

**ENVIRONMENTAL IMPACT ASSESSMENT ADDENDUM FOR THE PROPOSED  
OTJIKOTO – KATIMA MULILO TRANSMISSION LINE**

**EMP ADDENDUM**

CONTENTS

<b>1</b>	<b>BACKGROUND AND INTRODUCTION.....</b>	<b>4</b>
1.1	EA Addendum.....	5
<b>2</b>	<b>REQUIREMENTS FOR ENVIRONMENTAL MANAGEMENT: SURVEY &amp; DESIGN STAGE .....</b>	<b>7</b>
2.1	General .....	7
2.2	Vegetation.....	7
2.2.1	Minimising impacts on protected trees (and other large specimens) .....	7
2.2.2	Minimising impacts on other protected plants .....	7
2.2.3	Plant rescue.....	7
2.2.4	Particularly sensitive areas for vegetation .....	8
2.3	Birds.....	8
2.3.1	River Crossings .....	8
<b>3</b>	<b>ENVIRONMENTAL SPECIFICATIONS: CONSTRUCTION STAGE .....</b>	<b>9</b>
3.1	Environmental Specifications: General.....	9
3.1.1	Restricted working area .....	9
3.2	Environmental Specifications: Vegetation and Soils .....	9
3.2.1	Particularly sensitive areas of vegetation .....	9
3.2.2	Blading .....	9
3.2.3	Banks of watercourses .....	9
3.3	Environmental Specifications: Birds .....	10
3.3.1	Anti collision devices.....	10
<b>4</b>	<b>REQUIREMENTS FOR ENVIRONMENTAL MANAGEMENT: OPERATIONS &amp; MAINTENANCE STAGE (INCLUDING DECOMMISSIONING).....</b>	<b>11</b>
4.1	General .....	11
4.2	Ongoing Management: Birds.....	11
4.2.1	Landowner participation.....	11
4.2.2	Additional anti collision devices .....	11

**5 REFERENCES ..... 12**

**ACKNOWLEDGEMENTS**

**APPENDICES**

- Appendix A Protected Plant Species
- Appendix B Important Bird Species

## LIST OF ABBREVIATIONS

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EA Environmental Assessment (also known as an Environmental Impact Assessment)

EMP Environmental Management Plan

HVAC High Voltage Alternating Current

HVDC High Voltage Direct Current

I&APs Interested & Affected Parties (stakeholders)

kV Kilovolts (1 kilovolt = 1000 volts)



The full / overall transmission power line is to be constructed in 2007, but will not, however, use the full routes assessed in the EA's as listed above. Sections of each route assessed in the EA's will be constructed forming the power line route running from Auas Sub-Station (near Windhoek) via Gerus Sub-Station (north of Otjiwarongo) via Rundu and ending at Katima Mulilo. The remainder of the routes assessed will be constructed at a later date in accordance with demand and supply considerations.

The final transmission power line will be modified to transmit 350kV of High Voltage Direct Current (HVDC) electricity, which is very similar to the originally proposed High Voltage Alternating Current (HVAC) power line as part of the three above-mentioned EA's. HVDC will entail a slight modification, to that of a HVAC, at the start and end of the power lines due to the requirement for *earth electrode sites*, *repeater stations* and *converter stations* at the sub-stations.

The proposed overall transmission power line is planned as part of a greater plan to meet the need for growth in power demand and supply in Namibia and the greater SADC Region.

## **1.1 EA Addendum**

The EA undertaken for the Otjikoto – Katima Mulilo section of the power line has been completed and exists as the following documents:

- Volume 1: Route Evaluation and Scoping Report (October 2005);
- Volume 2: Environmental Assessment (June 2006); and
- Volume 3: Environmental Management Plan (June 2006).

The proposed route begins at the Otjikoto sub station, near Tsumeb, and continues north eastwards along an existing power line route to Mururani Gate. From there it continues along the national road (B8) through communal farming and woodland areas ending south of Rundu. From Rundu the power line will turn eastwards and follow the national road (B8) to Divundu, where it will make its first river crossing over the Okavango River and then proceed through the Caprivi Game Park. It will then make its second river crossing over the Kwando River. The power line will follow the road north eastwards through the State Forest to a planned substation at Katima Mulilo. The proposed power line route is illustrated in Figure 2.

The proposed power line route runs through various land use zones. These land use zones include privately owned farms and communal land between Otjikoto and Rundu. The remainder of the route runs through communal land and the Caprivi Game Park. River crossings are made at two (2) points along the proposed power line route, i.e. the Okavango River and the Kwando River.

During the EA process route evaluation, a detailed environmental impact assessment of the proposed route was undertaken. Both positive and negative impacts of the proposed route were identified and assessed. As part of the route evaluation and environmental impact assessment the original power line

route proposed by NamPower was adjusted in response to environmental issues, however despite these adjustments **significant negative environmental impacts** were identified in Volume 2: Environmental Assessment. The most significant of these negative impacts occur at the river crossings, where various bird species are severely affected, and consequently, the overhead power line crossing of the rivers was determined to be a fatally flawed option for the power line. Underground power line cables were recommended as an alternative and mitigation measure for the river crossings.

Underground river crossings were therefore further evaluated by NamPower and found to be non-feasible from a technical and economic perspective. For this reason an EA Addendum has been conducted by Eco.plan in order to identify and assess alternatives and possible mitigation measures for the power line river crossings.

The preferred option to mitigate the negative impacts is a HVDC overhead power line from Mururani Gate to Katima Mulilo, which will tie into a planned power line from Gerus (near Otjiwarongo) to Mururani Gate as part of the overall Auas – Katima Mulilo power line. The HVDC power lines will be modified at the Okavango River and Kwando River crossings.

The HVDC power line will look very similar to that of a HVAC power line as described in the original Otjikoto- Katima Mulilo EA Report. The construction and operation of the HVDC power line will be exactly the same as that of a HVAC power line and is therefore not re-assessed in this EMP Addendum.

This EMP arises out of the Otjikoto – Katima Mulilo EA Report, which identified a number of potential environmental impacts that need to be managed during the project cycle: This EMP has been amended where relevant for the purposed EA Addendum and should be implemented in conjunction with the Volume 3: Environmental Management Plan (June 2006) produced as part of the overall Otjikoto to Katima Mulilo Power Line EA as well as NamPower's General Environmental Management Plan for the Construction of Power Lines (March 2006).

This EMP outlines the roles and responsibilities of all parties who can influence or give effect to the recommendations or specifications that follow. It is important that all parties should understand the guidelines / specifications, and the reasons for them.

**Note: This EMP only contains information where the EA EMP Addendum deviates or is different from the original EA Reports and EMP.**

## 2 REQUIREMENTS FOR ENVIRONMENTAL MANAGEMENT: SURVEY & DESIGN STAGE

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### 2.1 General

During the Environmental Assessment, the route was mapped on orthophotos at a scale of 1: 50,000 (Volume 2). At that scale details of vegetation, topography, and even small dwellings can sometimes be overlooked. Therefore more detailed information is required from the ground survey.

This information must then be used to “fine tune” and adjust the alignment at the design stage of the power line.

Sections 2.2 and 2.3 below will provide further details on information that needs to be gathered or confirmed during the ground survey and taken into account in designing the final alignment.

### 2.2 Vegetation

#### 2.2.1 Minimising impacts on protected trees (and other large specimens)

The requirements of the NamPower General Environmental Management Plan for the Construction of Power Lines and Substations (March 2006) as approved by the MET, must be implemented. This has specific reference to Section 4: Physical Environment – Section 4.5 and Section 5 Biological Environment – Section 5.4.

#### 2.2.2 Minimising impacts on other protected plants

In the case of other protected plants, a similar approach must be taken as for trees during the ground survey and design stage. Where these cannot be avoided, a plant rescue operation is required.

#### 2.2.3 Plant rescue

At the design stage, a plant rescue operation must be organised with the National Botanical Research Institute (NBRI Tel. 061 - 2022023).

Where protected species of trees and other plants cannot be avoided, permits must be obtained at the design stage.

A permit is required from the Directorate of Forestry (MAWF) to remove any protected trees. (Tel. 061 – 221478, 221511 or 221671)

For other protected plants, e.g. aloes, succulents, bulbs, a permit is required from the Ministry of Environment and Tourism. Contact the Permit Office at MET (Tel. 061 – 263131).

#### 2.2.4 Particularly sensitive areas for vegetation

The following areas are likely to be particularly sensitive for vegetation, especially protected species, but they will not be limited to these areas. For more detail refer to Volume 2, Sections 5.1 and 6.

- Along all river courses (large trees) – the power line should cross where the woodland is narrowest; and
- In the State Forest near Katima Mulilo where highly diverse species like *Albizia versicolor*, *Pterocarpus lucens* and *Pterocarpus rotundifolius* occur. These species must be avoided as far as possible.

### **2.3 Birds**

Power lines are a hazard to large birds, refer to Appendix B for a list of important bird species that will be affected. Water will also attract many large birds to drink or feed. Large birds will be particularly vulnerable near farm dams, pans and perennial rivers.

#### 2.3.1 River Crossings

The risk to birds at the river crossing has been significantly minimised and mitigated through the implementation of a 350kv HVDC power line along the route, along with modifications to the earth wire. These modifications can only be supported by relatively short cable / conductor spans and therefore the placing of the tower at the river crossings needs to be as far away from the water courses as possible.

Along with the modification of the power line and conductors, at the two rivers, the following is recommended:

- Anti-collision devices must be fitted to all sections of the line that are within 2km of rivers, open water and reed beds, in accordance with the location and spacing co-ordinates issued by the Environmental Consultant.

### 3 ENVIRONMENTAL SPECIFICATIONS: CONSTRUCTION STAGE

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#### 3.1 Environmental Specifications: General

##### 3.1.1 Restricted working area

The requirements of the NamPower General Environmental Management Plan for the Construction of Power Lines and Substations (March 2006) as approved by the MET, must be implemented. This has specific reference to Section 3: Social Environment – Section 3.1 and 3.2.

#### 3.2 Environmental Specifications: Vegetation and Soils

##### 3.2.1 Particularly sensitive areas of vegetation

The following areas are likely to be particularly sensitive for vegetation, especially protected species, and the Contractor shall be particularly careful to minimise impacts on vegetation in sensitive areas such as: -

- Along all river courses (large trees);
- Riverine vegetation which may be impacted on in the stringing of the conductors; and
- In the State Forest near Katima Mulilo where highly diverse species like *Albizia versicolor*, *Pterocarpus lucens* and *Pterocarpus rotundifolius* occur.

##### 3.2.2 Blading

Disturbance of the ground cover or topsoil exposes the soil unnecessarily to the risk of erosion. The ground shall not be bladed, thus grasses and low herbaceous plant cover shall be left in place. No blading shall be undertaken in the riverine vegetation areas at the river crossings.

The requirements of the NamPower General Environmental Management Plan for the Construction of Power Lines and Substations (March 2006) as approved by the MET, must be implemented. This has specific reference to Section 4: Physical Environment – Section 4.5 and Section 4.6.

##### 3.2.3 Banks of watercourses

The banks of watercourses are susceptible to erosion if de-stabilised. Trees may collapse unnecessarily if these banks are de-stabilised or eroded.

Particular care shall be taken at crossings of rivers so that the banks are not unduly de-stabilised or eroded. Where it is necessary for vehicle tracks to cross rivers this shall be done where the risk of erosion is minimised – taking into account the minimum destruction of riverine trees and bush, and

avoidance of the steepest banks. Where felling of trees on riverbanks is unavoidable, the roots shall be left in place to help prevent erosion of the banks.

### **3.3 Environmental Specifications: Birds**

#### **3.3.1 Anti collision devices**

The power line represents a threat to large birds and aircraft, which may collide with the conductors. To protect aircraft, aircraft spheres are to be fitted to the line near landing strips and roads. To protect birds, anti collision devices are to be fitted in specified situations where the risks of collision are greatest.

The contractors are to provide anti-collision devices in accordance with the location and spacing requirements of the Environmental Consultants.

## **4 REQUIREMENTS FOR ENVIRONMENTAL MANAGEMENT: OPERATIONS & MAINTENANCE STAGE (INCLUDING DECOMMISSIONING)**

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### **4.1 General**

The Environmental Specifications set out above shall apply also to the Operations and Maintenance stage, whether the work is done in-house by NamPower or by an external Contractor.

In addition Section 4.2 below draws attention to specific issues to be addressed by NamPower on an ongoing basis, which may not be adequately covered in Section 3.

### **4.2 Ongoing Management: Birds**

#### **4.2.1 Landowner participation**

It will be impractical for NamPower to monitor the fatalities to birds on a routine basis. If birds are killed they are likely to be consumed by jackals and vultures or consumed by fire. It is therefore recommended that NamPower should encourage farmers to report any bird fatalities or other problems to NamPower's Safety, Health and Environmental Office / National Control Centre should keep a record of all reports on an ongoing basis stating the date, species (or at least the genus), the manner in which the bird was killed or the nature of the problem.

These records should then be used to determine the needs for additional measures to protect birds particularly between Divundu and Kongola. It is recommended that interested persons (e.g. local land owners or lodge owners) be asked to assist in the monitoring and reporting of bird kills, which can be reported to NamPower's Safety, Health and Environmental Office.

NamPower need to establish a rigorous monitoring programme to determine the effects of the modified HVDC power line on birds at the river crossings.

#### **4.2.2 Additional anti collision devices**

In the event of significant numbers of collisions at particular locations, extra anti collision devices may be required. In some cases fluorescent tubes or luminous bird flappers may be required so that they are visible to birds flying at night.

## 5 REFERENCES

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National Botanical Research Institute (NBRI) Tel. 061 - 2022023

A permit is required from the Directorate of Forestry (MAWF) to remove any protected trees. (Tel. 061 – 221478, 221511 or 221671)

For other protected plants, e.g. aloes, succulents, bulbs, a permit is required from the Ministry of Environment and Tourism. Contact the Permit Office at MET (Tel. 061 – 263131).

Heritage Council and J.Kinahan (Tel. 061 – 256702 / 236216)

### **Useful Reference Material**

Birds & Power Lines” (Ferrer & Janss eds. 1999).

Problem Plants of South Africa (Bromilow, 2001).

## Appendix A: Important Protected Plant Species

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Nomenclature follows Craven (1999)

*Acacia erioloba*  
*Acacia haematoxylon*  
*Acacia montis-usti*  
*Acacia robynsiana*  
*Acacia sieberana*  
*Acanthosicyos horidus*  
*Adansonia digitata*  
*Albizia anthelmintica*  
*Baikiaea plurijuga*  
*Berchemia discolor*  
*Boscia albitrunca*  
*Burkea africana*  
*Colophospermum mopane*  
*Combretum imberbe*  
*Elaeodendron transvaalensis* (= *Cassine transvaalensis*)  
*Entandrophragma spicatum*  
*Erythrina decora*  
*Euclea pseudebenus*  
*Faidherbia albida* (= *Acacia albida*)  
*Ficus cordata*  
*Ficus sycomorus*  
*Ficus thonningii*  
*Guibortia coleosperma*  
*Kirkia accuminata*  
*Lannea discolor*  
*Lonchocarpus capassa*  
*Lonchocarpus nelsii*  
*Maerua schinzii*  
*Ochna pulchra*  
*Olea europea* subsp. *africana*  
*Ozoroa crassinervia*  
*Pappea capensis*  
*Parkinsonia africana*  
*Peltophorum africanum*  
*Pterocarpus angolensis*  
*Rhus lancea*  
*Salix capensis*  
*Schinziophyton rautanenii* (= *Ricinodendron rautanenii*)  
*Schotia afra*  
*Sclerocarya birrea*  
*Securidaca longipendunculata*  
*Spirostachys africana*  
*Sterculia africana*  
*Strychnos cocculoides*  
*Strychnos spinosa*  
*Tamarix usinioides*

## **Appendix B: Important Bird Species**

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The following Red Data species would be extremely vulnerable to collisions with an overhead power line across the two rivers in question. Their conservation status is shown in bold:

### **Great White Pelican *Pelecanus onocrotalus* Vulnerable**

- Scarce non-breeding visitor. Small groups have been recorded, most often during the period when the floodplains are drying up and fish are trapped in channels and ponds.

### **Pinkbacked Pelican *Pelecanus rufescens* Vulnerable**

- Rare non-breeding visitor. Solitary individuals have been recorded in most months. Both Pelican species are large enough to be vulnerable to power lines.

### **Slaty Egret *Egretta vinaceigula* Vulnerable**

- Scarce (non-breeding) resident. Globally threatened. Recorded throughout the year in small numbers – increasing during periods of declining floods, most often seen in areas with floating mats of *Echinochloa* and *Vossia*. This is not a very large bird and it is not known whether these would be vulnerable to collisions with power lines.

### **Whitebacked Nightheron *Gorsachius leuconotus* Endangered**

- Rare resident. Recorded most often in dense wooded thickets overhanging the river. This species is probably most common in the Mukwe-Divundu area where it occurs in dense *Syzygium guineense* thickets. Very young birds have been recorded in March/April and the species may breed in the area. The species is considered by some to be continentally threatened.

### **Saddlebilled Stork *Ephippiorhynchus senegalensis* Endangered**

- Scarce visitor. Recorded throughout the year in Mahango Game Park in very small numbers (< 5 birds). It is generally found feeding in wet floodplain habitats, along the edge of the river channels and in ephemeral pans. This large species would be very vulnerable to power lines. It is considered to be continentally threatened.

### **Marabou Stork *Leptoptilos crumeniferus* Rare**

- Uncommon to common visitor. Recorded in all months of the year, this species is found throughout the area in wooded as well as open floodplain and riverine habitats.

### **Yellowbilled Stork *Mycteria ibis* Vulnerable**

- Scarce to uncommon visitor. Recorded in small numbers throughout the year. This species favours riverine habitats, lagoon margins, flooded grasslands, swamps and marshes. Large and very vulnerable to power lines.

**Sacred Ibis *Threskiornis aethiopicus* Rare**

- Scarce (non-breeding) resident. Formerly common in floodplain habitats, this species has become scarce since the destruction of its main breeding sites by Elephant and fire. Now only seen irregularly in small numbers. Not a very large bird but possibly vulnerable to power lines.

**Glossy Ibis *Plegadis falcinellus* Vulnerable**

- Uncommon to scarce visitor. Recorded in small numbers in the summer months, but is most common during periods of declining floods from April to July. Not a very large bird but possibly vulnerable to power lines.

**Hadedda Ibis *Bostrychia hagedash* Vulnerable**

- Rare visitor. There are isolated records of this species from the study area. Apparently suitable breeding and feeding habitats exist especially on the islands in the Mukwe-Divundu area.

**African Marsh Harrier *Circus ranivorus* Vulnerable**

- Uncommon to rare resident. During the late dry season few birds recorded as most of the floodplain is dry. With the onset of the floods numbers increase markedly. Probably breeds in the floodplain areas of the Mahango Game Park. Possibly vulnerable to power lines.

**African Fish Eagle *Haliaeetus vocifer* Vulnerable**

- Uncommon resident along the river and associated floodplain habitats. Numbers are lower during the breeding season when territories are aggressively defended. Numbers increase considerably during the late dry season (October) Probably vulnerable to power lines while flying over the river hunting for fish.

**Western Banded Snake-Eagle *Circaetus cinerascens* Critically Endangered**

- Scarce resident - restricted to the densely wooded riverine strip. A small population occurs in the Mukwe-Divundu area with the birds known to breed on some of the islands there. Possibly vulnerable to power lines.

**Wattled Crane *Grus carunculata* Critically Endangered**

- Scarce resident. Found on floodplains along the rivers, usually in pairs or family groups of three. They breed soon after high-water in May/June. **This species is considered globally threatened. It would definitely be vulnerable to overhead power lines.** The study area is a major global stronghold for this species and they must be considered to be of the highest conservation concern.

**African Finfoot *Podica senegalensis* Critically Endangered**

- Rare. May occur in the Mukwe-Divundu area on wooded river margins and island forest. These birds require river margins with dense overhanging vegetation. Vulnerability to power lines unknown, but it tends to fly low over the water.

**African Skimmer *Rhynchops flavirostris* Endangered**

- Uncommon breeding intra-African migrant. Present in the study area as soon as sandbanks become exposed enough to allow roosting July to February when sandbanks are once again inundated. Breeds in extended colonies on sandbanks from late August/September to October. Possibly vulnerable to power lines.

**Coppery-tailed Coucal *Centropus cupreicaudatus* Vulnerable**

- Common resident. Recorded in all months of the year. Restricted to floodplain and riverine habitats, seldom venturing into riparian woodlands. Probably vulnerable to power lines.

**Pel's Fishing Owl *Scotopelia peli* Critically Endangered**

- Scarce resident. Recorded in all months of the year. Most often recorded in riparian woodland and tall trees along the main river course, but may be found roosting up to 200 m from the river. Several territories are known from the Mukwe-Divundu islands. Any loss of the large trees within the riparian habitats (through inundation) will lead to a significant reduction in the local population. These birds are probably also vulnerable to collisions with power lines.

Other small species in the area, which that are Red Data listed, include: -

**Red-winged Pratincole *Glareola pratincola* Vulnerable**

- Common resident. Found in large flocks (>500 birds) on sandbanks and short grass habitats on the main floodplains. Breeds in extensive colonies from September to December during periods of low water.

**Rock Pratincole *Glareola nuchalis* Vulnerable**

- Common breeding intra-African migrant. Occurs from June to March/April on rocky rapids from Mukwe to Divundu and downstream to the Mahango area. Breeds from December to March. Their breeding habitat is very restricted, and the above-mentioned river section is a regional stronghold of this species in southern Africa.

**Greater Swamp Warbler *Acrocephalus rufescens* Vulnerable**

- Common resident. Only occurs in dense stands of Papyrus and other tall aquatic grasses and reeds.
- Due to the small size of these three species they are probably not vulnerable to power lines.

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