TO:

ESKOM, RUSTENBURG

A HERITAGE IMPACT ASSESSMENT (HIA) FOR ESKOM'S NEW PROPOSED IKAROS INTEGRATION SCHEME IN THE RUSTENBURG DISTRICT OF THE NORTH-WEST PROVINCE OF SOUTH AFRICA

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ANNEXURE F

EXECUTIVE SUMMARY

The Ikaros Integration Scheme was divided into Main Corridors and into Subsidiary Corridors. Main Corridors consisted of the Ikaros Substation Stand, the Concentrator Deviation from the Main Corridor and the Main Corridor itself. Subsidiary Corridors were divided into power lines that were part of the Western Deviation and those that constituted the Eastern Deviation.

Heritage resource present in the Ikaros Integration Scheme included two Late Iron Age Complexes located along the 2^nd^ and 3^rd^ stretch of the Main Corridor; Late Iron Age sites and a modern cemetery. The Late Iron Age sites are located along the 4^th^ stretch of Part AB between the Eastern Deviation and the CCT Plant; the 3^st^ stretch of Part AB between the Eastern Deviation and the Spruitfontein Substation and the 2^nd^ stretch of Part AB between the Eastern Deviation and the Spruitfontein Substation. The modern cemetery is located along the 3^rd^ stretch of Part AB between the Eastern Deviation and the CCT Plant (Figure 1).

The heritage resources were tabulated (Table 1). Their levels of significance were determined as well as the degree of impact these resources have experienced in the past (past impact) or may experience in the future (possible future impact). Three levels of significance were used: high (3), medium (2) and low (1). These levels of significance were based on criteria such as ideological/symbolic value; the aesthetic nature; uniqueness; cultural historical significance; the state of preservation, and the research value of the different types of heritage resources.

<u>The corridors of most of the power lines do contain heritage resources</u>.

The two Late Iron Age Complexes can be considered to be of high significance. The Main Corridor may not impact on these complexes. The two complexes can be conserved under the Main Corridor if the pylons on the opposing ends of the two complexes are erected at a 'safe' distance from the complexes' perimeters (30m). Eskom must supervise the private contractor when construction of the pylons and the hanging of the power lines take place in order to ensure that the complexes are not damaged.

<u>If Eskom cannot unequivocally guarantee the unaffected existence of these two complexes under the Main Corridor, Eskom has to deviate the Main Corridor.</u>

The Late Iron Age sites along the 'Lynrandjes' have been impacted severely in the past. Eskom's development therefore can cause little further damage to these sites. However, it is possible for Eskom to avoid impacting of what have remained of these sites, as these sites are small and therefore easy avoidable (in comparison with the large Late Iron Age Complexes).

CONTENTS

1 INTRODUCTION

This document contains the report on the results of a Heritage Impact Assessment (HIA) study done for Eskom's new proposed Ikaros Integration Scheme near Rustenburg in the Central Bankeveld of the North-West Province of South Africa.

The Bankeveld is located, ecologically speaking, between the Bushveld (to the north) and the Highveld (to the south). For the purposes of this report, this ecozone is divided into the Western Bankeveld, the Central Bankeveld and the Eastern Bankeveld. The Western Bankeveld is the area around Zeerust, Marico and Swartruggens in the far North-West. The Central Bankeveld includes the areas around Rustenburg, Marikana and Brits. The Eastern Bankeveld is the area to the east of Pretoria and includes the Middelburg district as far as Belfast and Roossenekal.

The Bankeveld as a whole has a rich archaeological heritage comprised of remains dating from the prehistoric and the historical (or colonial) periods of South Africa. Prehistoric and historical remains in the Bankeveld form a record of the cultural heritage of most groups living in South Africa today. Various types and ranges of heritage resources as outlined in the National Heritage Resources Act (Act No 25 of 1999) occur in this region (see Box 1, next page).

BOX 1: TYPES AND RANGES OF HERITAGE RESOURCES AS OUTLINED IN THE NATIONAL HERITAGE RESOURCES ACT (ACT NO 25 OF 1999)

The National Heritage Resources Act (Act No 25 of 1999, Art 3) outlines the following types and ranges of heritage resources that qualify as part of the national estate, namely:

(a) places, buildings structures and equipment of cultural significance;
(b) places to which oral traditions are attached or which are associated with living heritage;
(c) historical settlements and townscapes;
(d) landscapes and natural features of cultural significance;
(e) geological sites of scientific or cultural importance;
(f) archaeological and paleontological sites;
(g) graves and burial grounds including-
  (i) ancestral graves;
  (ii) royal graves and graves of traditional leaders
  (iii) graves of victims of conflict
  (iv) graves of individuals designated by the Minister by notice in the Gazette;
  (v) historical graves and cemeteries; and
  (vi) other human remains which are not covered by in terms of the Human Tissue Act, 1983 (Act No 65 of 1983)
(h) sites of significance relating to the history of slavery in South Africa;
(i) moveable objects, including -
  (i) objects recovered from the soil or waters of South Africa, including archaeological and paleontological objects and material, meteorites and rare geological specimens;
  (ii) objects to which oral traditions are attached or which are associated with living heritage;
  (iii) ethnographic art and objects;
  (iv) military objects;
  (v) objects of decorative or fine art;
  (vi) objects of scientific or technological interest; and
  (vii) books, records, documents, photographs, positives and negatives, graphic, film or video material or sound recordings, excluding those that are public records as defined in section 1(xiv) of the National Archives of South Africa Act, 1996 (Act No 43 of 1996).

The National Heritage Resources Act (Act No 25 of 1999, Art 3) also distinguishes nine criteria for places and objects to qualify as 'part of the national estate if they have cultural significance or other special value ...'. These criteria are the following:

(a) its importance in the community, or pattern of South Africa's history;
(b) its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
(c) its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
(d) its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
(e) its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
(f) its importance in demonstrating a high degree of creative or technical achievement at a particular period;
(g) its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
(h) its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa;

2 AIM OF THIS REPORT

Eskom intends to develop several new power lines on parts of the farms Kookfontein 265 JQ, Beerfontein 263JQ, Turffontein 262JQ, Uitvalgrond 105JQ and Doornspruit 106JQ in the Rustenburg district of the North-West Province of South Africa. In order to comply with legislation, Eskom requires knowledge of the presence, relevance and the significance of any heritage resources that may occur in the study area. Eskom needs this information in order to take pro-active measures with regard to any heritage remains that may be affected by the new development as such remains may be affected, damaged or destroyed when the various new power lines are build. Eskom therefore commissioned me to undertake a Heritage Impact Assessment (HIA) study of the study area to be affected by the proposed development. The aim of the HIA study is:

- to establish whether any heritage resources do occur in or near the proposed new power line corridors and, if so, what the nature, the extent and the significance of these remains are;
- to determine whether such remains will be affected by the proposed new power lines; and
- to evaluate what appropriate actions could be taken to reduce the impact of the building of the new power lines on such remains.

3 METHODOLOGY

3.1 A survey on foot

The main critical areas (corridors) relevant to Eskom's new proposed Ikaros Integration Scheme were subjected to a survey on foot. The main corridors were divided into subsidiary corridors that were also reconnaissance on foot. The different corridors were divided into different stretches (or parts) that were subjected to a survey on foot. These stretches of power lines are outlined and discussed in detail in Part 5 of this report.

3.2 Databases and literature survey

Information derived from databases kept and maintained at institutions such as the South African Heritage Resources Agency (SAHRA) and the National Cultural History Museum in Pretoria were used to determine whether any heritage remains have been identified in or near the critical areas (corridors).

A survey of literature relating to the cultural and historical context of the study area was also undertaken in order to establish whether any heritage remains of significance occur in or near the study area (see Part 5.3).

The author of this report also has completed several impact assessment studies in the Rustenburg District and is therefore not totally unacquainted with the region in which the development is planned. Several impact assessment studies have been done close to where this study has been conducted (see 'Selected Bibliography', Part 9).

3.3 Assumptions and limitations

It must be kept in mind that cultural heritage surveys may not detect all heritage resources in any given study area. While certain remains may simply be missed during surveys (observations), others may occur below the surface of the earth and may only be exposed once development (such as the digging of holes for pylons) commences.

The author of this report has done several HIA studies in the immediate surroundings of the study area and is therefore not totally unacquainted with the broader area in which the development is planned (see 'Selected Bibliography', Part 9).

The possible presence of heritage resources in the study area can therefore to a certain extent be predicted on the basis of the archaeologist's experience, gained through years of fieldwork, in this particularly area. However, heritage resources at times appear in the most unexpected places. It must also be kept in mind that heritage surveys may not detect all heritage resources in any given study area. While certain remains may simply be missed during surveys (observations), others may occur below the surface of the earth and may only be exposed once development (such as mining) commences.

3.4 **Some remarks on terminology**

The cultural heritage assessment referred to in the title of this report includes a survey of heritage resources as outlined in the National Heritage Resources Act (Act No 25 of 1999).

Cultural heritage (or cultural resources) includes all human-made phenomena and intangible products that are the result of the human mind. Natural, technological or industrial features may also be part of heritage resources, as places that have made an outstanding contribution to the cultures, traditions and lifestyles of the people or groups of people of South Africa.

The term 'pre-historic' generally refers to the time before any historical documents were written or any written language developed in a particular area or region of the world. The historical period and historical remains refer, for the Rustenburg area, to the first appearance or use of 'modern' Western writing brought to Rustenburg by the first Colonists who settled in this area c. 1840. The historical period for the Rustenburg area therefore dates from c. 1840.

The term 'relatively recent past' refers to the 20th century. Remains from this period are not necessarily older than sixty years and therefore may not qualify as archaeological or historical remains. Some of these remains, however, may be close to sixty years of age and may, in the near future, qualify as heritage resources.

It is not always possible, based on observations alone, to distinguish clearly between archaeological remains and historical remains, or between historical remains and remains from the relatively recent past. Although certain criteria may help to make this distinction possible, these criteria are not always present, or, when they are present, they are not always clear enough to interpret with great accuracy. Criteria such as square floor plans (a historical feature) may serve as a guideline. However, circular and square floors may occur together on the same site.

The term 'sensitive remains' is sometimes used to distinguish graves and cemeteries as well as ideologically significant features such as holy mountains, initiation sites or other sacred places. Graves in particular are not necessarily heritage resources if they date from the recent past and do not have tombstones that are older than sixty years.

The term 'Stone Age' refers to the prehistoric past, although Late Stone Age peoples lived in the area well into the historical period. The Stone Age is divided into an Earlier Stone Age (3 million years to 150 000 thousand years ago) the Middle Stone Age (150 000 years to 40 000 years ago) and the Late Stone Age (40 000 years to 200 years ago).

The term 'Late Iron Age' refers to the period between the 17th century and the 19th century and can therefore include the historical period.

The term 'study area' or 'project area' refers to the area where Eskom wants to focus its development activities.

The 'critical areas' refer to the areas (or corridors) that will be affected by Eskom's proposed development project.

The 'peripheral area' refers to the area where Eskom does not intend to focus its development activities, but which are in close proximity to the critical areas (or corridors).

Phase I studies refer to surveys using various sources of data in order to establish the presence of all possible types of heritage resources in any given area.

Phase II studies include in-depth cultural heritage studies such archaeological mapping and excavating work, the documenting of rock art sites, engraving sites or historical dwellings and other architectural features and structures, the sampling of archaeological sites or shipwrecks, etc. Phase II work requires the co-operation and approval of SAHRA.

4 THE STUDY AREA

4.1 Location

Eskom's new proposed Ikaros Integration Scheme is located in the great divide between the town of Rustenburg (in the west) and the Thaba-ea-Maralla range of mountains in the east. This range of mountains separates Rustenburg from Marikana and is also called the 'Lynrandjes' near its southern tail. The Thaba-ea-Maralla range of mountains is host to hundreds of Late Iron Age sites mostly associated with the Iron Age Fokeng people who occupied this range of mountains, possibly from as early as the 17^{th} century onwards.

The new proposed routes for the various power lines that contribute to the Ikaros Integration Scheme are mainly confined to the farms Paardekraal 297JQ and Waterval 303JQ as well as a piece of land known as August Mokgatle which belongs to the Fokeng people. Further to the east the Ikaros Integration Scheme extends onto the farms Hoedspruit 298JQ, Brakspruit 299JQ and Spruitfontein 341JQ (1: 50 000; Rustenburg East 2527CB).

4.2 The nature of the study area

The western part of the study area incorporates the farms Paardekraal 297JQ and Waterval 303JQ, which are both covered with a wide range of development activities. The eastern part of the study area consists of the August Mokgatle piece of land, which is still in a pristine condition. The farms Hoedspruit 298JQ, Brakspruit 299JQ and Spruitfontein 341JQ constituting the south-eastern part of the study area are increasingly encroached by mining infrastructure. Large parts of these farms are also covered with agricultural fields.

The different power lines that constitute the Ikaros Integration Scheme are located between several mines with their infrastructure associated with the mining and the processing of platinum. This infrastructure includes: buildings; head gear of shafts; rock waste, slimes and tailings dams; towers rising above shafts and ventilation shafts; primary (tar) and secondary (dirt) roads; reservoirs; etc. Other infrastructure in the area include telecommunications masts; railroad lines with service roads; overhead lines such as telephone and power lines; mining compounds; a mining club house, etc. Old abandoned agricultural fields are scattered between these infrastructure.

The study area also incorporates several formal and informal settlements located in the midst and on the boundaries of platinum mining activities.

The Ikaros Substation and the main stem of the power lines emerging from the Substation run across August Mokgatle's which is a pristine piece of land. This part of the study area also contains some of the foothills of the Thaba-ea-Maralla range of mountains further to the east. Only one main river, namely the Hex River cuts across the western perimeter of the study area, running from the Magaliesberg in the south to the Bospoortdam in the north. Numerous smaller rivers and spruits criss-cross the study area.

Figure 1 - Eskom's new proposed Ikaros Integration Scheme in the Rustenburg District of the North-West Province covers farms such as Paardekraal 297JQ, Waterval 303JQ and August Mokgatle's. In the southeast the study area covers farms such as Hoedspruit 298JQ, Brakspruit 299JQ and Spruitfontein 341JQ.

The presence of two late Iron Age Complexes, Late Iron Age sites and a modern cemetery are indicated on the map.

4.3 Brief historical context of the Ikaros Integration Scheme's study area

The following types and ranges of heritage resources may occur in or near the various power line corridors that are planned for the Ikaros Integration Scheme.

4.3.1 Stone Age sites

Stone Age sites are usually associated with stone artefacts usually found scattered on the surface or as part of deposits in caves and rock shelters. The Stone Age is divided into the Early Stone Age, the Middle Stone Age and the Late Stone Age. The Early Stone Age covers the period from 2.5 million years ago to 250 000 years ago. The Middle Stone Age refers to the time period from 250 000 years ago to 22 000 years ago and the Late Stone Age is the period 22 000 years ago to 2 000 years ago. Each of these 'ages' are divided into different 'cultural' periods, which may differ chronologically or which may have existed roughly simultaneous in different regions and therefore under different climatic conditions in South Africa.

The Ikaros Integration Scheme's study area is not known to contain significant numbers of Stone Age sites from any of the different periods identified for the Stone Age. This little information about Stone Age sites can partly be attributed to a lack of archaeological surveys done in this part of South Africa. Stone Age sites are numerous all over South Africa and tend to crop up even where the presence of humans in the past was not remotely expected.

4.3.2 Late Iron Age, historical period and remains from the recent past

The oldest legends state that the Fokeng entered the Transvaal through Tweedepoort, under the leadership of Nape, the earliest known Fokeng chief. This was before c. 1700 AD. The group moved south-eastwards and settled on the banks of the Elands River (Kgetleng). Fokeng groups detached them from the main branch and moved southwards on different occasions settling along the Maralla-a-Nape mountain range (the eastern fringes of Impala's leasing area) at various places such as Serutube, Marakana, Tsitsing (Kanana), Thekwane and Photsaneng (or Bleskop) when they arrived in the Rustenburg district, from as early as the 17^{th} century. Simultaneously, other clans occupied Phokeng, the original town lands of what later became Rustenburg and the foothills of the Magaliesberg. The Fokeng then gradually expanded their influence and presence over the great divide between the Magaliesberg in the west and the Maralla-a-Nape mountain range in the east.

It is therefore clear that the Ikaros Integration Scheme's study area contains the remains of numerous Fokeng families and clans who lived scattered over the countryside, close to granite outcrops and mountains from as early as the Late Iron Age sites (17the century to the 19^{th} century), during the historical period (second half of the 19^{th} century to the 20^{th} century) and during the more recent past (the last sixty years). The descendants of these early Fokeng clans today still inhabit many of the 'modern' towns and townships that exist in the great divide between the Magaliesberg and the Maralla-a-Nape mountain range.

At least two mountains in the Maralla-a-Nape range are associated with rulers named in the Fokeng's genealogy. Malejane Mountain is the burial place of Diale, who ruled during the early 18^{th} century while Nape Mountain further to the north of the Bospoort dam was the place were Nape ruled when the Fokeng settled in the Rustenburg district. Other prominent mountains in this range include Mafothelo, Soding and Pelane to the north of Mmatshetshele and Motanyane and Malejane Mountain to the south of Mmatshetshele Mountain. Modern settlements with predominantly Tswana-speaking people living close to the Mmatshetshele Mountain are Serutube, Marakana and Kanana. A foot survey done in 1999 revealed the presence of a large number of Late Iron Age sites, historical sites and remains dating from the recent past (such as graves) along this range of mountains. Extensive excavations on

Mmatshetshele Mountain during 1998 and 1999 indicated that ancestors of the Fokeng occupied these sites during the 17th century.

One of Mzilikazi's villages was discovered in the foothills of the Magaliesberg, opposite Thlabane-West in 1997. Charles Bell (one of the first white men to visit the former Transvaal) painted this village in 1835 when Andrew Smith's expedition moved along the foothills of the Magaliesberg through Rustenburg *on route* to the Crocodile River near Brits. This route along the western fringes of Impala's leasing area served as the first route to be used by (white) traders (Schoon and McLuckie), missionaries (Robert Moffat), scientists (Andrew Smith) and hunters (Cornwallis Harris) who visited the central parts of the trans-Vaal before the Voortrekkers moved northwards during the second half of the 19th century.

4.3.3 **Remains relating to mining heritage**

The discovery of platinum in South Africa dates back to the late 19th century. In 1892, William Bettel identified osmium-iridium alloy particles in concentrate from the Witwatersrand gold mines. Bettel (1902) and Hall and Humphrey (1908) also recorded the presence of platinum in the chromatite layers of the Bushveld Complex. Wagner (1924) reported the presence of sperrylite in the ore bodies at Vlakfontein near the Pilanesberg. However, none of these discoveries were considered to be of any economic significance. The first deposits that were economically viable (called the Waterberg Platinum) were found by Adolf Erasmus in the Rooiberg fellsites between Nylstroom and Potgietersrust. These deposits did not prove to be significant. Andries Lombaard's discovery of platinum nuggets in the Moopetsi River on the farm Maandagshoek in the Steelpoort area in 1924 can be considered the initial discovery of the Merenky Reef.

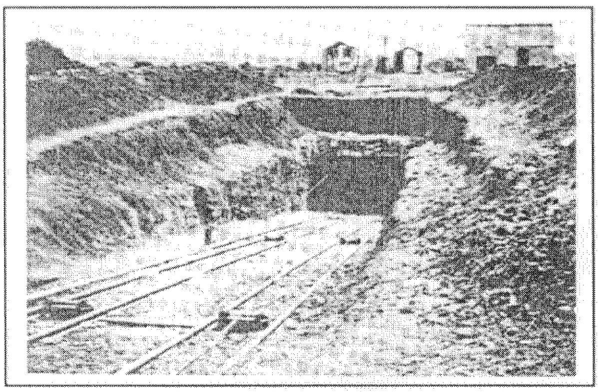
The Merensky Reef occurs, geographically, in the westerly and the easterly parts of the Bushveld Complex. These two limbs of the Complex are confined to the North-West Province and to the Northern and the Mpumalanga Provinces of South Africa. The Merensky Reef has been traced for a total distance strike extent of 283km, 138 kilometres of which is in the eastern limb and 145 kilometres in the western limb of the Bushveld Complex. Vertical depths of 1 900m have been registered along the Reef, which also indicates its continuity. The eastern limb of the Reef is geologically less well known than the western limb, because mining activities in this part of the Reef have been limited.

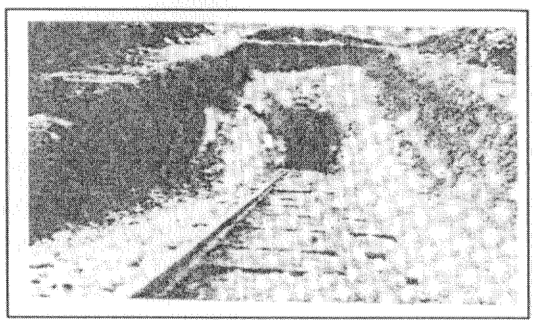
During the great platinum boom of 1925 over fifty companies were started in the Union of South Africa to exploit the mineral resources of the Bushveld Complex and the Waterberg district. Oxidized ores were initially taken from the Merensky Reef. When these ores had been exhausted, they were replaced by sulphide ores.

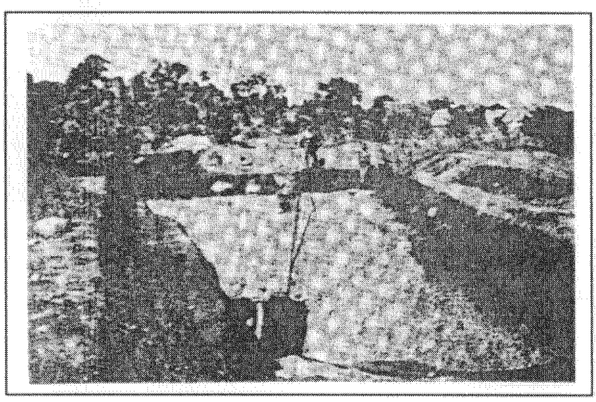
The world's consumption of platinum and its price became extremely depressed which lead to the collapse of all the mining companies in the 1930's. Many of the companies faded from memory. Only two companies remained and amalgamated namely Rustenburg Platinums Ltd. This mine remained in production until the 1970's when three other companies developed mines to join the platinum market, which again experienced a boom. More prosperous companies absorbed others, while some companies transferred their activities from the Lydenburg district to the more favourably circumstanced Rustenburg district, while retaining their Lydenburg properties.

Remains associated with old platinum mining activities still exist. These include shafts, headgear, infrastructure and even underground workings. Access to underground platinum mines could be gained through incline shafts or adits dug into kopjes or into the level ground, at a slight angle.

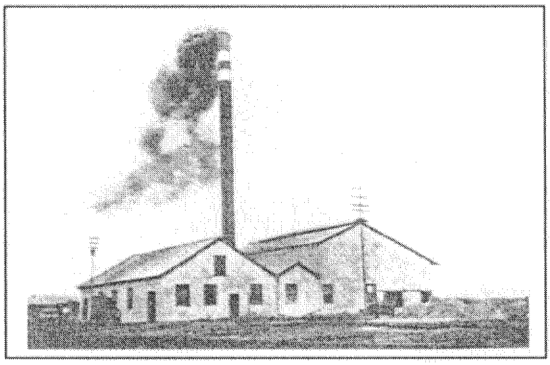
Incline shafts into the Kroondal-Klipfontein, the Schilpadnest and the Waterval Platinum Mines, all located in Rustenburg in the 1920's, can be seen below (Wagner 1973:96, 128).

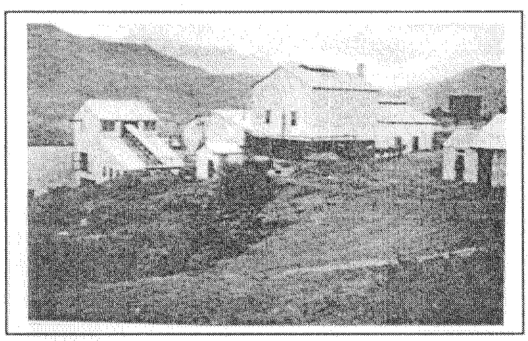


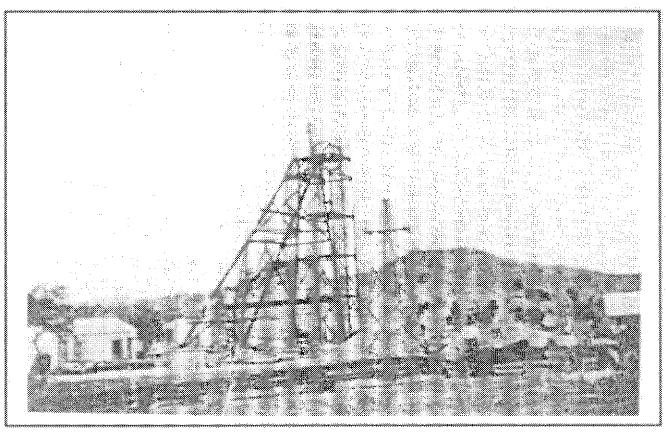




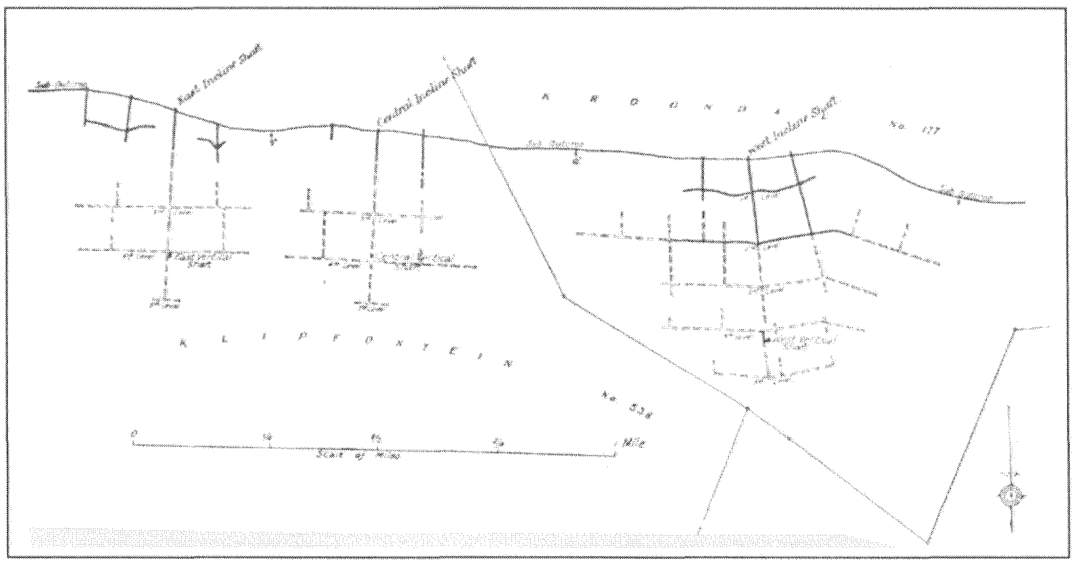
The infrastructure of early 20th century platinum mines consisted mainly of cement and brick buildings covered with corrugated iron. Important plants included treatment plants (Onverwacht Mine in Lydenburg, left, below), power plants (Kroondal in Rustenburg, middle) as well as mills. Other conspicuous structures were the towering headgear of vertical shafts (Mooihoek Mine in Lydenburg (far below) (Wagner 1973:78, 96).







Underground platinum workings that qualify as heritage remains today still exist. Note a section across the underground workings of an early 20th century platinum mine in Rustenburg that existed until recently (below).



4.4 Possible heritage resources in and near Eskom's study area

The National Heritage Resources Act (Act No 25 of 1999) outlines various types and ranges of heritage resources that qualify as part of South Africa's national estate. Considering the brief historical context of the Ikaros Integration Scheme it is possible that three of these types of heritage resources in particular may occur in or near the power lines that are planned for the new Ikaros Integration Scheme, namely:

- stone tools from any of the Stone Age periods;

- remains dating from the Late Iron Age (AD 1600 to 1880);

- remains relating to the earliest platinum mining in the Rustenburg area (1920's to 1930's); and

- remains dating from the more recent past such as dwellings or homesteads associated with single graves or with small cemeteries.

5 NATURE AND EXTENT OF THE NEW PROPOSED IKAROS INTEGRATION SCHEME

Eskom's new proposed Ikaros Integration Scheme is intimately associated with the Western Limb of the Merensky Reef currently exploited by Amplats, Implats and Lonmin some of the biggest platinum mining groups in South Africa. All the power lines constituting the Ikaros Integration Scheme are spread out over the farms Paardekraal 297JQ and Waterval 303JQ (in the west), August Mokgatle's (in the east) and Hoedspruit 298JQ, Brakspruit 299JQ and Spruitfontein 341JQ (in the south-east).

The majority of the new proposed power lines are situated in the midst of Amplats' platinum mining activities whilst the Ikaros Main Corridor leaving the Substation and the Ikaros Substation itself extend beyond the boundaries of these mining activities into pristine veldt (Figure 1).

5.1 Route options and the HIA study

The HIA study was conducted along five main corridors and several subsidiary corridors situated between the Ikaros Substation in the north and the eastern and western extremities of the study area. The Ikaros Substation was another critical area that was subjected to the HIA study. All the main and subsidiary corridors were considered equally important for the purposes of the HIA although the main and lesser corridors differ in width, subsequently having greater or lesser impact on any possible heritage resources that may occur in or near these corridors. Although broad tracks (corridors) of land were covered during the survey, heritage resources may have been missed as the study area covers a formidable piece of land.

5.1.1 Main corridors

The main corridors (or critical areas) that were surveyed were the following:

- The Ikaros Substation (Stand).

- The Ikaros Main Corridor running from the Ikaros Substation to the south (before dividing).
- The Ikaros Western Deviation (before dividing into subsidiary corridors).
- The Ikaros Eastern Deviation (before dividing into subsidiary corridors).
- The Concentrator deviation from the Ikaros Main Corridor with two options: parallel with existing power lines (longer route) or parallel with a tailings dam (short route).

5.1.2 Subsidiary corridors

Subsidiary corridors were divided into those that originate from the Ikaros Western Deviation and those that originate from the Ikaros Eastern Deviation, namely:

5.1.2.1 Western Subsidiary corridors

Subsidiary corridors in the western part of the study area include those running from the Western Deviation to the ACP Substation; the Furnace; the Matte Smelter; and the Compressor.

5.1.2.2 Eastern Subsidiary corridors

Subsidiary corridors in the eastern part of the study area include those running from the Eastern Deviation to the CCT Plant and to the Spruitfontein Substation.

6 THE HERITAGE IMPACT ASSESSMENT FOR THE IKAROS INTEGRATION SCHEME

The Heritage Impact Assessment (HIA) study for the Ikaros Integration Scheme can be divided into the surveys that were done for the main corridors (including the Ikaros Substation's stand) and surveys that were done for the subsidiary corridors.

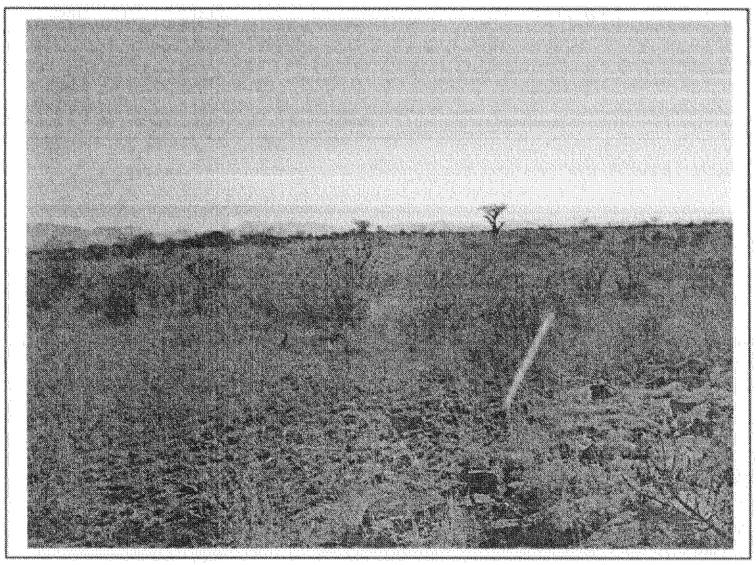
6.1 The Main Corridors

6.1.1 The Ikaros Substation (Stand)

Eskom intends to establish the new proposed Ikaros Substation on August Mokgatle's, a level piece of land next to the road running between Kana (in the north) and Thekwane (in the south). This piece of land was subjected to a survey on foot.

None of the types or ranges of heritage resources as listed in the National Heritage Resources Act (Act No 25 of 1999) could be found on this piece of land. Neither were any of the stone walled sites so abundantly present along the 1st and the 2nd stretches of the Main Corridor observed in the new proposed stand for the Ikaros Substation (Figure 2, below).

Figure 2 – August Mokgatle's, the level piece of land on which the Ikaros Substation will be built is devoid of any heritage resources.



6.1.2 **The Ikaros Main Corridor (before dividing)**

The Ikaros Main Corridor runs from the north to the south for approximately 12,5 km before dividing to the west and to the east. The Main Corridor contains several power lines that are constructed parallel to each other and can be divided into three parts or stretches (1st, 2nd and 3rd stretch) before dividing into the Ikaros Western Deviation and the Ikaros Eastern Deviation. These three stretches are the following:

- The 1st stretch of the Ikaros Main Corridor runs from the new proposed Ikaros Substation Stand to the first bend in the Main Corridor that is situated between a triad of kopjes further towards the southeast.

- The 2nd stretch of the Ikaros Main Corridor will run from the first bend between the triad of kopjes across open veldt to an open space between two randjes approximately 4,0 km further to the south.

- The 3rd and last stretch of the Ikaros Main Corridor runs from the two elongated kopjes to a point where the Ikaros Main Corridor divides into the Ikaros Western Deviation and into the Ikaros Eastern Deviation.

The three stretches of the Ikaros Main Corridor revealed the following types and ranges of heritage resources:

6.1.2.1 1st stretch of the Ikaros Main Corridor

The 1st stretch of the Ikaros Main Corridor runs across open veldt with little tree cover for approximately 2,5 km (Figure 3). This part of the Ikaros Main Corridor contains no heritage resources.

Figure 3 – The 1st stretch of the Ikaros Main Corridor runs across open veldt with no heritage resources.

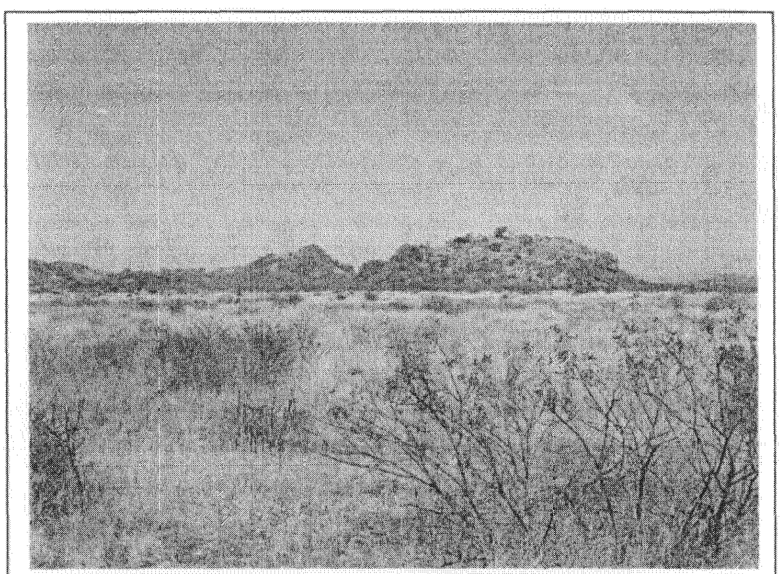


Figure 4 – The first part of the 2nd stretch of the Ikaros Main Corridor will cross a Late Iron Age stone walled complex situated between a triad of kopjes (below and far below).

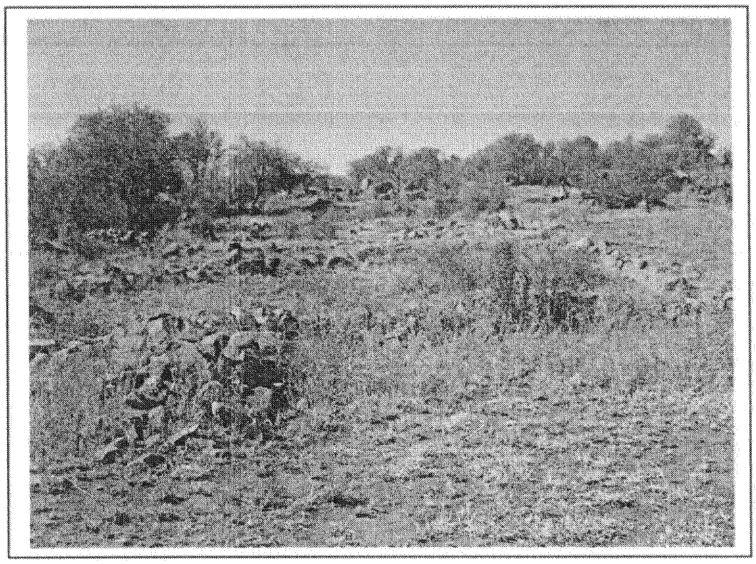
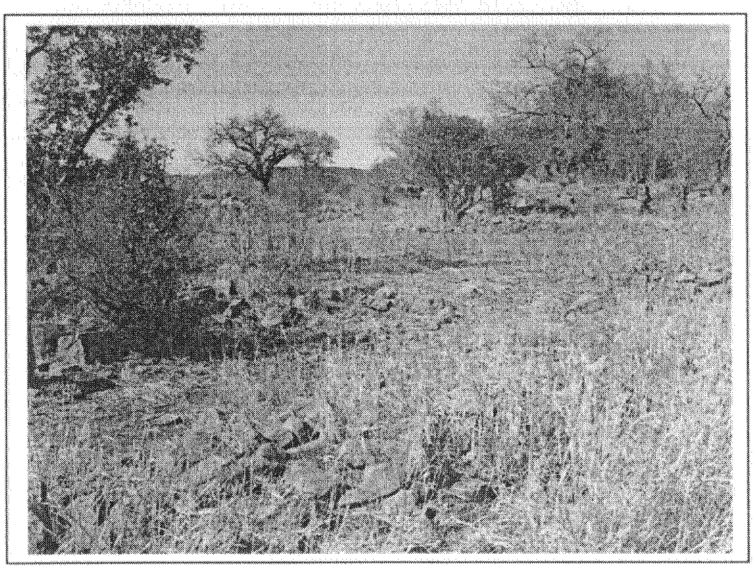


Figure 5 – The first part of the 2nd stretch of the Ikaros Main Corridor will cross a Late Iron Age stone walled complex situated between a triad of kopjes (below).



6.1.2.2 **2^{nd} stretch of the Ikaros Main Corridor**

The first part of the 2^{nd} stretch of the Ikaros Main Corridor will cross a cluster of stone walled sites that is located between the three kopjes (see Figures 4 & 5, previous page).

The last part of the 2^{nd} stretch of the new proposed Ikaros Main Corridor will cross a second cluster of Late Iron Age stone walled sites located between two elongated randjies (see Figures 6 & 7).

Figures 6 & 7 (below and next page) – A second cluster of Late Iron Age sites is located between two elongated randjes in the last part of the 2^{nd} stretch and in the first part of the 3^{rd} stretch of the Ikaros Main Corridor.

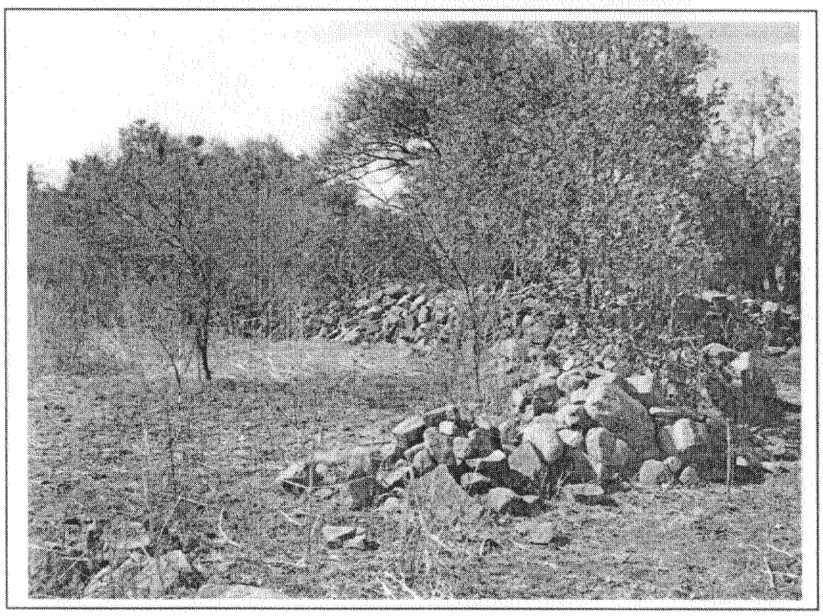
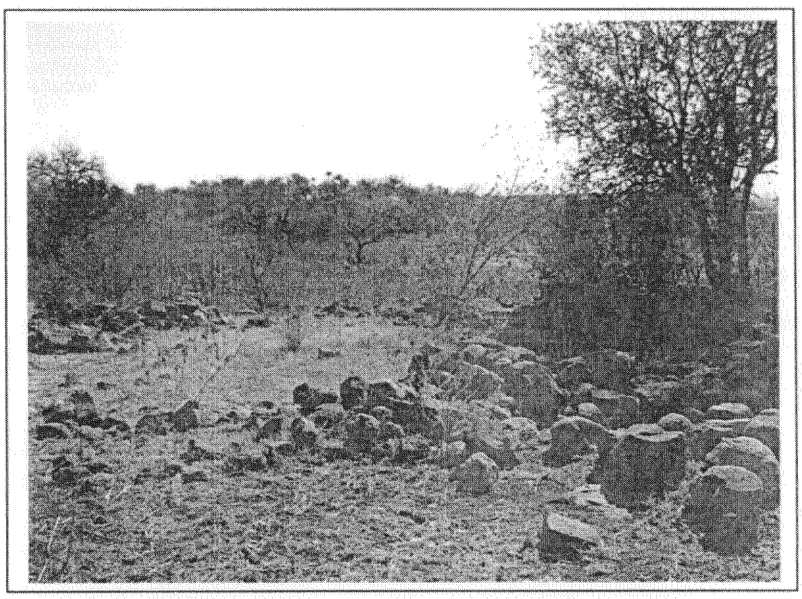


Figure 7(below) – A second cluster of Late Iron Age sites is located between two elongated randjes in the last part of the 2nd stretch of the Ikaros Main Corridor and in first part of the 3rd stretch of the Ikaros Main Corridor.



6.1.2.3 3rd stretch of the Ikaros Main Corridor

The 3rd stretch of the Ikaros Main Corridor will run from the two elongated kopjes for approximately 5 km to the south where the line will divide into the Ikaros Western Deviation and into the Ikaros Eastern Deviation.

The 3rd stretch of the Ikaros Main Corridor runs from between the two elongated kopjes across old abandoned agricultural fields on the farm August Mokgatle.

6.1.3 **The Ikaros Western Deviation**

The Ikaros Western Deviation runs from the point of separation from the Main Corridor towards the west for approximately 2,0 km. It runs across old abandoned agricultural fields on August Mokgatle's, along the south-eastern corner of Mfidikwe village and across a small stream after which it divides into the Western Subsidiary Corridors that run towards the ACP Substation, the Concentrator, the Furnace and the Matte Smelter.

6.1.4 **The Ikaros Eastern Deviation**

The Ikaros Eastern Deviation will run from the point of separation from the Main Corridor towards the east for approximately 9,5km and can be divided into two stretches, namely:

- the 1st stretch that will run from the point of separation towards the southeast for approximately 7,5 km before joining a railway line near Bleskop Station; and
- the 2nd stretch that will run parallel to the north of the railway line in an easterly direction for 2km where it runs through the village of Photsaneng.

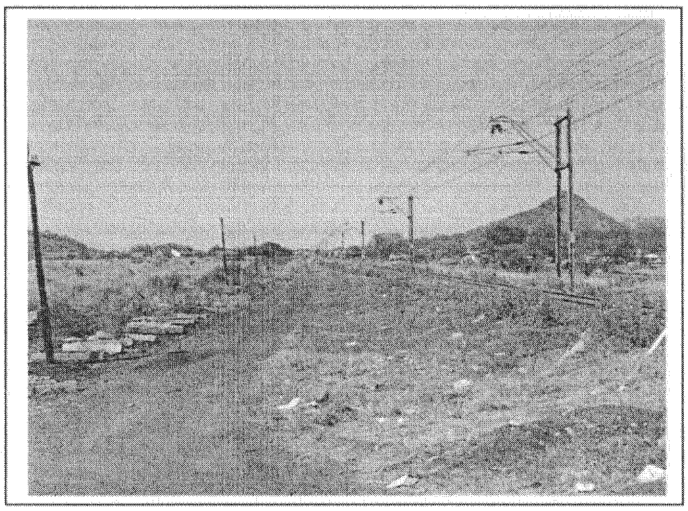
6.1.4.1 **1st stretch of the Ikaros Eastern Deviation**

The 1st stretch of the Ikaros Eastern Deviation runs from its separation from the Main Corridor (and its split from the Ikaros Western Deviation) to a railway line in the southeast. This part of the Ikaros Eastern Deviation is 7,5 km long and runs across old abandoned agricultural fields. It passes to the north of a small kopje as well as a larger kopje, Bleskop, located to the south of the railway line. (Bleskop's northern foot, slope and summit is covered with an extensive site dating from the Late Iron Age. However, this kopje is located a considerable distance from the Ikaros Eastern Deviation).

6.1.4.2 2nd stretch of the Ikaros Eastern Deviation

The 2nd stretch of the Ikaros Eastern Deviation runs parallel with and to the north of a railway line and a service road adjacent to the railway line. This stretch of the new power line corridor is also situated on the northern border of Photsaneng. This new proposed corridor is not a pristine piece of land anymore (Figure 8).

Figure 8 - The 2nd stretch of the Ikaros Eastern Deviation will run to the north of a railway line and a service road, both running along the northern perimeter of Photsaneng.



6.1.5 The Concentrator deviation from the Ikaros Main Corridor

The Concentrator deviation from the Main Corridor will run from the 2nd stretch in the Ikaros Main Corridor (on August Mokgatle's in the northeast) towards the Concentrator that is situated in the Platinum Working Plant (on Paardekraal 297JQ, in the southwest) and will follow one of two options, namely:

- Option 1 will deviate from the Ikaros Main Corridor in order to run westwards, southeast and eastwards, parallel with existing power lines to the Concentrator. Option 1 is approximately 23km long.

- Option 2 will also deviate from the Ikaros Main Corridor and will initially follow the same corridor as Option 1, running parallel with existing power lines. However, Option 2 will turn southwards in order to run along the western perimeter of a tailings dam before turning towards the east from where Option 2 will follow the same corridor as Option 1 towards the Concentrator in the east. The latter part of Option 2 therefore will run parallel with existing power lines. Option 2 is approximately 20,5 km long.

The HIA study for the Option 1 and the Option 2 deviations from the Ikaros Main Corridor revealed the following:

6.1.5.1 **Option 1: parallel with existing power lines**

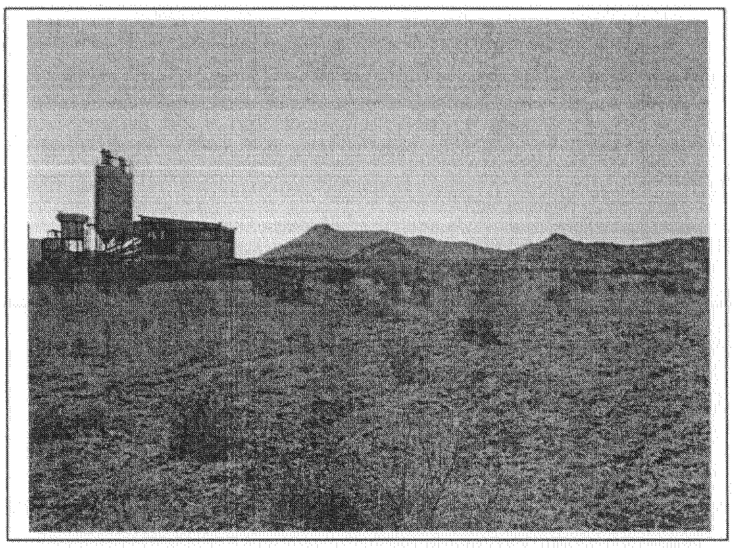
Option 1 will run from the 2nd stretch in the Ikaros Main Corridor westwards, along the southern border of Frank's Shaft where it bends towards the northwest in order to run parallel with the southern wall of a large tailings dam towards the west. It crosses a tar road and then turns 90° towards the southeast before turning with a second 90° bend towards the Concentrator.

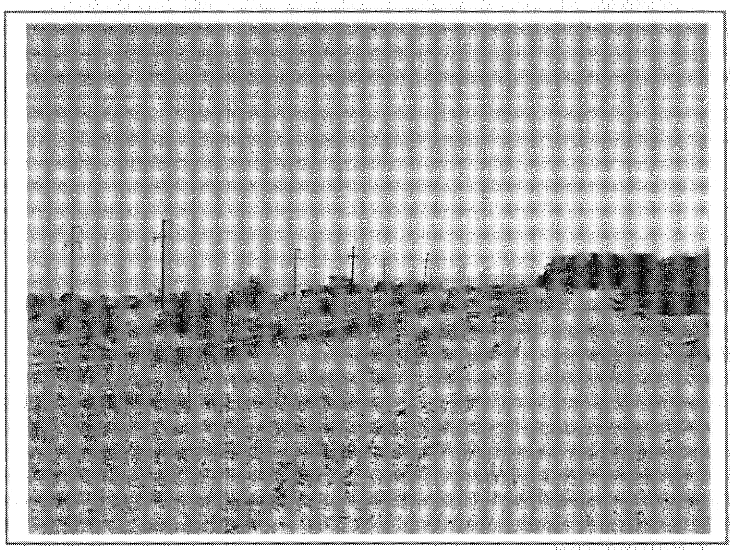
The HIA study for Option 1 was done along the following stretches of the new proposed power line:

<u>Part AB</u>

Part AB runs from the Ikaros Main Corridor to the first 90° bent in the southwest. Part AB is approximately 14,5km long and runs along and across pipelines, dirt roads, a tar road and two tailings dams (Figures 9 & 10, following page).

Figures 9 & 10 - Part AB runs to the south of Frank's Shaft (below) and parallel with a dirt road and tailings dam (out of picture) (far below).





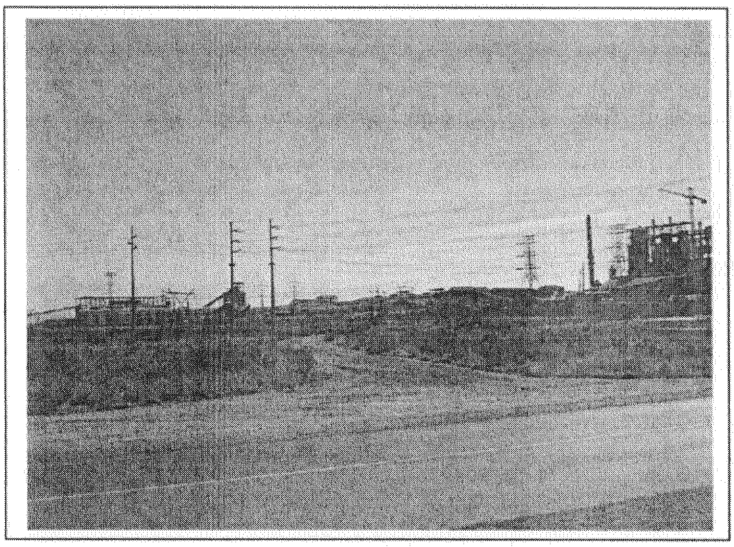
Part BC

Part BC runs from the first 90° bent to the second 90° bent in the southwest. Part BC is approximately 4,5km long.

Part CD

Part CD runs from the second 90° bent towards the Concentrator located approximately 4,5km from the last bent (Figure 11, below).

Figure 11 - Part CD is located between the second 90° bent and the Concentrator (below).



6.1.5.2 Option 2: parallel with a tailings dam

Option 2 follows a similar corridor than Option 1 except that this option is approximately 2,5 km shorter as it runs along the western wall of one of the tailings dams situated between the Ikaros Main Corridor and the Concentrator.

6.2 The Subsidiary Corridors

The Subsidiary Corridors were divided into those that originate from the Ikaros Western Deviation and those that originate from the Ikaros Eastern Deviation.

6.2.1 **Western Subsidiary Corridors**

Subsidiary Corridors that form part of the new proposed western development of the Ikaros Integration Scheme that were subjected to the HIA study were the following:

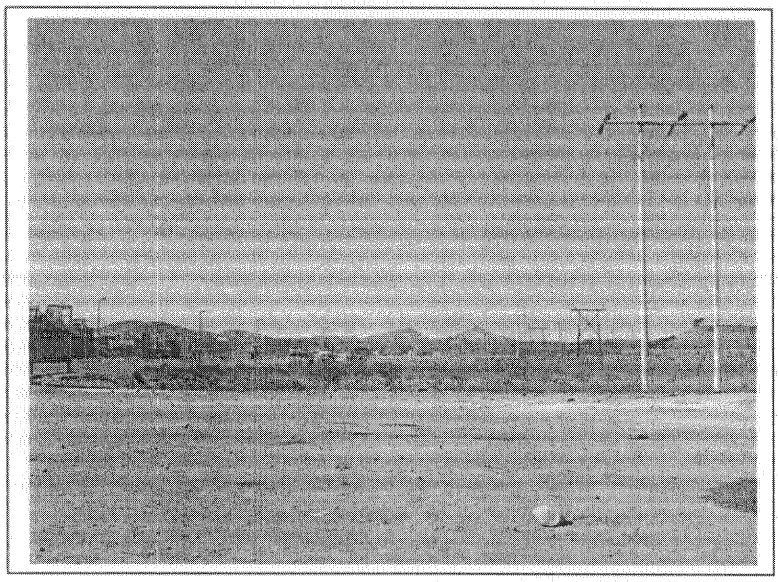
6.2.1.1 **From the Western Deviation to the ACP Substation**

This power line corridor will run from the end of the Western Deviation to the ACP Substation and is 3km long with two stretches. The 1st stretch runs from the end of the Western Deviation towards the southwest for two kilometres before bending further towards the southwest (the 2nd stretch) for another 1 km before entering the ACP Substation.

6.2.1.2 **From the Western Deviation to the Furnace**

This power line corridor will run from the end of the Western Deviation to the Furnace in the Platinum Working Plant and is approximately 6,5km long. The 1st stretch of the new power line runs directly to the south from the end of the Western Deviation for 4km before turning 90° to the west for another 2,5 km before entering the Furnace in the Platinum Working Plant (Figure 12, next page).

Figure 12 – The new proposed power lines for the Furnace and for the Matte Smelter will run along an existing power line and across disturbed veldt (below).



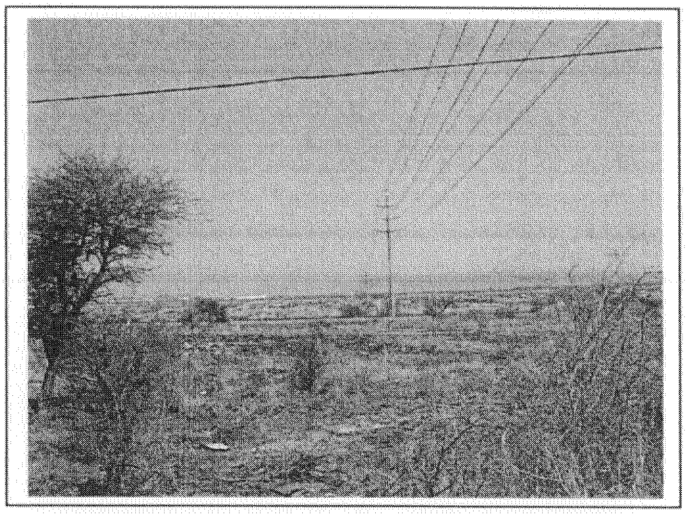
6.2.1.3 **From the Western Deviation to the Matte Smelter**

This power line will follow the same corridor as the new proposed power line for the Furnace but will deviate from this power line (in the 2nd stretch that runs from the east towards the west) to join the Matte Smelter approximately 1,5 km further to the southwest (Figure 12, above).

6.2.1.4 **From the Western Deviation to the Compressor**

This power line will run from the end of the Western Deviation to the Compressor that is located 8,0 km further to the south. The new power line for the Compressor will initially run parallel with an existing power line and then parallel with two existing power lines. It crosses a railway line, a tar road, a second railway line and then runs across relatively pristine veldt and a pipeline before entering the Compressor in the far south (Figure 13, next page).

Figure 13 - The power line running from the Western Deviation into the Compressor (below).



6.2.2 **Eastern Subsidiary Corridors**

Subsidiary Corridors that form part of the new eastern development of the Ikaros Integration Scheme that were subjected to the HIA study were the following:

6.2.2.1 **From the Eastern Deviation to the CCT Plant**

The new power line between the Eastern Deviation and the CCT Plant will run along the following three major stretches, each with two or more bents:

Part AB

Part AB runs from the end of the Eastern Deviation towards the southeast crossing two railway lines and two tar roads before running south of the Rustenburg/Marikana road towards the east. This new power line will have four 90° bents and five stretches.

While the 3rd stretch of Part AB will pass close to a cemetery, the 4th stretch of Part AB will cut across the southern tip of the Maralla-ea-Nape range of Mountains ('Lynrandjes') where the remains of stone walled sites occur. This part of the Lynrandjes is known as Kgamakwe (Plates 14 & 15).

Figure 14 – A modern cemetery is situated near the north-western corner of Kgamakwe Mountain (middle, left of photograph). The cemetery will not be affected by the 3rd stretch of the power line running between the end of the Eastern Deviation and the CCT Plant (below).

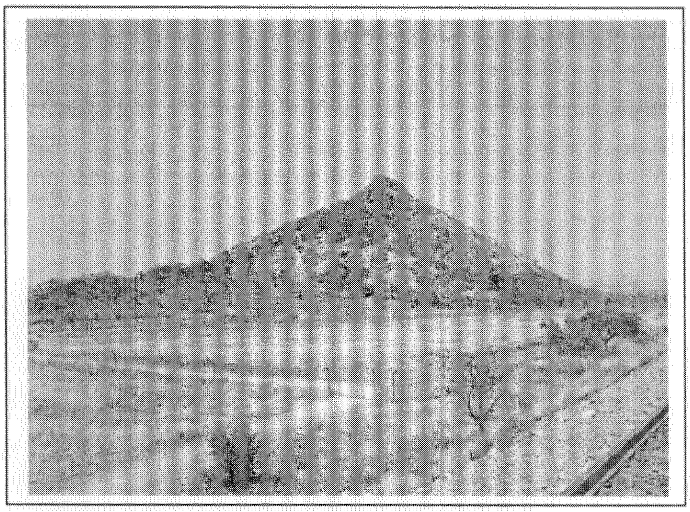
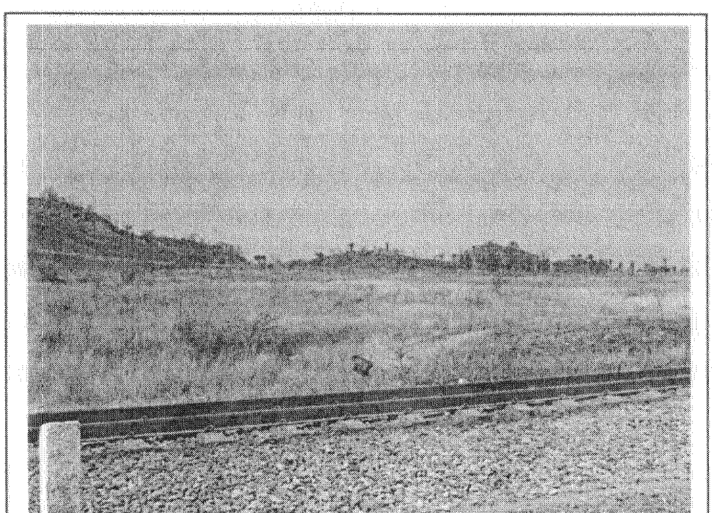


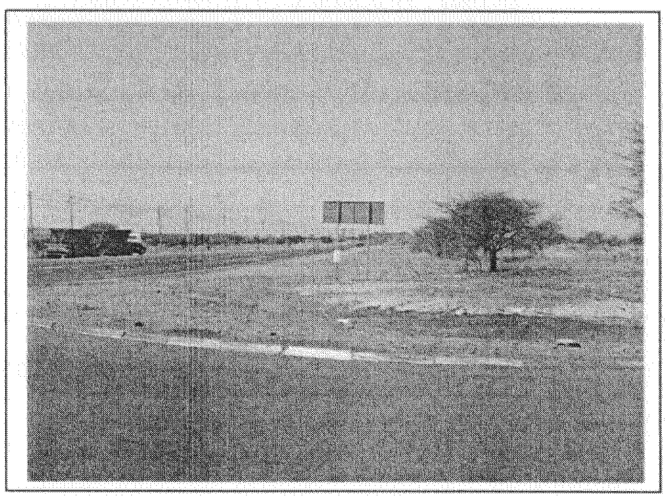
Figure 15 – The southern tip of Kgamakwe Mountain will be crossed by the 4th stretch of Part AB of the power line running between the end of the Eastern Deviation and the CCT Plant (below).



Part BC

Part BC runs for 4,5km along the southern shoulder of the Rustenburg/Marikana road towards Marikana in the east before turning to the south. The shoulder of the Rustenburg/Marikana road is intensely disturbed by earlier road construction activities closest to an informal settlement (in the west) whilst the part furthest from the informal settlement (in the east) is still relatively pristine (Figure 16).

Figure 16 – The eastern part of the shoulder of the Rustenburg/Marikana road (except the corner, foreground) is relatively pristine, but without heritage resources.

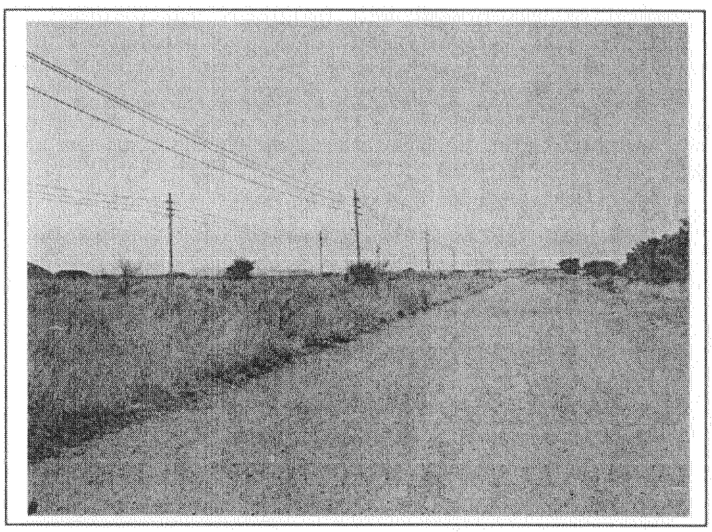


Part CD

Part CD runs from the Rustenburg/Marikana road southwards with four stretches and three bents before entering the CCT Plant. The 1st stretch runs for 2,5km from the Rustenburg/Marikana road towards the south where it turns 90° towards the west before turning through another 90° bend towards the south and a last bend towards the east running into the CCT Plant.

The 1st stretch of Part CD runs along a dirt road and across relatively pristine veldt whilst the 2nd stretch runs along the northern shoulder of a dirt road and between a massive heap of gravel (north) and what seems like evaporation dams (south). The 3rd and 4th stretches are relatively short corridors, both approximately 700m long that will be established within the borders of the CCT Plant.

Figure 17 – A stretch of the new power line between the CCT Plant and the Eastern Deviation will run along existing power lines and a dirt track road as well as between heaps of gravel (north) and evaporation dams (south).



6.2.2.2 From the Eastern Deviation to the Spruitfontein Substation

The new power line between the end of the Eastern Deviation and the Spruitfontein Substation will follow the same corridor as the power line between the end of the Eastern Deviation and the CCT Plant. However, two differences occur, namely:

- two stretches in Part AB may be located to the north of Kgamakwe Mountain and not to the south (as in the case with the CCT power line); and

- the CCT power line and the Spruitfontein power lines will be located on opposite sides of the trajectories of the tar and dirt roads that these two power lines will follow.

The two stretches in Part AB (to the north of Kgamakwe Mountain) may affect Late Iron Age stone walled sites that are located in the 1st stretch through the poort to the north of Kgamakwe Mountain and in the 2nd stretch along the north-eastern foot of the mountain. The sites that are located in the poort (gap) to the north of the Kgamakwe Mountain have been impacted upon in the past when a pipeline, dirt track road and a railway line were built through this opening in the mountain.

The last stretch of the power line between the Eastern Deviation and the Spruitfontein Substation runs towards the south for 4km before turning to the southeast and then towards the south in order to run into the Spruitfontein Substation.

7 HERITAGE RESOURCES IN THE IKAROS INTEGRATION SCHEME

7.1 Types of heritage resources in the study area

In order to subject the Ikaros Integration Scheme to a HIA study, the proposed new power lines were divided into Main Corridors and into Subsidiary Corridors. The Main Corridors consisted of the Ikaros Substation Stand, the Concentrator Deviation from the Main Corridor and the Main Corridor itself. The Subsidiary Corridors were divided into the power lines that were part of the Western Deviation and those that contributed to the Eastern Deviation.

7.2 Heritage resources in the Ikaros Integration Scheme

Heritage resources present in the Ikaros Integration Scheme are (Table 1; Figure 1):

- A Late Iron Age complex of sites located between a triad of kopjes at the start of the 2nd stretch of the Main Corridor.
- A Late Iron Age Complex of sites located between two elongated randjes at the end of the 2nd stretch of the Main Corridor and in the 1st part of the 3rd stretch of the Main Corridor.
- A modern graveyard located in the 3rd stretch of Part AB of the new power line between Eastern Deviation and the CCT Plant.
- Late Iron Age sites located in the 4th stretch of Part AB of the new power line between the Eastern Deviation and the CCT Plant.
- Late Iron Age sites located in the 1st stretch of Part AB (in the poort north of Kgamakwe Mountain) of the new power line between the Eastern Deviation and the Spruitfontein Substation.

- A Late Iron Age site located in the 2nd stretch of Part AB (on the north-eastern foot of Kgamakwe Mountain) of the new power line between the Eastern Deviation and the Spruitfontein Substation.

It is clear from the HIA study done on the various corridors that one main type of heritage resource can be associated with the power lines that constitute the Ikaros Integration Scheme. These heritage resources consist of two Late Iron Age complexes of sites, Late Iron Age sites and a modern graveyard. These heritage resources are listed in Table 1 that also outline the level of significance of these resources and the degree (or severity) of impact these remains have experienced in the past (past impact) or may experience in the future (possible future impact).

Three levels of significance were used to grade the heritage resources, namely high (3), medium (2) and low (1). These levels of significance were determined by considering criteria such as the ideological/symbolic value; the aesthetic nature; uniqueness; cultural historical significance; the state of preservation; and the research value of the different types of heritage resources.

It must also be stressed that the majority of stretches of power lines that were surveyed contained no heritage resources of outstanding significance.

7.3 **Past impacts**

It is clear from Table 1 that there has been some impact in the past, whether coincidental or inevitable, on some of the heritage resources located in the Ikaros Integration Scheme. Using the criteria 'severe', 'high', 'low' and 'none' the degree of impact (in the past) was determined. Past impacts have affected the following remains in the Ikaros Integration Scheme (Table 1):

- The First Late Iron Age Complex of sites located between a triad of kopjes was damaged when a dirt road was built through one of the settlements in this complex. However, the overall condition of this complex is pristine.

- Various types of development activities damaged late Iron Age sites located in the 4^{th} stretch of Part AB of the new power line between the Eastern Deviation and the CCT Plant. The most obvious of these activities include road building and squatting.

- Road building and the construction of a pipeline and a railway line damaged Late Iron Age sites in the 1^{st} stretch of Part AB between the Eastern Deviation and the Spruitfontein Substation. These sites, which are located on the northern foot of Kgamakwe Mountain, were also vandalised in the past.

The degree (or severity) of impact on the heritage resources has been analysed in terms of the impact on these remains in the past (mostly before the new heritage bill was promulgated) and in terms of any possible future impact that may occur during the construction of the new power lines. Four degrees of impact in the past were distinguished, namely: severe (4), high (3), low (2) and none (1) (Table 1).

7.4 **Possible future impact**

It is also possible that future impact may occur on some of the heritage resources. These impacts may occur on some of the heritage resources that have been impacted in the past. These heritage resources include:

- The Late Iron Age Complex of sites between the triad of kopjes;

- The Late Iron Age Complex of sites located between two elongated randjes;

- The late Iron Age sites located in the 4^{th} stretch of Part AB of the new power line between the Eastern Deviation and the CCT Plant;

- The Late Iron Age sites located in the 1^{st} stretch of Part AB of the new power line between the Eastern Deviation and the Spruitfontein Substation.

The possibility of impact in the future were graded in three degrees of probability, namely: definitely (3), probably (2) and no impact (1) (Table 1) .

7.5 Levels of significance

The two Late Iron Age Complexes are of high significance, as both can be rated high on criteria such as: ideological significance; aesthetic appearance; uniqueness; cultural historical and research value and state of preservation.

The Late Iron Age sites located in the 4^{th} stretch of Part AB and the Late Iron Age sites located in the 1^{st} stretch of Part AB (in the poort north of Kgamakwe Mountain) would have rated high on the criteria mentioned above, but the damage that have been done to these sites is so severe that these sites can not be considered to be of high significance anymore.

8 CONCLUSION AND RECOMMENDATIONS

The two Late Iron Age Complexes can be considered to be of high significance. Eskom's Main Corridor may not impact on these two complexes. It is possible to conserve the two complexes under the Main Corridor if the pylons on the opposing sides of the two complexes are erected at a 'safe' distance from the two complexes' perimeters (approximately 30m). The construction of the pylons and the power lines must be supervised in order to ensure that the complexes of sites are not damaged in any way.

If Eskom cannot unequivocally guarantee the unaffected existence of the two complexes under the Main Corridor, Eskom has to deviate the Main Corridor.

The Late Iron Age sites along the 'Lynrandjes' have been impacted severely in the past. Eskom's development therefore can cause little damage to these sites that have already been damaged in the past. It is possible for Eskom to avoid impacting on what have remained of these sites, as these sites are small and can easily be avoided in comparison with the large Late Iron Age Complexes.

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IKAROS: MAIN CORRIDOR, DEVIATIONS & SUBSIDIARY CORRIDORS	HERITAGE RESOURCES PRESENT(•) ABSENT (■)	TYPES/RANGES OF HERITAGE RESOURCES	LEVEL OF SIGNIFICANCE High (3) Medium (2) Low (1)	DEGREE OF IMPACT IN THE PAST Severe(4); High (3); Low (2); None (1)	POSSIBILITY OF IMPACT IN THE FUTURE Definitely (3); Probably (2); No Impact (1).
Ikaros Substation (Stand)	■				
Ikaros Main Corridor					
1st stretch	■				
2nd stretch	•	Late Iron Age Complex	3	2	2-1
3rd stretch	•	Late Iron Age Complex	3	1	2-1
The Concentrator deviation (from Main Corridor)					
Option 1: parallel with existing power lines	■				
Option 2: parallel with a tailings dam	■				
Ikaros Western Deviation					
to the ACP Substation	■				
to the Furnace	■				
to the Matte Smelter	■				
to the Compressor	■				
Ikaros Eastern Deviation					
to the CCT Plant					
3rd stretch of Part AB	•	Modern graveyard	3	1	1
4th stretch of Part AB	•	Late Iron Age sites	1	3	1
to the Spruitfontein Substation					
1st stretch of Part AB	•	Late Iron Age sites	1	3	1
2nd stretch of Part AB	•	Late Iron Age site	1	1	1

Table 1. Various components of the Ikaros Integration Scheme; heritage resources present/absent in these components; levels of significance of these components and degree of impact in the past and possible future impact on the heritage resources.

ANNEXURE G

Bird Impact Assessment Study

Proposed new 88kV Distribution line infrastructure, North-West Province.

Prepared by

Chris van Rooyen

Endangered Wildlife Trust

December 2003

EXECUTIVE SUMMARY

The project is located in the Rustenburg area, and is to serve platinum mining operations. The project entails a number of proposed 88kV distribution lines radiating from a new substation - to be known as the Ikaros Substation. The longest proposed line will be about 18km in length. All the proposed lines will run through areas that have been significantly impacted upon by human activity. In most instances the impacts are long term namely mining and urban sprawl. The number of large birds that occurred historically in the area has been reduced due to destruction of suitable habitat and disturbance. In some areas, species have disappeared completely. Very few patches of relatively intact habitat remain. Due to the fragmentation of the habitat, low bird numbers are expected. No significant bird impacts are expected. No specific mitigation measures are therefore recommended.

1 BACKGROUND

1.1 Particulars of study area

The project is located in the Rustenburg area, and is to serve platinum mining operations. The project entails a number of proposed 88kV distribution lines radiating from a new substation - to be known as the Ikaros Substation. The longest proposed line will be about 18km in length.

Vegetation type is one of the most important factors influencing bird distribution (Harrison et.al 1997). It is therefore important to record the vegetation patterns in a study if his nature, as it directly influences the species composition, abundance and range. The vegetation type through which the all the corridors run can broadly be described as Arid Woodland (Harrison et.al 1997) which is characterized by fine leaved, deciduous Acacia-dominated woodlands on rich soils. Arid woodland occurs where there is intermediate, variable rainfall (average 250-650mm), with hot, wet summers and cool, dry winters.

The vegetation has been radically altered in many areas, primarily by mining activity and human settlement. The area has a high population of people and livestock, which has benefited some bird species, particularly the scavengers, but negatively impacted upon others, especially certain terrestrial species that have not been recorded in the area in recent times. The destruction of vegetation through overgrazing, disturbance by mining operations and hunting pressure are the most likely reasons why species such as Kori Bustard do not occur in the area any longer. Conversely, species such as the Pied Crow has benefited greatly from the humans settlements and has become common in certain areas. The area is also transected by numerous powerlines. The few wetlands that were recorded in the area were highly impacted upon by mining operations and extensively altered. Some were man-made impoundments.

The site of the proposed Ikaros substation is in an island of relatively undisturbed open woodland. It is however surrounded by densely populated townships, and the traffic through the area is heavy. The area is also utilized by people for firewood, and game that may have occurred there have most likely been hunted to extinction.

In summary, the human impacts on all the corridors have been extensive, completely altering the both the bird species composition and behaviour from what was historically the case. See appendix A for examples of the habitat along the proposed alignments.

1.2 Proposed structure types

The dominant structure to be used for the proposed powerlines is the single steel pole with stand-off insulators.

2 DESCRIPTION OF TYPICAL IMPACTS OF POWERLINES ON BIRDS

2.1 Characteristics

Because of their size and prominence, electrical infrastructures constitute an important interface between wildlife and man. Negative interactions between wildlife and electricity structures take many forms, but two common problems in southern Africa are electrocution of birds and other animals and birds colliding with powerlines. (Ledger & Annegarn 1981; Ledger 1983; Ledger 1984; Hobbs & Ledger 1986a; Hobbs & Ledger 1986b; Hobbs *et al.* 1990; Ledger 1992; Ledger *et al.* 1992; Verdoorn 1996; Kruger & Van Rooyen 1998; Van Rooyen 1998; Kruger 1999; Van Rooyen 1999; Van Rooyen 2000, Anderson 2001). Other problems are electrical faults caused by bird excreta when roosting or breeding on electricity infrastructure, and disturbance and habitat destruction during construction and maintenance activities.

2.1.1 *Electrocutions*

Large birds of prey are the most commonly electrocuted on powerlines. The large transmission lines from 275 kV to 765 kV structures are usually not a threat to large raptors, because the pylons are designed in such a manner that the birds do not perch in close proximity the potentially lethal conductors. In fact, these powerlines have proved to be beneficial to birds such as Martial Eagles, Tawny Eagles, African Whitebacked Vultures, and even occasionally Black Eagles by providing safe nesting and roosting sites in areas where suitable natural alternatives are scarce (pers.obs). Cape Griffons have also taken to roosting on powerlines in certain areas in large numbers, while Lappetfaced Vultures are increasingly using powerlines as roosts, especially in the Northern Cape (pers.obs.).

Unfortunately, the same can not be said of the smaller sub-transmission and reticulation lines (Van Rooyen 1998; 2000). Raptors and vultures instinctively seek out the highest vantage point as suitable perches from where they scan the surrounding area for prey or carrion. In flat, treeless habitat power pylons often provide ideal vantage points (from a raptor's perspective) for this purpose. The vast majority of electrical structures were designed and constructed at a time when the awareness of the danger that they pose for raptors was very limited or totally absent. Depending on the design of the pole, a large raptor can potentially touch two live components or a live and earthed component simultaneously, almost inevitably resulting in instant electrocution and a concomitant disruption in the electrical supply (Van Rooyen 1998).

2.1.2 *Collisions*

Anderson (2001) summarizes collisions as a source of avian mortality as follows:

"The collision of large terrestrial birds with the wires of utility structures, and especially powerlines, has been determined to be one of the most important mortality factors for this group of birds in South Africa (Herholdt 1988; Johnsgard 1991; Allan 1997). It is possible that the populations of two southern African endemic bird species, the Ludwig's Bustard *Neotis ludwigii* and Blue Crane *Anthropoides paradiseus*, may be in decline because of this single mortality factor (Anderson 2000; McCann 2000). The Ludwig's Bustard (Anderson 2000) and Blue Crane (McCann 2000) are both listed as "vulnerable" in The Eskom Red Data Book of Birds of South Africa, Lesotho & Swaziland (Barnes 2000) and it has been suggested that powerline collisions is one of the factors which is responsible for these birds' present precarious conservation status

Collisions with powerlines and especially overhead earth-wires have been documented as a source of mortality for a large number of avian species (e.g. Beaulaurier et al. 1982; Bevanger 1994, 1998). In southern Africa, this problem has until recently received only limited attention. Several studies however have identified bird collisions with powerlines as a potentially important mortality factor (for example, Brown & Lawson 1989; Longridge 1989). Ledger et al. (1993), Ledger (1994) and Van Rooyen & Ledger (1999) have provided overviews of bird interactions with powerlines in South Africa. Bird collisions in this country have been mainly limited to Greater and Lesser Flamingos, various species of waterbirds (ducks, geese, and waders), Stanley's *Neotis denhami* and Ludwig's Bustards, White Storks *Ciconia ciconia*, and Wattled *Grus carunculatus,* Grey Crowned *Balearica regulorum* and Blue Cranes (for example, Jarvis 1974; Johnson 1984; Hobbs 1987; Longridge 1989; Van Rooyen & Ledger (1999)). Certain groups of birds are more susceptible to collisions, namely the species which are slow fliers and which have limited maneuverability (as a result of high wing loading) (Bevanger 1994). Birds which regularly fly between roosting and feeding grounds, undertake regular migratory or nomadic movements, fly in flocks, or fly during low-light conditions are also vulnerable. Other factors which can influence collision frequency include the age of the bird (younger birds are less experienced fliers), weather factors (decreased visibility, strong winds, etc.), terrain characteristics and powerline placement (lines that cross the flight paths of birds), powerline configuration (the larger structures are more hazardous), human activity (which may cause birds to panic and fly into the overhead lines), and familiarity of the birds with the area (therefore nomadic Ludwig's Bustards would be more susceptible) (Anderson 1978; APLIC 1994).

Although collision mortality rarely affects healthy populations with good reproductive success, collisions can be biologically significant to local populations (Beer & Ogilvie 1972) and endangered species (Thompson 1978; Faanes 1987). The loss of hundreds of Northern Black Korhaans *Eupodotis afraoides* due to powerline collisions would probably not affect the success of the total population of this species and would probably not be biologically significant, but if one Wattled Crane was killed due to a collision, that event could have an effect on the population that would be considered biologically significant. Biological significance is an important factor that should be considered when prioritising mitigation measures. Biological significance is the effect of collision mortality upon a bird population's ability to sustain or increase its numbers locally and throughout the range of the species.

There are many methods that can be used to mitigate avian powerline interactions (for example, APLIC 1994) and several investigations dealing with the collision problem have recently focused on finding suitable mitigation measures (see APLIC 1994 for an overview). The most proactive measures are powerline route planning (and the subsequent avoidance of areas with a high potential for bird strikes) and the modification of powerline designs (this option includes line relocations, underground burial of lines, removal of over-head ground wires, and the marking of ground wires to make them more visible to birds in flight). In many instances, decisions on powerline placement and possible mitigation measures are however eventually based on economic factors. The relocation of an existing line is the last option that is usually considered when trying to mitigate avian collisions. The huge expense of creating a new line and servitude usually cannot be justified unless there are biologically significant mortalities. Underground burial of powerlines is another option available to managers in areas of high collision risk. This will obviously eliminate collisions, but the method has many drawbacks. The costs of burying lines can be from 20 – 30 times (or more) higher than constructing overhead lines (Hobbs 1987), and such costs are related to the line voltage, type and length of cable, cable insulation, soil conditions, local regulations, reliability requirements, and requirement of termination areas. Limitations of cable burial include: no economically feasible methods of burying extra high voltage lines have been developed, there is a potential to contaminate underground water supplies if leakage of oil used in insulating the lines occurs, and extended outage risks due to the difficulty in locating cable failures (APLIC 1994). Since most strikes involve earth-wires (more than 80% of observed bird collisions) (e.g. Beaulaurier 1981; Faanes 1987; Longridge 1989), the removal of these wires would decrease the number of collisions (Beaulaurier 1981; Brown et al. 1987). Faanes (1987) has argued that the large number of earth-wire collisions is because birds react to the more visible conductors by flaring and climbing and then collide with the thinner earth-wires. Earth-wire removal is, however, not a simple matter. Due to the need for lightning protection and other types of electricity overload, it is only possible on lower-voltage powerlines (where polymer lightning arresters can be used). The marking of overhead earth-wires to increase their visibility is usually considered to be the most economical mitigation option for reducing collision mortality (Morkill & Anderson 1991; Brown & Drewien 1995). This is particular so for the thousands of kilometres of established powerlines through areas of high potential for avian interaction which cannot be rerouted."

2.1.3 *Habitat destruction and disturbance*

During the construction phase and maintenance of powerlines, some habitat destruction and alteration inevitably takes place. This happens with the construction of access roads, and the clearing of servitudes. Servitudes have to be cleared of excess vegetation at regular intervals in order to allow access to the line for maintenance, to prevent vegetation from intruding into the legally prescribed clearance gap between the ground and the conductors and to minimize the risk of fire under the line which can result in electrical flashovers.

These activities could have an impact on birds breeding, foraging and roosting in or in close proximity of the servitude, both through alteration of habitat and disturbance caused by human activity. Transmission line shave become an important nesting substrate for several large raptors, including the threatened Martial Eagle (pers. obs.). These birds are highly susceptible to disturbance, and should this disturbance take place during a critical time in the breeding cycle e.g. when the eggs have not hatched or just prior to the chick fledging, it could terminate the breeding effort. This scenario could present itself where a new line is constructed next to an existing powerline containing active raptor nests.

2.2 Predictive methods

In predicting impacts of a proposed powerline on birds, a combination of science and field experience was used.

2.2.1 *Methodology*

- Maps of the study area were provided showing existing powerlines, roads, railways , dams, urban areas and the land cover. These were used in order to identify potential "hot-spots" along the corridors e.g. patches of undisturbed vegetation, river crossings, wetlands and dams and agricultural areas.
- Atlas of southern African Birds (ASAB) (Harrison *et.al.* 1997) species lists of the relevant quarter degree square (or 1: 50 000 map units) 2527CB, within which the corridors are located were obtained from the Avian Demography Unit at University of Cape Town.
- The area was visited for a day to obtain a first-hand perspective of the proposed routes and birdlife. An attempt was made to travel all the alternative corridors as far as was practically possible.
- The impacts were predicted on the basis of seven years of experience in gathering and analysing data on wildlife impacts with powerlines throughout southern Africa (see van Rooyen & Ledger 1999 for an overview of methodology), supplemented with local knowledge and first hand data. Extensive use was made of personal experience of the bird life in the study area, with which the author is intimately familiar with.

2.3 Uncertainties in predicting results

2.3.1 *Confounding factors*

- The ASAB data covers the period 1986-1997. Bird distribution patterns fluctuate continuously according to availability of food and nesting substrate.
- Sources of error in the ASAB database.

  Inadequate coverage of some areas

  Errors in species identification during data capturing stage

  Biases in the reporting process due to several factors

(For a full discussion of potential inaccuracies in ASAB data, see Harrison *et. al.* 1997).

2.3.1 *General comment*

Predictions are based on experience of these and similar species in different parts of South Africa. Bird behaviour can not be reduced to formulas that will hold true under all circumstances. By the same token, powerline impacts can be predicted with a fair amount of certainty, based on experienced gained through the investigation of more than 300 localities in southern Africa where birds interacted with powerlines. The author is well acquainted with the study area, having been actively involved in vulture conservation through the Vulture Study Group in the greater Magaliesberg area, therefore the predictions are made with a high level of confidence.

2.4 **Gaps in baseline data**

- Little long term, verified data of species distribution on microhabitat level along the proposed powerline routes.
- Little long term, verified data on impacts of existing powerlines lines in the study area on birds.

3 CRITERIA AGAINST WHICH EXPECTED IMPACTS ARE EVALUATED

Nature and status	Description of impact and status (negative, neutral, positive)
General susceptibility to expected impact	• Very high, high, low, very low
Probability	• Improbable, where the possibility of the impact to materialise is very low • Probable, where there is a distinct possibility that the impact will

	occur • Highly probable, where it is most likely that the impact will occur • Definite, where the impact will definitely occur
Expected locality	• Description of localities where impact is expected to occur
Frequency	• Very high, high, low, very low
Timing	• Time of day/year
Duration	• Short term (0-5 years) • Medium term (5-15 years) • Long term (for the life-time of the infrastructure)
Permanence	• Permanent, semi-reversible or reversible
Extent	Local (the site and immediate surroundings) • Regional • National • International
Significance	• Low, where it will not have an impact on the decision • Medium, where it should have an impact on the decision unless mitigated • High, where it will influence the decision regardless of possible mitigation

(Adapted from Guideline Document, EIA Regulations, Implementation of sections 21, 22 and 26 of the Environment Conservation Act, April 1998, DEAT)

4 EVALUATION OF EXPECTED IMPACTS ON IMPACT SENSITIVE SPECIES IN STUDY AREA

Generally speaking, it is unavoidable that birds get killed through interaction with infrastructure, including powerlines, despite the best possible mitigation measures. It is therefore important to direct risk assessments and mitigation efforts towards species that have a high biological significance, in order to achieve maximum results with the available resources at hand. However, a pure scientific approach would only consider the effects of deaths on the sustainability of the population, but society places other values on certain species, e.g. aesthetic or commercial, which can not be accounted for in a pure scientific approach, but can not be ignored either. In accordance with this principle, the risk assessment is primarily aimed at assessing the potential threat to Red Data species (biological significance), but in addition, more common large species that are vulnerable to powerlines, that occur or potentially occur along the proposed powerline corridors, were also considered in the study, although in less detail.

4.1 Potential Impacts of proposed powerlines

4.1.1 *Impacts on Red Data species*

For an analysis of potential impacts on Red Data species recorded in 2527CB see appendix B.

4.1.5 *Impacts on non-Red Data species*

Potential impacts on non-Red Data medium to large species recorded in 2527CB

Species	Nature of impact and probability of occurring	Locality
• Large raptors: Black Eagle Steppe Eagle Wahlberg's Eagle African Hawk Eagle Brown Snake Eagle Blackbreasted Snake Eagle African Fish Eagle Steppe Buzzard Jackal Buzzard	All these species are potentially vulnerable to collisions with powerlines, although the risk decreases with the size of the bird. The probability is however low due to expected low numbers along the corridors due to severe human impacts on the habitat.	These species could be encountered in low numbers anywhere along the proposed corridors in suitable habitat, but due to the extensive habitat transformation, the occurrence is likely to be sporadic.
• Waterbirds Great Crested Grebe Whitebreasted Cormorant Darter Grey Heron Blackheaded Heron Goliath Heron Purple Heron Great White Egret Yellowbilled Egret Little Egret Black Egret Cattle Egret Squacco Heron Greenbacked Heron Blackrowned Night Heron	All these species are potentially vulnerable to collisions with powerlines, although the risk decreases with the size of the bird. The probability is however low due to expected low numbers along the corridors due to severe human impacts on the habitat.	These species could be encountered anywhere along the proposed corridors in low numbers in suitable habitat outside human settlements. Population numbers could vary hugely depending on the availability of seasonal wetlands. Again, due to the extensive habitat transformation, the occurrence is likely to be sporadic or at low densities.

Hamerkop Sacred Ibis Glossy Ibis Hadeda Ibis African Spoonbill Whitefaced Duck Fulvous Duck Whitebacked Duck Egyptian Goose South African Shellduck Yellowbilled Duck African Black Duck Cape Teal Hottentot Teal Redbilled Teal Cape Shoveller Southern Pochard Knobbilled Duck Spurwinged Goose		
• Storks White Stork Abdim's Stork	These species are potentially vulnerable to collisions with powerlines. Collisions with the powerline are probable near agricultural areas.	These species could be encountered anywhere along the proposed corridors in suitable habitat, even close to human settlements. Again, due to the extensive habitat transformation, the occurrence is likely to be sporadic if at all.

5 CONCLUSIONS

5.1 Level of impact

All the proposed lines will run through areas that have been significantly impacted upon by human activity. In most instances the impacts are long term e.g. mining and urban sprawl.

5.2 Large birds

The number of large birds that occurred historically in the area has been reduced due to destruction of suitable habitat and disturbance. In some areas, species have disappeared completely.

5.3 Remaining undisturbed habitat

Very few patches of relatively intact habitat remain. Due to the fragmentation of the habitat, low bird numbers are expected.

5.4 Potential impacts

- No significant bird impacts are expected.

6 RECOMMENDED MITIGATION MEASURES

No specific mitigation measures are recommended.

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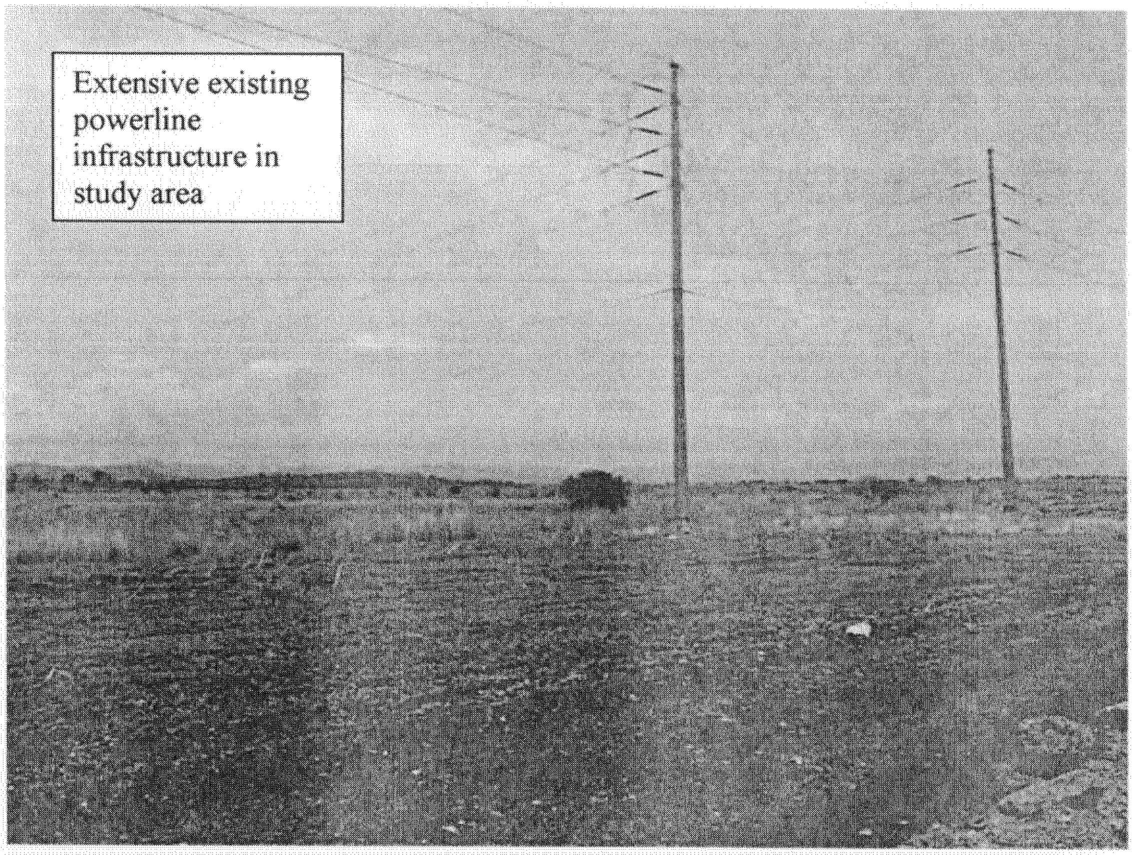
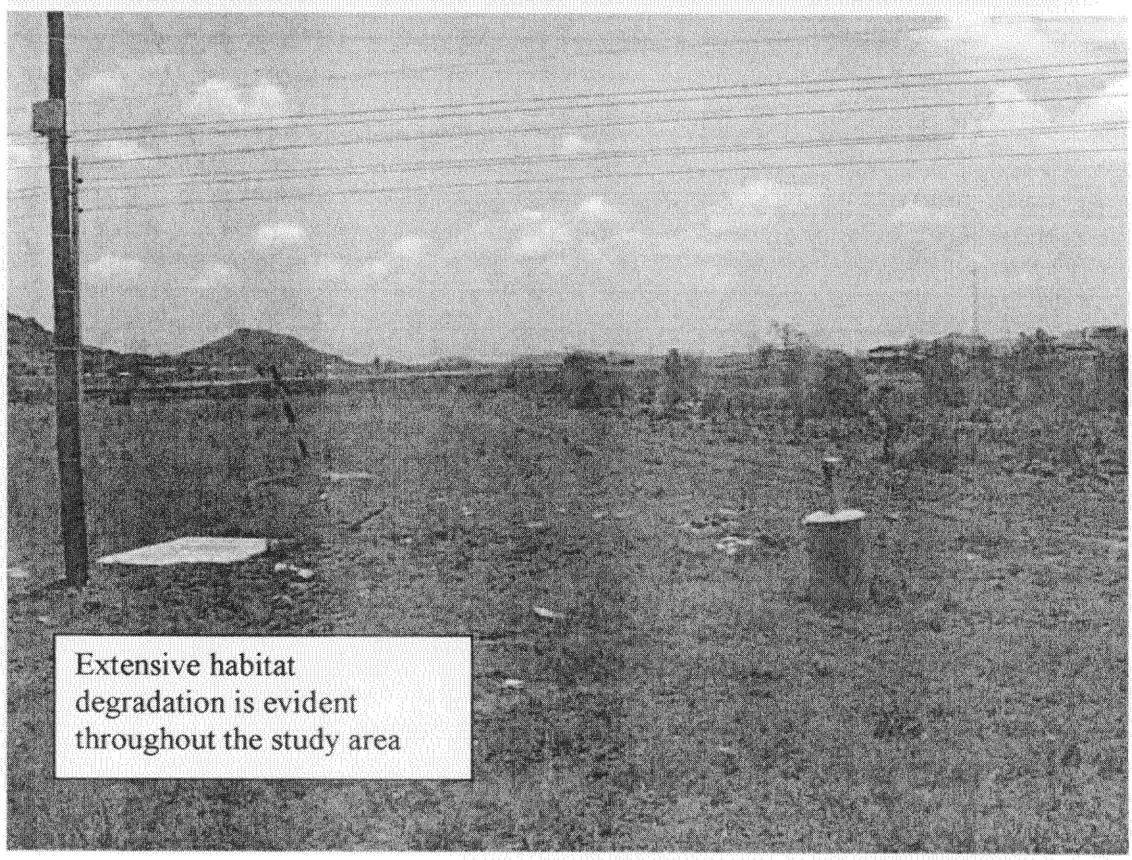
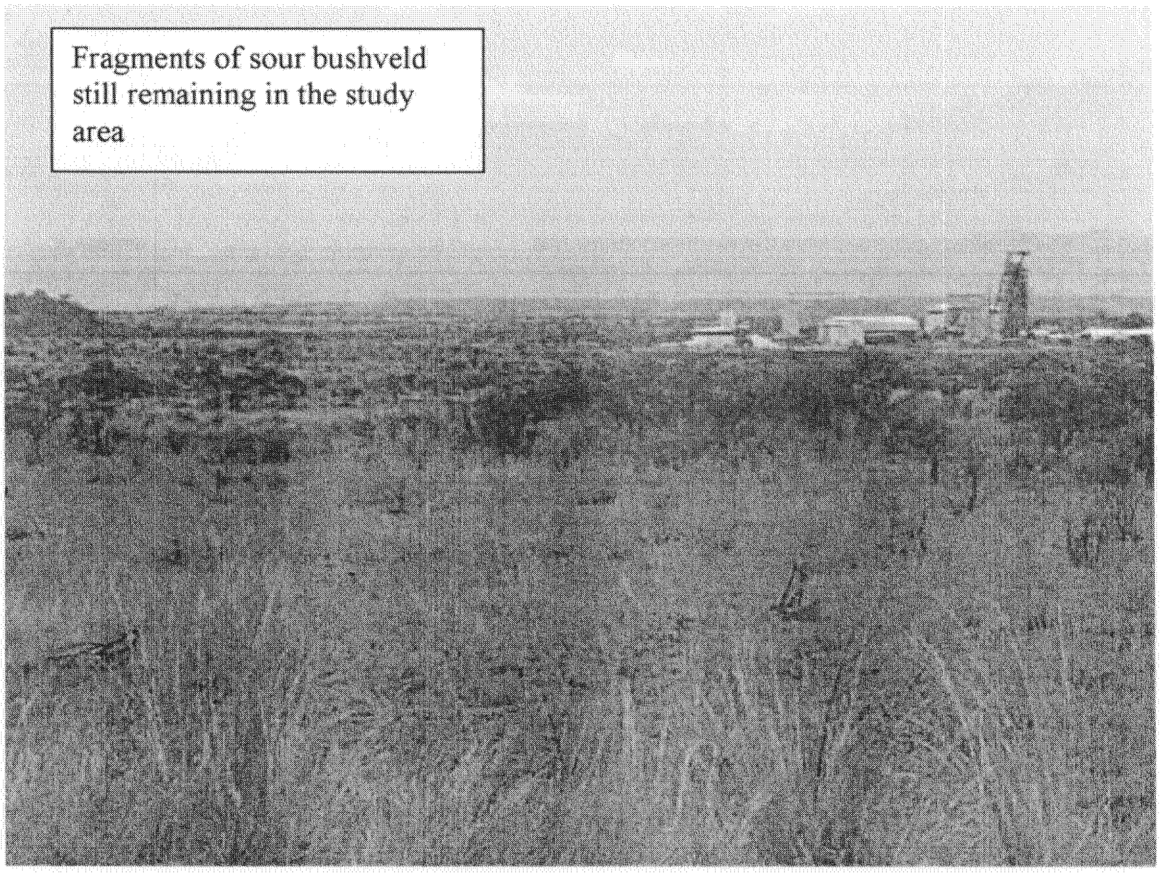
Appendix A: Examples of habitat along the alignments

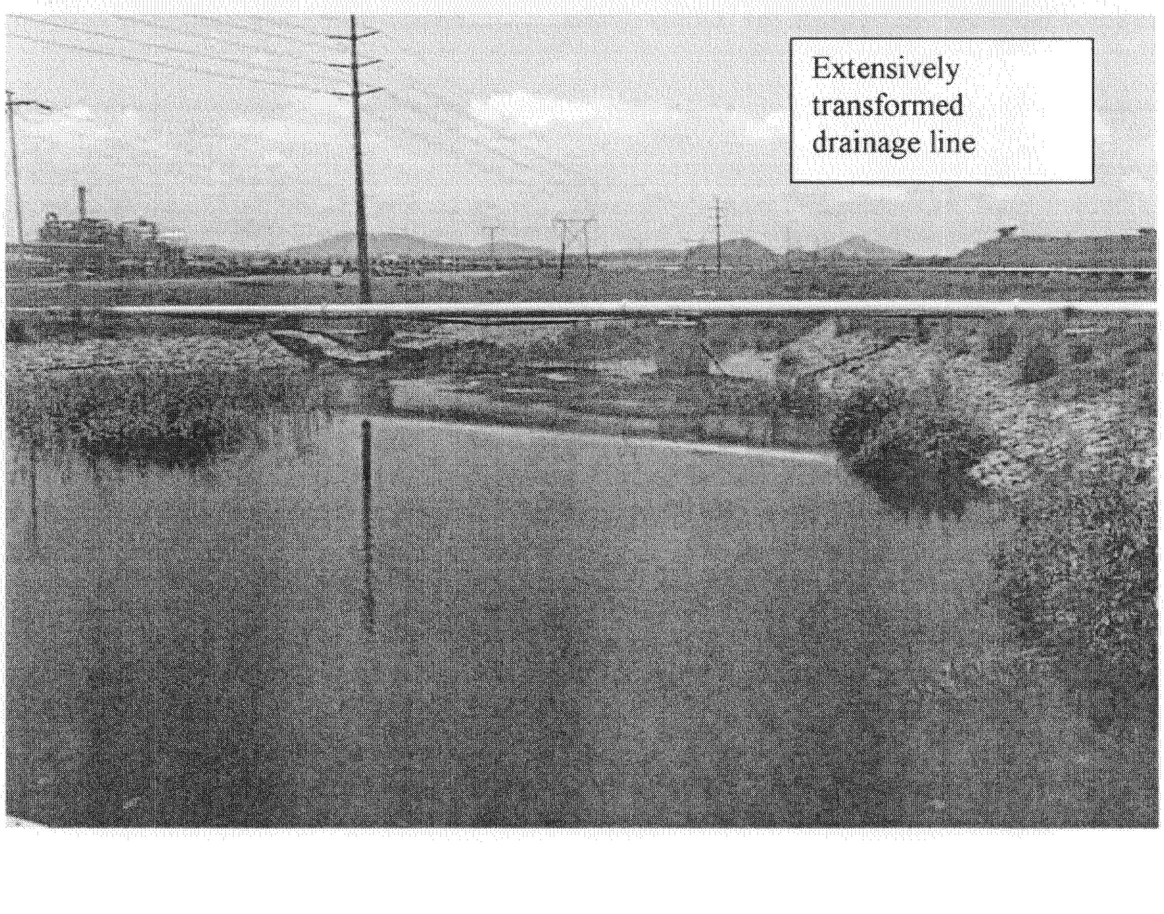




Appendix A: Examples of habitat along the alignments

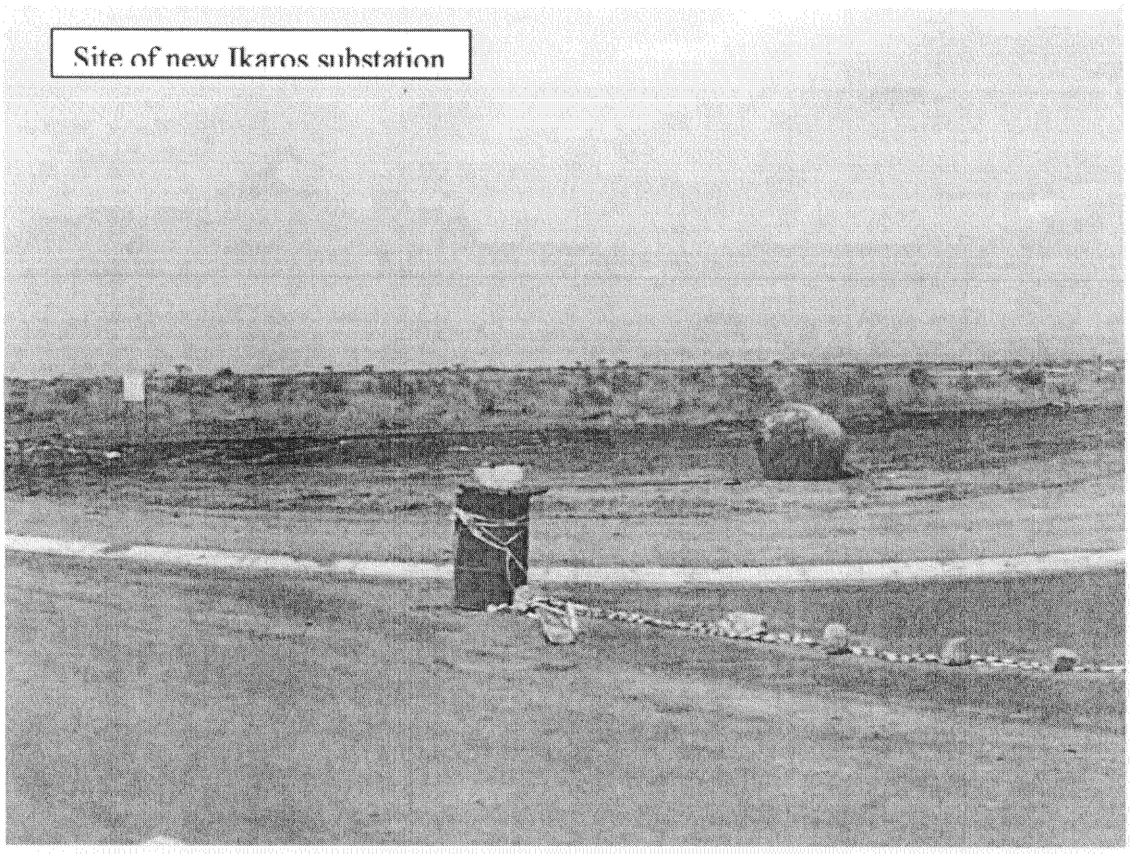


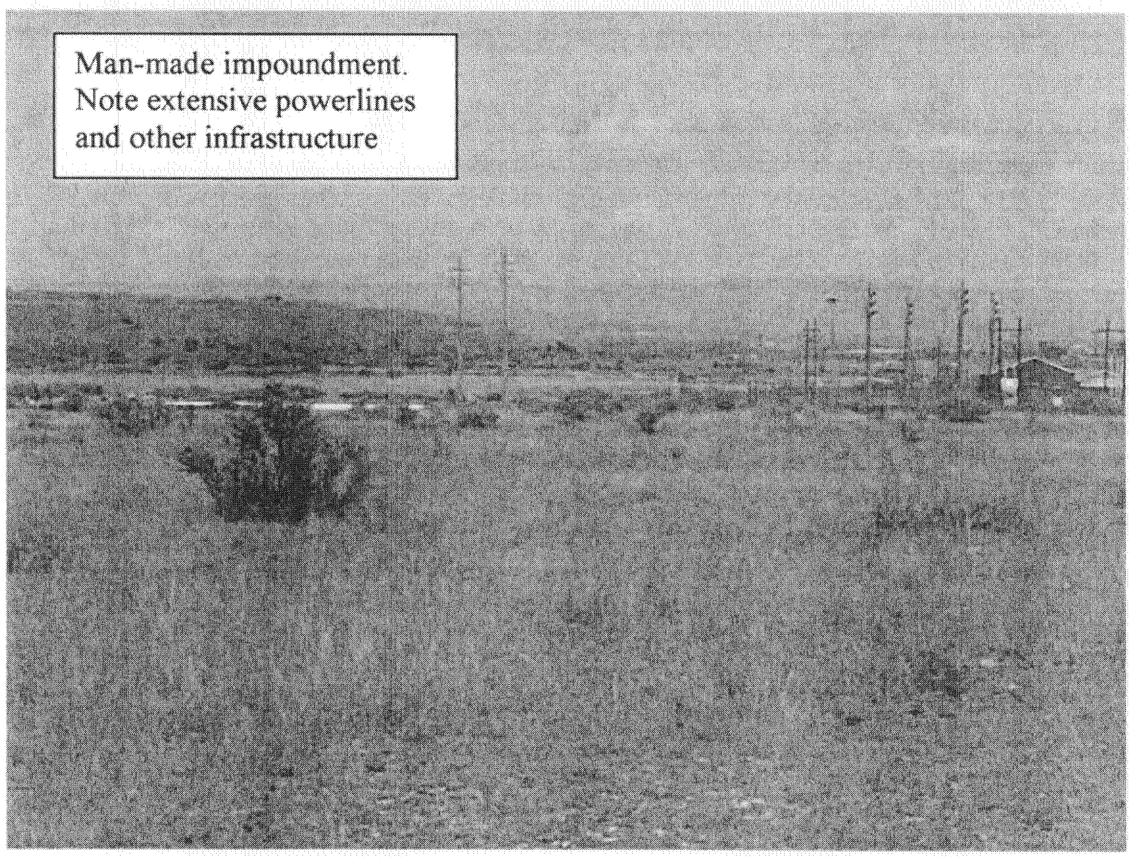
Fragments of sour bushveld still remaining in the study area



Extensively transformed drainage line

Appendix A: Examples of habitat along the alignments


Site of new Ikaros substation


Man-made impoundment. Note extensive powerlines and other infrastructure

Annexure A

Potential impacts on Red Data species recorded in 2527CB

Species	Conservation status (Barnes 2000)	Nature of impact	General susceptibility to expected impacts	Probability	Expected locality	Frequency	Timing	Duration	Permanence	Extent	Magnitude
Pinkbacked Pelican	Vulnerable	• Collision	High	Improbable	No suitable habitat						
Black Stork	Near-threatened	• Collision Electrocution	Unknown. Its close relative, the White Stork is highly susceptible to collisions and electrocutions	Improbable	The species breed in the Magaliesberg at Roberts Farm east of Olifantsnek. It occurs sparsely throughout the study area. Frequent cliffs to roost and breed, rivers and wetlands to feed. Suitable habitat lacking along alignments						
Marabou Stork	Near-threatened	• Collision Electrocution	Unknown, but probably high due to physical size and behaviour.	Improbable	Vagrant to the area						
Greater Flamingo	Near-threatened	• Collision	High	Improbable	No suitable habitat						
Lesser Flamingo	Near-threatened	• Collision	High	Improbable	No suitable habitat						

Annexure A

Secretarybird	Near-threatened	• Collision	High	Improbable	Too much disturbance, although a few patches of suitable habitat remains.						
Cape Griffon	Vulnerable	• Collision with powerline when feeding in the vicinity of powerlines Electrocution	Medium	Improbable	This species breed at three localities in the adjacent Magaliesberg. However, lack of food and human disturbance in the study area make interaction with the proposed powerlines unlikely.						
African Whitebacked Vulture	Vulnerable	• Collision with powerline when feeding in the vicinity of powerlines Electrocution	Medium	Improbable	This species roost regularly on powerlines in the vicinity of Sun City. Could be encountered anywhere away from human settlements, feeding on livestock carcasses. However, lack of food and human disturbance in the study area make interaction with the proposed powerlines unlikely.						
Lappetfaced Vulture	Vulnerable	• Collision with powerline when feeding in the vicinity	Medium	Probable	Very rare. Lack of food and human disturbance in the study area						

Annexure A

		of powerlines Electrocution			make interaction with the proposed powerlines unlikely.						
Tawny Eagle	Vulnerable	• Collision Electrocution	Medium	Improbable due to low numbers	Tawny Eagles are extremely rare outside large game reserves..Lack of food and human disturbance in the study area make interaction with the proposed powerlines unlikely.						
Martial Eagle	Vulnerable	• Collision Electrocution	Medium	Improbable due to low numbers.	Lack of food and human disturbance in the study area make interaction with the proposed powerlines unlikely.						

Annexure A

Lanner Falcon	Vulnerable	• Collision	Low. Normally nimble enough to avoid powerlines.	Improbable	Lanner Falcons could occur anywhere outside urban areas.								
Lesser Kestrel	Vulnerable	• Collision	Very low. Bird is small and agile.	Improbable	Vagrant to the area. Will benefit from powerlines as it uses it to perch on.								
African Marsh Harrier	Vulnerable	• Collision	Very low	Improbable	Vagrant to the area								
Grass Owl	Vulnerable	• Collision	?	Improbable .	Vagrant to area. Requires tall , undisturbed rank grassland.								
Halfcollare d Kingfisher	Vulnerable	• None											
Melodious Lark	Near-threatened	• None											