



SPECIFIC

ENVIRONMENTAL MANAGEMENT
PLAN

FOR THE

CONSTRUCTION

OF THE

AUAS – NARUCHAS

132KV

POWER LINE

REV 1

1. INTRODUCTION

A route evaluation and environmental impact assessment (EIA) was completed for the proposed 132 kV power-line from the Auas Transmission Station east of Windhoek to the new Naruchas Substation just north of Rehoboth.

The route evaluation suggested a number of route changes for consideration by NamPower, and 1 km buffer zones were generally established around homesteads, tourism establishments, dams, vleis and pans, from cliff faces and isolated inselbergs, as well as from archaeological sites. In this way, many potential environmental impacts could be effectively addressed.

Some environmental impacts as a result of the proposed power line cannot, however be avoided through alternative route selections. These environmental impacts, which were identified in the EIA study for the finalised route selected for the proposed power line, require mitigation.

In order to mitigate against these identified impacts, an **Environmental Management Plan (EMP)** is required, which is given in both the generic NamPower EMP and this document.

The Rights of and Interaction with landowners

| TASK | RESPONSIBILITY | DUE DATE |
|--|-------------------------------|-----------------|
| A list of farm-owners with all relevant available contact details is provided in the EIA report. Note: due to subletting, some of these details could not be obtained at the time the EIA was conducted and the onus is on the Contractor to ensure all reasonable steps are taken to contact all affected landowners. | Project Manager Contractor | |

Impacts to Birds

The species highlighted here are the most susceptible to collision and electrocution in the project area:

- 53 species of large wetland birds occur in the project area. The most vulnerable wetland bird in the study area includes the White Pelican and Egyptian Goose. The pelican is a *Vulnerable* Red-listed species in Namibia.
- A relatively large number of raptors (birds of prey) and vultures occur in the project area, totalling 33 species. Of the 33 raptors, the two **vultures** are relatively common in the project area and include the White-backed Vulture and Lappet-faced Vulture. Both are Red Data species - *Near Threatened* and *Vulnerable* respectively.
- The only other species that regularly impact power lines are sandgrouse that flock to waterholes in the evening and morning, but these are likely to be impacted at a very low level in this area.

| TASK | RESPONSIBILITY | DUE DATE |
|--|-----------------------|-----------------|
| <p>Bird flappers are required where the power line crosses major rivers and in the vicinity of farm dams.</p> <p>It is suggested that the EBM bird flapper is used, obtainable from the following supplier; (Eerhardt Martin at +27-11-6732036).</p> <p>Bird flappers are required at the following dam locations:</p> <ul style="list-style-type: none"> • Hohewarte (22° 39.3'S, 17° 21.5'E) • Aus Game Lodge | Surveyor, ESO, EO | |

| | | |
|---|-------------------|--|
| <p>(22° 47.7'S, 17° 19.8'E)</p> <ul style="list-style-type: none"> • Nauaspoort Dam (23° 03.4'S, 17° 13.0'E) | | |
| <p>Bird flappers are required at the following river crossing locations:</p> <ul style="list-style-type: none"> • Olifants River on farm Hohewarte (twice crossing it) (22° 38.0'S, 17° 21.9'E; 22° 39.4'S, 17° 21.6'E) • Brack River on farm Tew (Aus Game Lodge) (22° 46.9'S, 17° 20.4'E) • Keiseb River on farm Onnaams - Koppies Kraal (twice crossing it) (22° 56.2'S, 17° 17.4'E) | Surveyor, ESO, EO | |
| <p>Bird flappers are recommended for the base of slopes and near cliffs: at</p> <ul style="list-style-type: none"> • the Farm Koppieskraal • at the poort where the line traverses the Nauaspoort Mountains, on the farm Wortel. | Surveyor, ESO, EO | |

Impacts to Vegetation

- The Awas mountain complex has been identified as an important plant area. The southern Aus Mountain complex (Oamites, Nauaspoort, Grimmrucken, Bahnhofberg and related ranges) are of varied geological origin, and indications are that they support a different, highly specific vegetation.
- Rocky outcrops and inselbergs of the highlands harbour vegetation that is highly diverse and which has a high number of niche species which are generally restricted to these outcrops. This particular factor makes rocky outcrops highly sensitive to disturbances.
- The string of rocky outcrops south of the Nauaspoort Mountains are likely to have a high vegetation diversity. These rocky outcrops have several aloe and succulent species associated with them. In addition, the unique habitats provided by these outcrops also attract a variety of fauna. Ferns and mosses grow on the southern slopes of these rocks. These rocky outcrops must be regarded as sensitive.
- The Camelthorn (*Acacia erioloba*) woodlands are the best feature of the Rehoboth district, which occur on the alluvial plains to both the north and south of the town. These woodlands harbour a high number of geophyte species, which are generally little known in Namibia. Conservation of these

woodlands is of concern to the Directorate of Forestry as well as the Rehoboth community, and permits are required should these camelthorn trees require removal.

- The proposed route crosses the Schaap and the Usib Rivers. Both rivers have splendid river line woodlands along their banks which should be left as undisturbed as possible.
- Protected species likely to be encountered along the proposed power line route include the following:
 - Aloe littoralis (Windhoek Aloe)^{NC}
 - Aloe viridiflora (Green Aloe)^{NC}
 - Aloe hereroensis (Sand Aloe)^{NC}
 - Acacia erioloba (Camelthorn)^F
 - Albizia anthelmintica (worm cure Albizia)^F
 - Boscia albitrunca (shepherd's tree)^F
 - Maerua schinzii (ringwood tree)^F

^{NC} Protected by the Nature Conservation Ordinance (Ordinance 4 of 1975)

^F Protected by the Forestry Act (Act 12 of 2001)

Permits are required from the Directorate of Forestry should any of these tree species require removal.

| TASK | RESPONSIBILITY | DUE DATE |
|---|-------------------------|----------|
| The National Botanical Research Institute (NBRI) staff should be tasked to do rescue missions of any Aloe populations and/or succulents encountered while doing the final survey of the route. | ESO to contact the NBRI | |
| Bulbs (geophytes) should also be removed from the route especially through any omirimbi or through the Camelthorn woodlands before clearing commences. These can be transplanted next to the clearing in a relocation effort or cultivated at the NBRI gardens. The NBRI and the Contractor should come to an agreement in this regard, with written proof of such agreement available before construction commences. | ESO to contact the NBRI | |

Climatic conditions of the project area

The climate of the Windhoek-Rehoboth area is classified as semi-arid highland savanna. This area experiences an average rainfall of 350 to 400mm per year (the long-term annual mean of measurements over 74 years at Windhoek Meteorological Office is 360mm), with a rainfall range of between 50 and 950 mm per year. Average monthly rainfall figures for the period 1909 to 1985 for Windhoek are shown in Table 5-2 below.

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|--------------|
| 76,2 | 78,3 | 77,9 | 38,5 | 5,7 | 1,2 | 0,8 | 1 | 2,7 | 10,4 | 26,4 | 40,9 | 360,0 |

Average Monthly rainfall (mm) for Windhoek Station No 0740/154 (1909 to 1985)

This rainfall is generally sporadic and unpredictable, and comprises predominantly high intensity, highly localised convective afternoon storm events, which occur mainly between December and March.

Evaporation exceeds precipitation by approximately 93% in the study area. Long term daily temperature statistics for the study area are given in the table below..

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Ave |
|--------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Max | 30 | 28,6 | 27,1 | 25,3 | 22,6 | 20,2 | 20,4 | 23,2 | 26,7 | 29 | 29,5 | 30,5 | 26,1 |
| Min | 17,3 | 16,7 | 15,5 | 13 | 9,3 | 6,8 | 6,4 | 8,8 | 12 | 14,7 | 15,7 | 16,9 | 12,7 |
| Mean | 23,6 | 22,6 | 12,3 | 19,1 | 16 | 13,5 | 13,4 | 15,9 | 19,2 | 21,8 | 22,6 | 23,6 | 19,4 |

Monthly temperatures for Windhoek station No 0740/154 (1909 to 1985)

Highest temperatures in the study area are measured in December with an average daily maximum of 31 °C and a minimum of 17,3 °C; the coldest temperatures are measured in July with an average daily maximum of 20,4 °C and minimum of 6,4 °C.

Wind directions over the Khomas Hochland are predominantly south-easterly. Southerly, easterly, and northerly airflow is also common. Wind seldom blows from the northwest and southwest. Dry and dusty westerly winds blow in the afternoons and evenings in early summer, caused by the prevalence of the Southern Atlantic Anticyclonic cell resting upon the coast of Namibia. Average annual surface wind speed frequencies for Windhoek are given in the table below.

| | | | | | | | | | | | |
|---------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-------------|-------------------|-------------------|-------------------|-------------------|-----------|
| Wind Speed m/s | 0.0 – 1.0 | 1.0 – 1.5 | 1.6 – 3.3 | 3.4 – 5.4 | 5.5 – 7.9 | 8 – 10.7 | 10.8 – 13.8 | 13.9 – 17.1 | 17.2 – 20.7 | 20.8 – 24.4 | 24.4 + |
| Frequenc y (%) | 28.8 4 | 10.8 0 | 31.2 5 | 19.8 7 | 7.3 | 1.8 | 0.08 | 0 | 0 | 0 | 0 |

Average Annual Surface Wind Speed Frequencies for Windhoek (1951 to 1970)