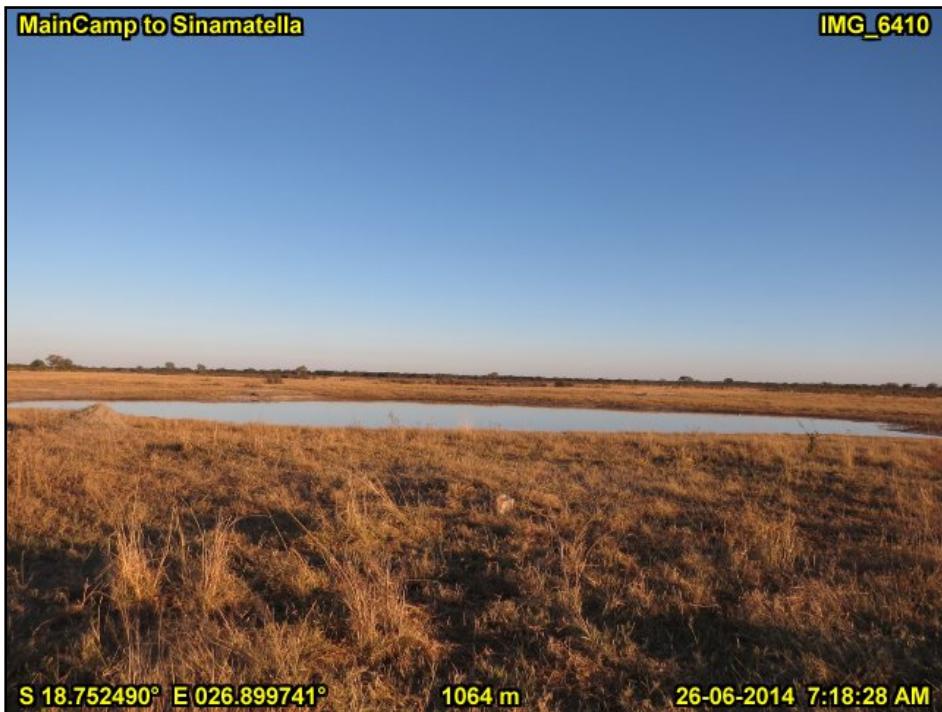
**Drilled:** 1973 (68m)

**Responsibility:**  
Friends of Hwange

**Comments:**



DOM



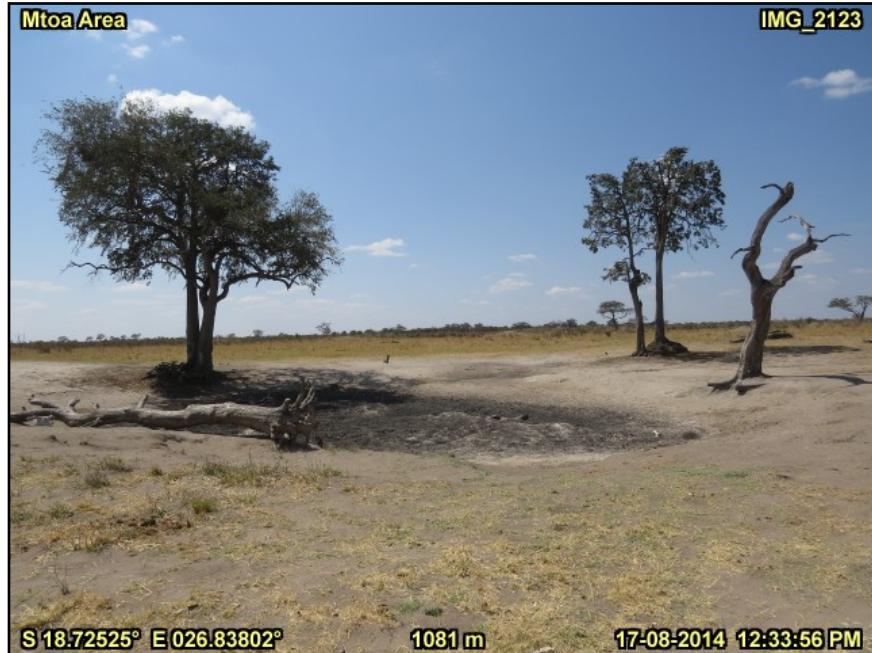
**Drilled:** 1936 (73m)

## **Responsibility: ZPWMA**

## **Comments:**



## TSHEBE TSHEBE



**Drilled:** 1968

**Responsibility:**  
Friends of Hwange

**Comments:** Is this  
being pumped in 2014



## LIVINGI



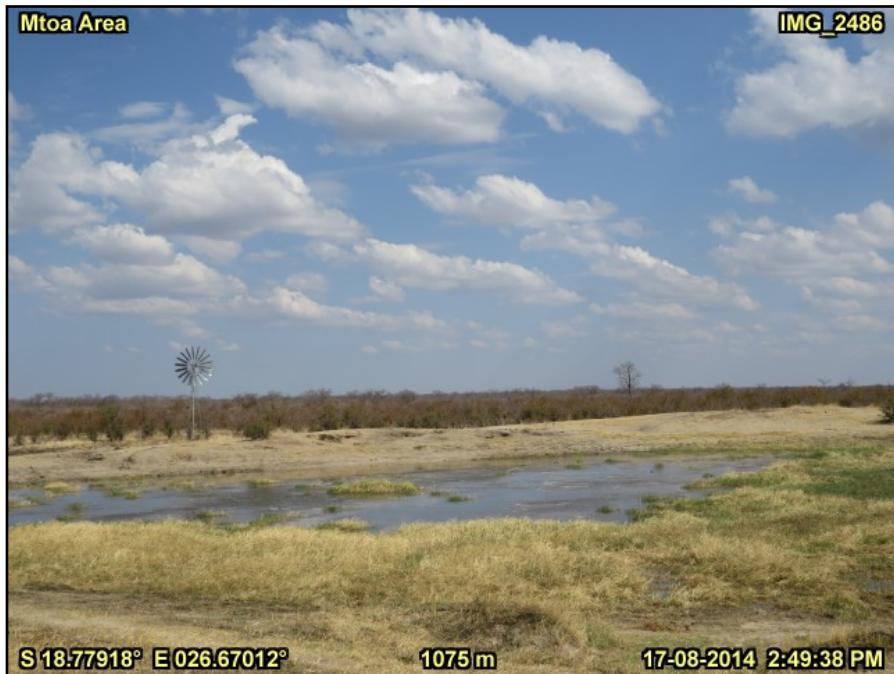
**Drilled:** 1973 (87m)

**Responsibility:**  
ZPWMA

**Comments:** On main road between Main Camp and Gate



## MABUYA MABENHA



**Drilled:** 1968 (78m)

**Responsibility:**  
Friends of Hwange

**Comments:**



## SHAPI



**Drilled:** 1936 (24m),  
1952

**Responsibility:**  
Friends of Hwange

**Comments:** Windmill  
fed



DANGA



**Drilled:** ?

## **Responsibility:** Nehimba

## **Comments:**



## NEHIMBA CAMP



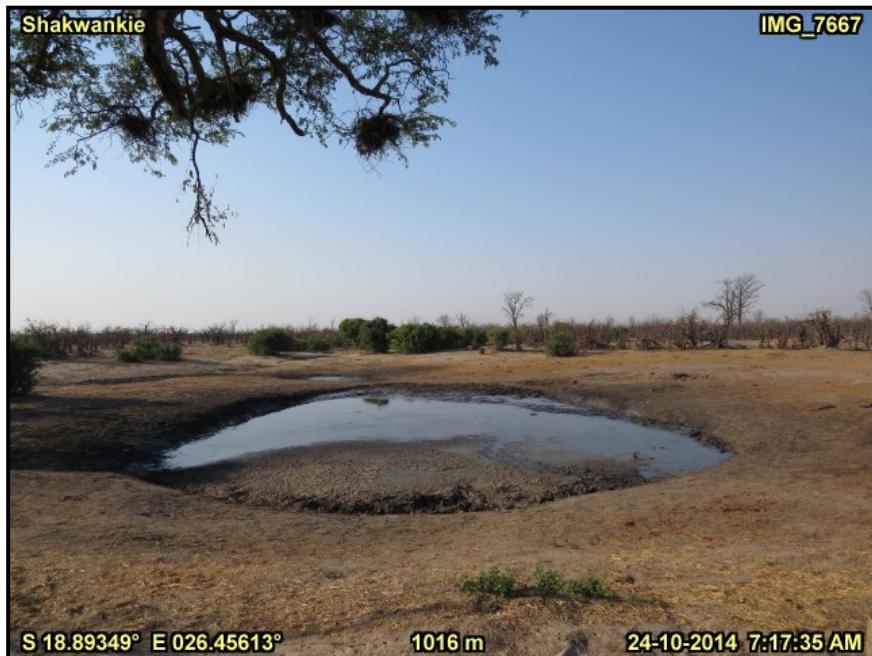
**Drilled:** Recent

**Responsibility:**  
Nehimba

**Comments:** In front of  
Nehimba Camp



## GRANNIES



**Drilled:** Recent

**Responsibility:**  
Nehimba

**Comments:** Has small  
platform



## THREE JOHNNIES



**Drilled:** Recent

**Responsibility:**  
Nehimba

**Comments:**



## SHUMBA



**Drilled:** 1936 (37m)

**Responsibility:**  
ZPWMA with assistance from Camp Hwange

**Comments:** In front of Shumba Picnic site.  
Has small platform



## CAMP HWANGE



**Drilled:** 2007?

**Responsibility:** Camp Hwange

**Comments:**  
Established in front of Camp Hwange



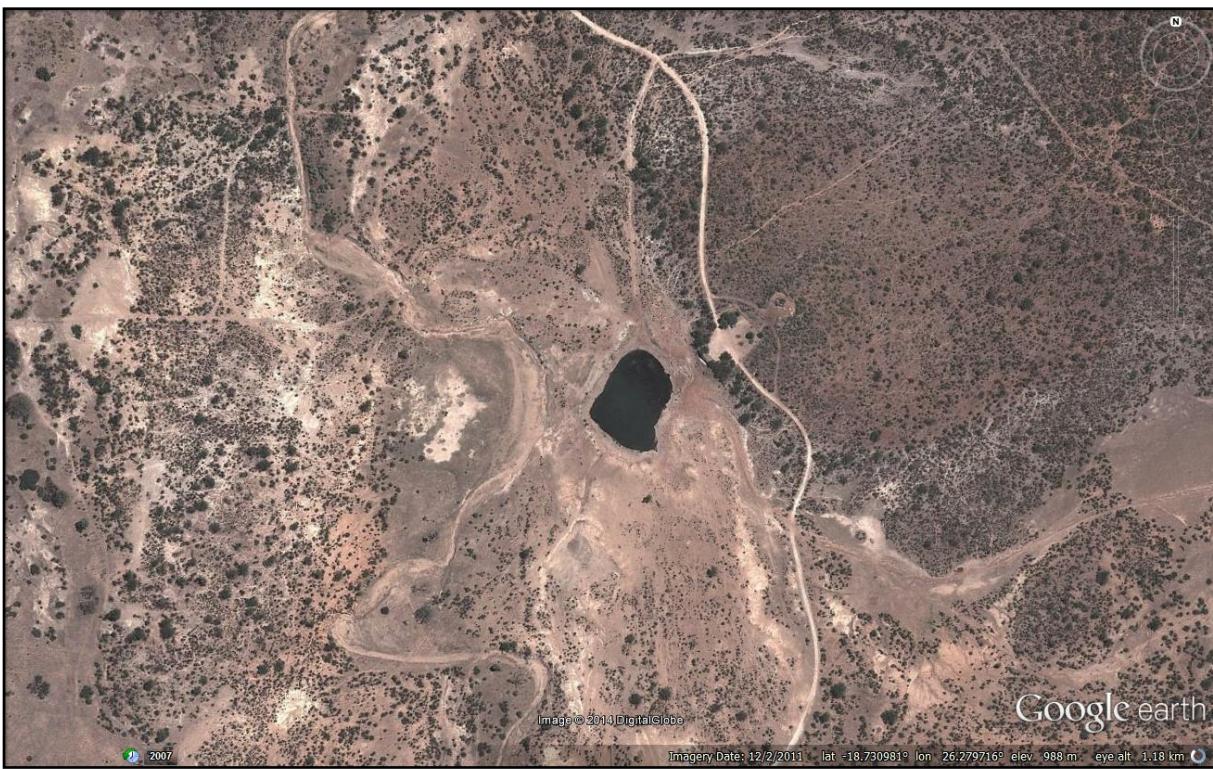
## MASUMA



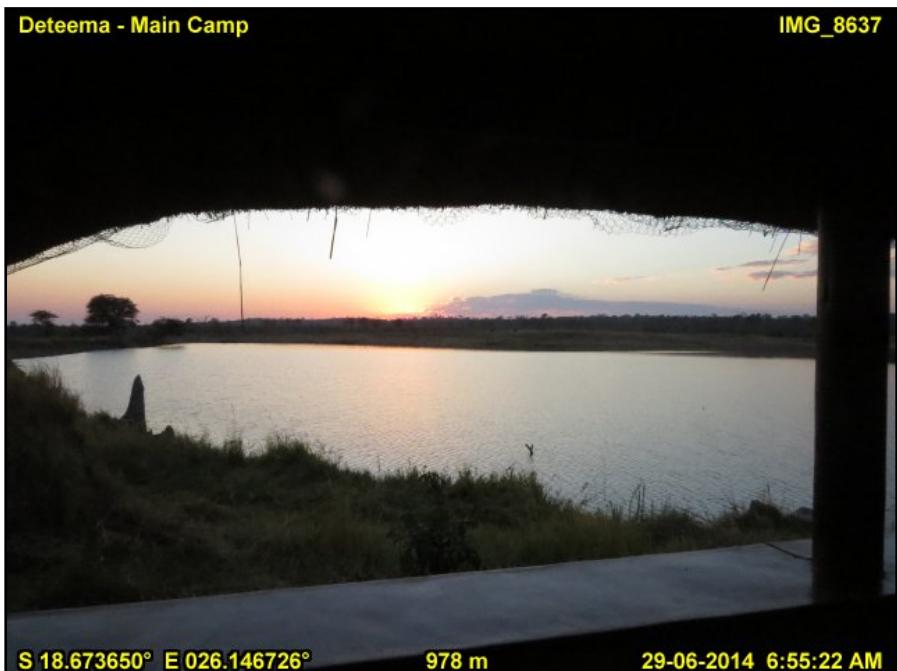
**Drilled:** 1936

**Responsibility:**  
ZPWMA (in association with Makomo)

**Comments:** dam established in 1936. Pumped to maintain levels



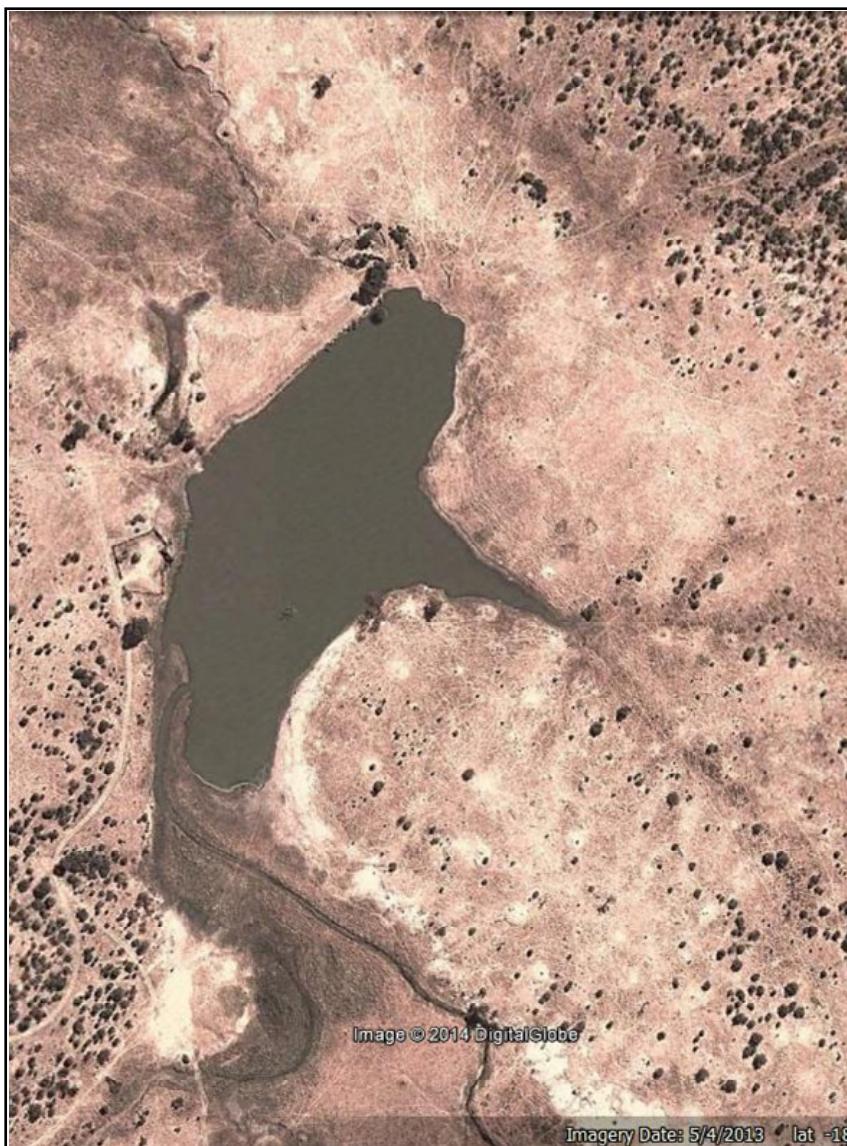
## DETEEMA DAM



**Drilled:** 1964 (44m)

**Responsibility:**

**Comments:** Dam established in 1938



## MANDAVU DAM



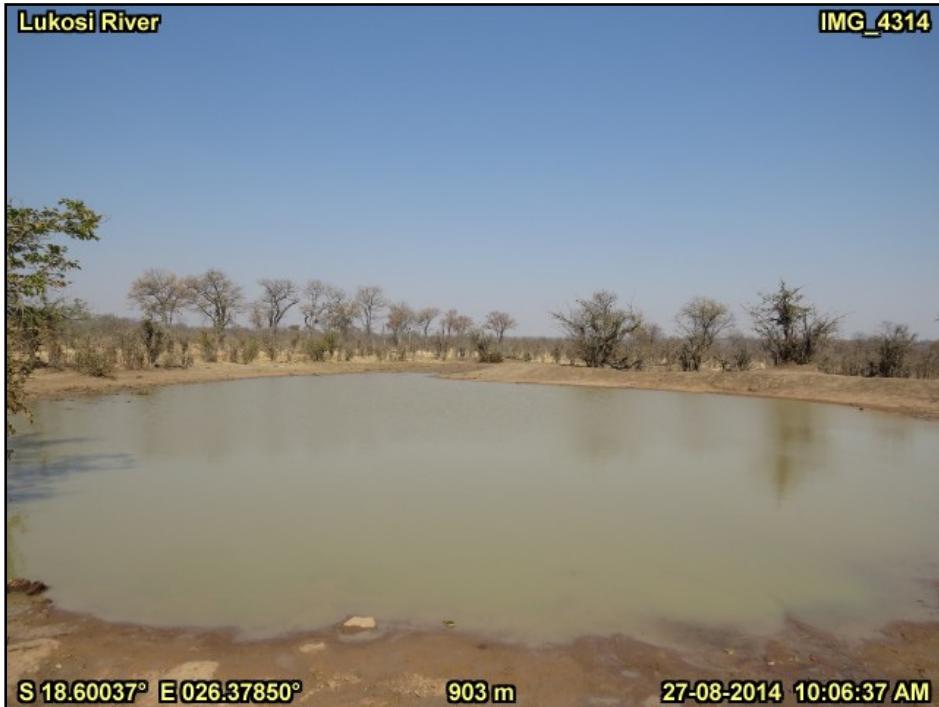
**Drilled:**

**Responsibility:**

**Comments:** Dam established in 1953



## BAOBAB



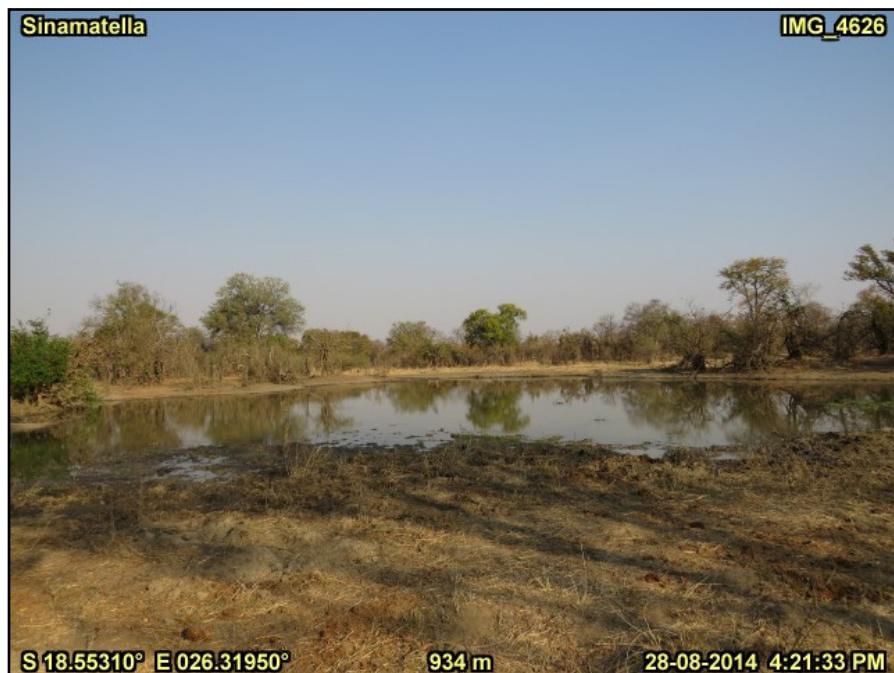
**Drilled:** 1969

**Responsibility:**  
ZPWMA

**Comments:** Pumped  
with solar installation  
donated by Bhejane  
Trust



## BOREHOLE 5



**Drilled:**

**Responsibility:**  
ZPWMA

**Comments:** Pumped  
using ZESA



## SALT PAN DAM



**Drilled:**

**Responsibility:**

**Comments:** Dam established in 1971



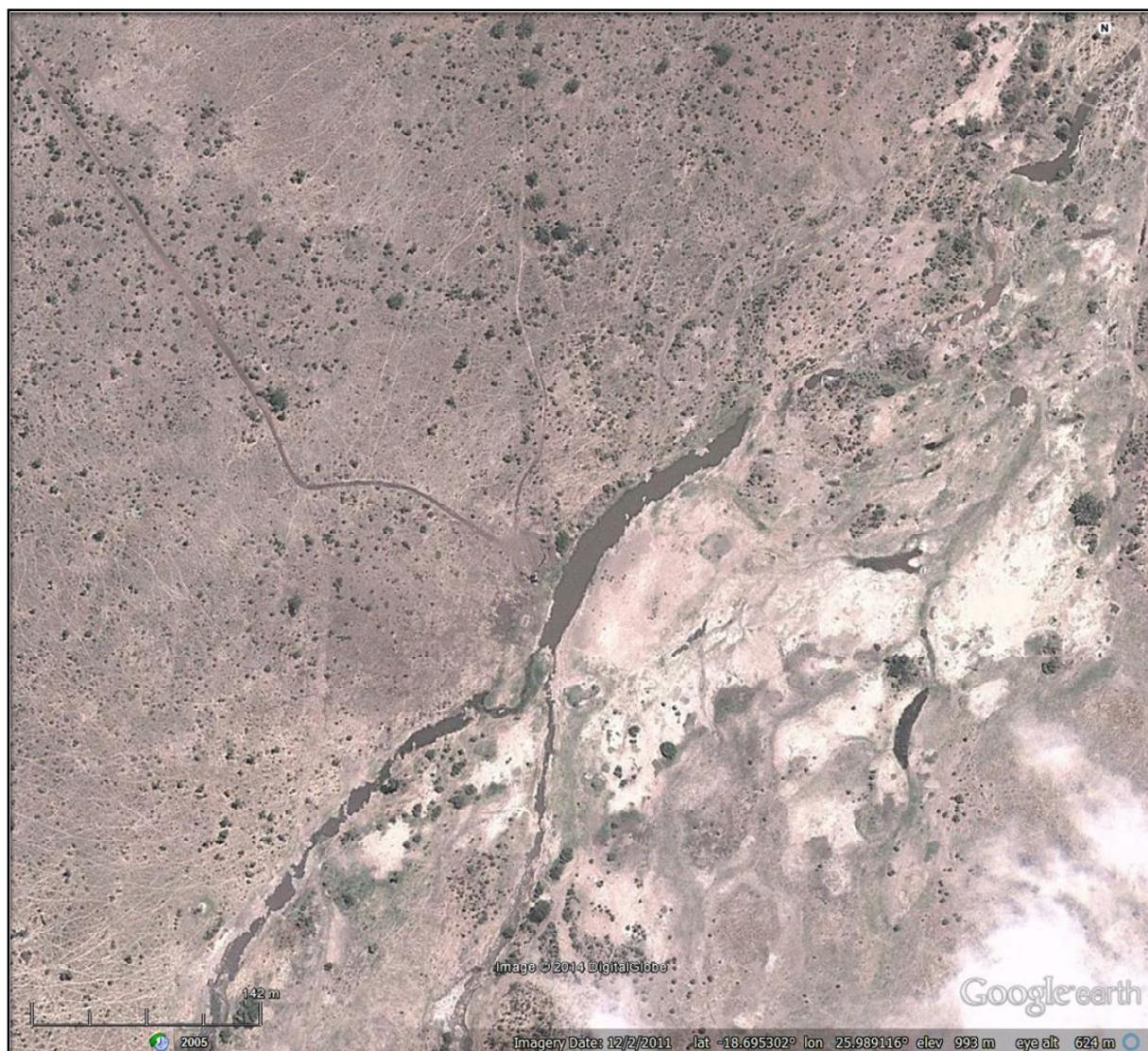
## BIG TOMS



**Drilled:** 1936

**Responsibility:**  
ZPWMA

**Comments:**



## LITTLE TOMS



**Drilled:** 1936

**Responsibility:**  
ZPWMA

**Comments:**



## JOSIVANINI



**Drilled:** 1965 (100m)

**Responsibility:**  
Imvelo Safaris

**Comments:** Site of an old scout camp. Now part of a tourism concession. Pumping starting 2014



## MAKONA



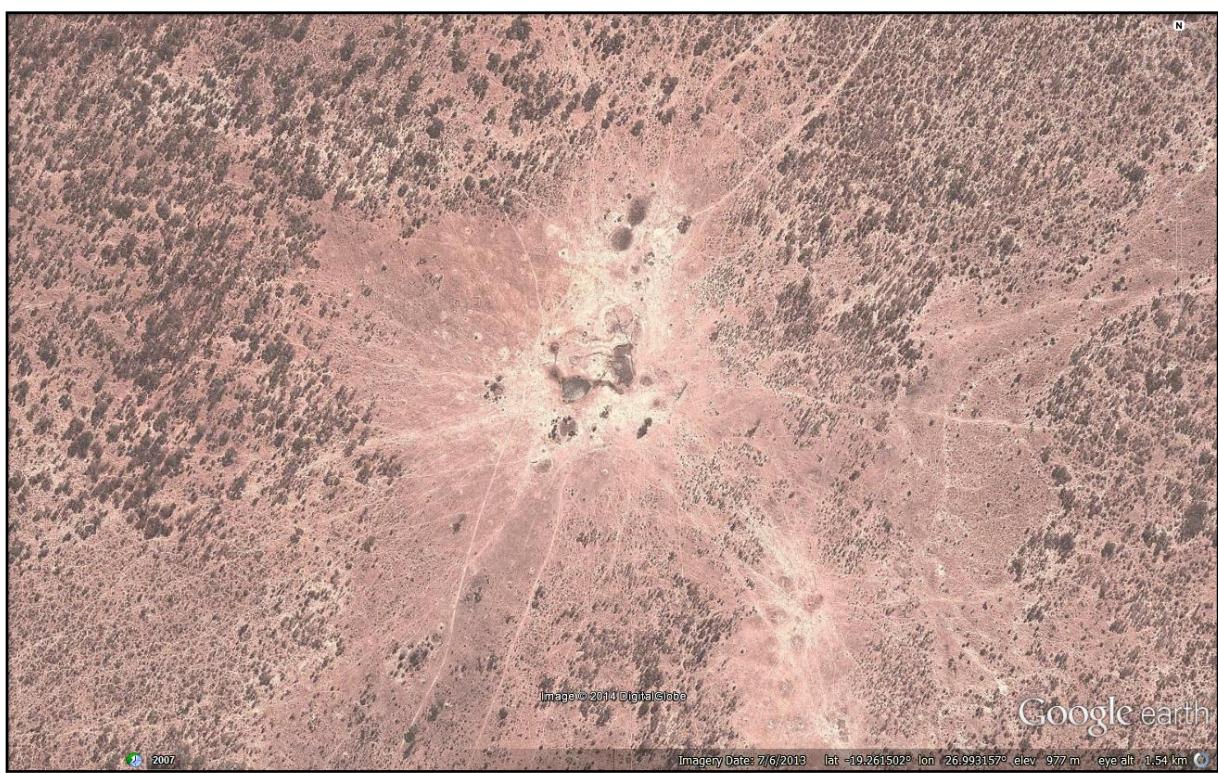
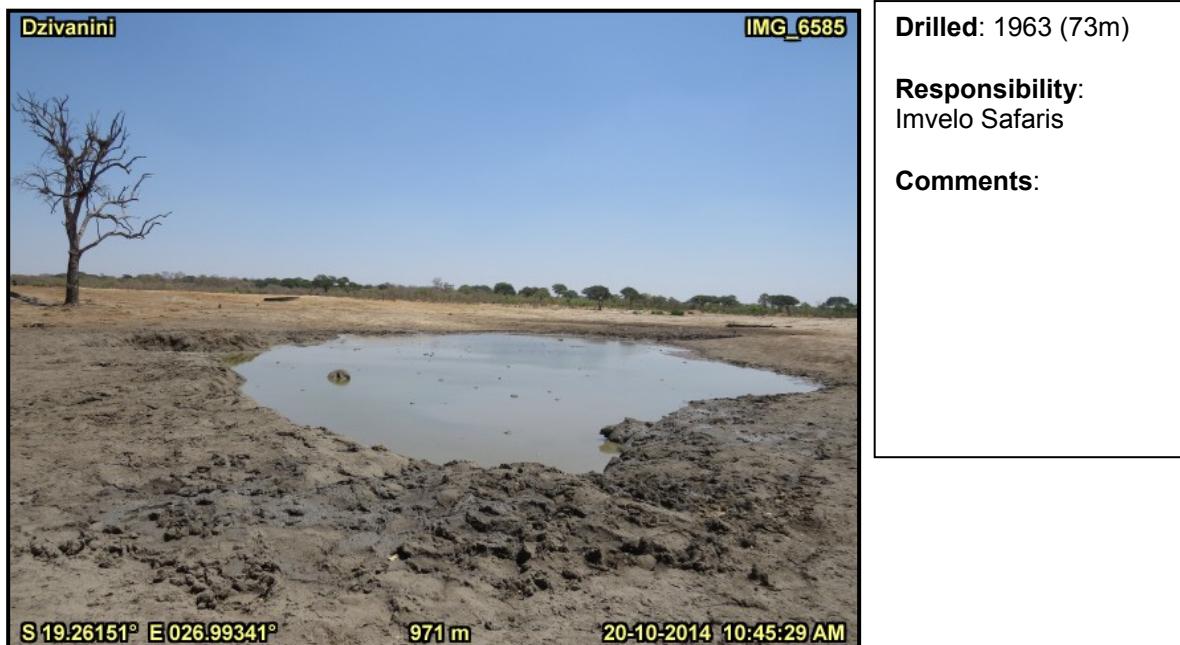
**Drilled:** 1963 (107 m)

**Responsibility:**  
Imvelo Safaris

**Comments:**  
Problematic hole.  
Makona station get water from another source



## SECHECHE



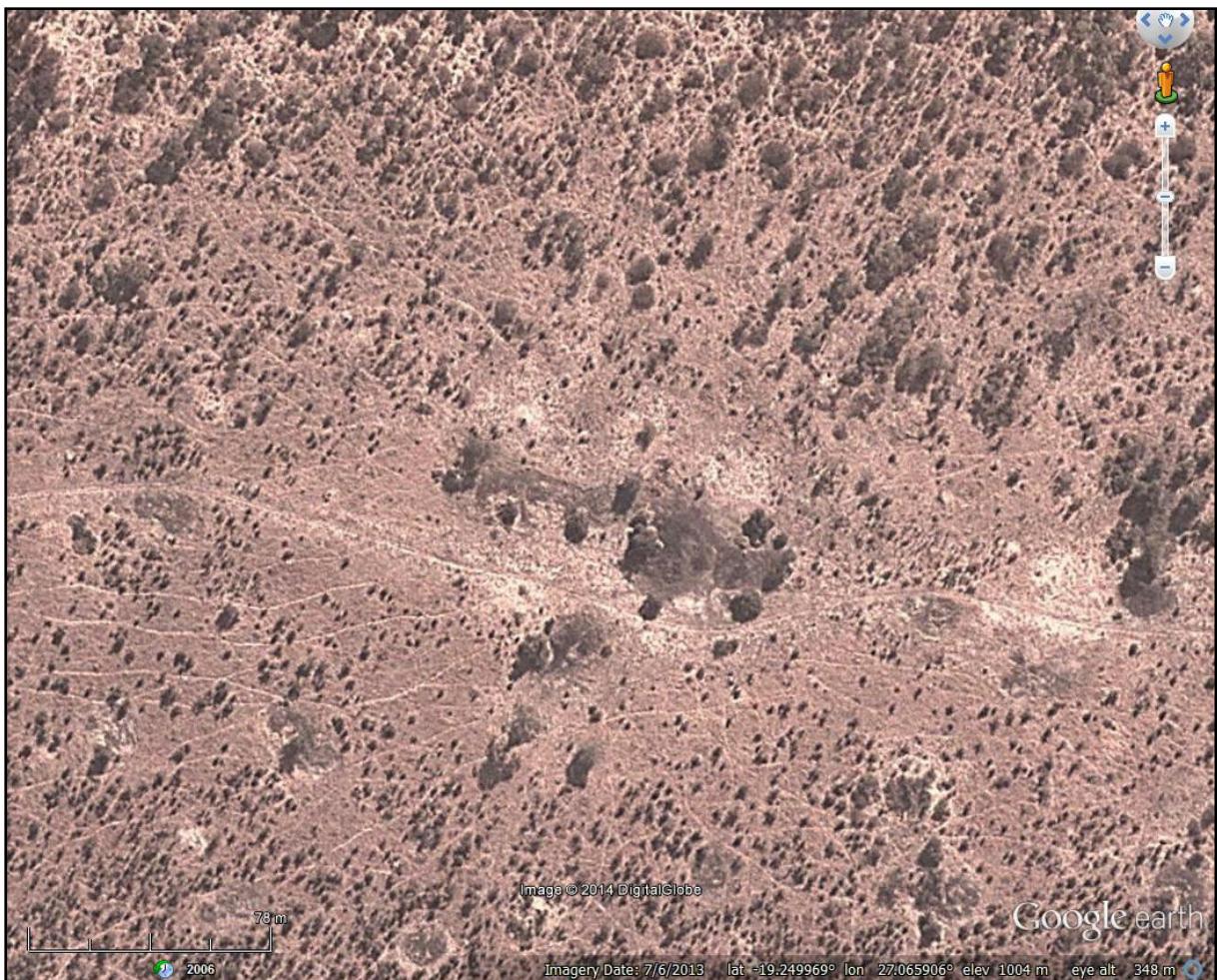
## MBAZAU



**Drilled:** 1963 (93m)

**Responsibility:**  
Imvelo Safaris

**Comments:**

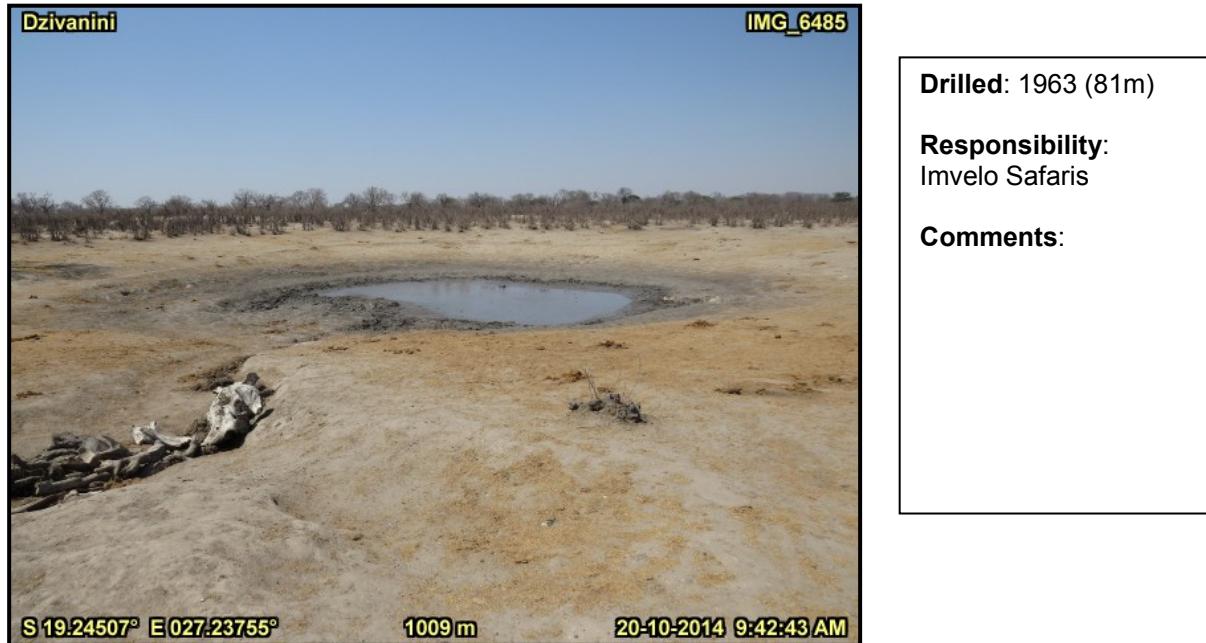


Imagery Date: 7/6/2013 lat -19.249969° lon 27.065906° elev 1004 m eye alt 348 m

Image © 2014 DigitalGlobe

Google earth

## MANDISEKA



## MPISA



**Drilled:** 2010?

**Responsibility:**  
Imvelo Safaris

**Comments:** Google  
image is prior to recent  
pumping



## MFAGAZANA

**Drilled:** 1963 (61m)

**Responsibility:**  
Imvelo Safaris

**Comments:**



## LEASHA DAM



**Drilled:**

**Responsibility:** Not pumped

**Comments:** Dam constructed 1965. Wall breached in centre but still holding water



## GOMO DAM



**Drilled:**

**Responsibility:** Not pumped

**Comments:** Dam constructed 1955. Breach to the side of the main wall



## ANNEX 11: REFERENCES

This reference list has been compiled from several sources. In many cases I did not have access to the original papers. I also was not able to locate some papers even when I did look for them. I think it would be a very valuable exercise to ensure that all of these documents are made available as digital files during the life of this plan.

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