ENVIRONMENTAL ASSESSMENT

of the proposed

220kV TRANSMISSION LINE FROM
OMBURU SUBSTATION TO KUISEB
SUBSTATION VIA THE PROPOSED HUSAB
SUBSTATION

DRAFT ROUTE EVALUATION AND
ENVIRONMENTAL IMPACT REPORT

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EXECUTIVE SUMMARY

Introduction

This study is a route evaluation and environmental impact assessment (EIA) of a proposed power line from the Omburu Transmission Station near Omaruru to the Kuiseb Transmission Station in the Central Namib, and the proposed construction of the Valencia Substation near the future Valencia Mine and the Husab substation in the Namib Naukluft Park (see Figure 1). The process involved the following steps:

- Brief confirmation of the justification of the power line.
- Consultation with interested and affected parties, particularly the affected farm owners along the proposed route.
- Data collection by means of desk studies and field visits.
- Route evaluation, to select the best crossing at the Khan River.
- EIA of the agreed upon route.
- Appendix to NamPower’s existing Environmental Management Plan – particular management actions required for this project.

This document reports on all the steps above.

Rationale for the project

The rationale for this project, namely to provide the expected increase in electricity demand for the growing uranium industry in the Erongo Region is legitimate. Whilst it is recognised that this project will add to the significant environmental disturbance caused particularly by the growing uranium industry; and whilst it may be disappointing to farm owners to accommodate a transmission line, often next to an existing one in many instances, it is understood that there are no other affordable and feasible alternatives available to provide the required power.

1 The Valencia Mine is responsible for the EIA of the proposed Valencia substation.
Consultation with Interested and Affected Parties

Having contacted all land owners along the proposed route and alternative routes at the Khan River crossing, the EIA team is confident that the needs and concerns of all interested and affected parties are understood and have been duly considered. Together with scientific concerns, the input received at the consultation meetings is considered a solid representation of the issues related to this project.

Most issues raised at the meetings relate to the need for good conduct on farms whilst construction is underway. The farm owners at the Khan River crossing near Valencia were thoroughly consulted, to ensure that their concerns are taken into account during the selection of the optimum route.

Route Evaluation

The six possible alternatives identified at the Khan River crossing near Valencia, were ranked using pre-determined criteria. Routes A and B are the preferred ones; eventually Route B was selected because it is acceptable to the affected farm owners.

Environmental Impact Assessment

Upon evaluation and agreement on the route, the EIA team continued to identify the key socio-economic and bio-physical impacts expected from the construction and maintenance of the proposed 220kV transmission line. The key impacts considered include:

- **Cumulative visual impacts** resulting from another power line added to the existing 220kV transmission line in the north-eastern parts, and new visual impacts along the portion of the route south-west of Usakos and into the relatively pristine Namib Naukluft Park. The route has already been optimised to avoid topographical features that would draw attention to the pylon structures, particularly for sensitive receptors such as travellers on the main roads. The proposed Husab substation will have a high visual impact; the site being proposed on the relatively pristine Namib plains and in the Namib Naukluft Park next to the District Road C28. There is no practical mitigation available to reduce the visibility of the substation.
Overall, visual impact of the power line from Omaruru to the Kuiseb substation is considered to be of moderate significance.

- Potential **bird collisions** at river crossings, hill slopes, cliffs, and flyways. Mitigation measures proposed include bird diverters to be attached to certain stretches that traverse these sensitive places along the route.

- **Destruction to vegetation.** The botanist considers this impact to be of low significance; individuals that might be affected along the line are not sufficient to significantly reduce the populations of plant species that are of conservation concern. By carefully managing the activities of the construction team, this impact can be successfully mitigated.

- **Disruption to fauna.** The significance of this impact is high if sensitive habitat to fauna (particularly reptiles of which a number of restricted range species occur in the Namib parts of the area), is not avoided as far as possible and treaded on lightly where unavoidable. Sensitive habitats for fauna include rocky ridges and outcrops, rugged areas at the Khan and Swakop River crossings, and other river beds.

- **Nuisance and disrespect towards farm owners** during construction and maintenance; examples being gates left open, veld fires, theft and poaching, lack of communication and arrangements prior to working on farms, and offensive toilet manners. The significance of this impact is considered to be high, but can be mitigated to achieve a low significance.

- **General degradation** of the area due to a lack of management during construction. Examples include erosion, littering and dumping, and pollution of water sources. Diligent care and management will be required on the part of NamPower and its appointed contractor to avoid a repeat of historical problems reported from previous power line projects. The plains of the Namib Naukluft Park are particularly sensitive to disturbance and neglect. Track discipline and rehabilitation there will be of utmost importance. The significance of this impact is high if not mitigated, but can be reduced to a low significance if problems are avoided and managed well.

**Final recommendations**

The EIA team is confident that the proposed route has been optimised by aligning it alongside an existing disturbed corridor in the north-eastern section and away from most of the sensitive land uses and bio-physical features.
As far as social impacts are concerned, the directly affected population wishes to be treated with respect during construction of the power line.

Apart from the normal control mechanisms that can be included in the construction contracts, it is strongly recommended that a local person independent from the contractor (ECO or Environmental Control Officer) be involved during construction to serve as the contact person with farm owners, and to ensure that complaints and requirements of the EMP are met. Such a person would also be able to tend to general requirements in the EMP such as track discipline, erosion control, waste management, and generally attending to problems as they occur.

It is strongly recommended that the ECO be with the construction team whilst busy at the river crossings, i.e. the Khan River and Swakop River crossings, and all work in the Namib Naukluft Park. All tracks in the Namib Naukluft Park will have to be rehabilitated to the satisfaction of the Chief Warden.

Monitoring and decommissioning plans should be addressed by NamPower. They should inter alia give attention to monitoring of bird impacts and the fate of the power lines once they have become redundant. Monitoring efforts are not always practical, but could be done in conjunction with the farm owners.
Figure 1: Locality of the proposed route.
The EIA Team

The following people made up the EIA team:

Ms. Stephanie van Zyl, Enviro Dynamics: Team Leader, Client Liaison, Report Integration, Meeting Facilitation, Route Evaluation, EIA

Mr. Ernst Simon, Urban Dynamics: Socio-economic assessment, public participation facilitator

Ms. Coleen Mannheimer, Individual Consultant: Vegetation

Mr. Peter Cunningham, Individual Consultant: Vertebrate fauna - mammals, reptiles, and amphibians

Mr. Chris Van Rooyen, Individual Consultant: Avifauna

Dr. John Kinahan, QRS: Archaeology

Ms. Bridgit Roberts, Geo-business Solutions: GIS and mapping

Acknowledgements

The EIA Team is grateful towards the following people for their input to this study:

Mr. Karl-Heinz Wagner for accompanying the team on the public meetings, site visits, and providing technical guidance.

Mr. Udo Kleyenstuber for accompanying the team on the site visit and providing good quality base maps.

The applicable farm owners in the Valencia area, who arranged an additional site visit, attended the meetings, provided valuable comments, and made alternative suggestions for the route alignment.
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<th>Description</th>
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<tbody>
<tr>
<td>BID</td>
<td>Background Information Document</td>
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<tr>
<td>CBD</td>
<td>Convention on Biological Diversity</td>
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<tr>
<td>ECO</td>
<td>Environmental Control Officer</td>
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<td>EHV</td>
<td>Extra High Voltage</td>
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<td>EIA</td>
<td>Environmental Impact Assessment</td>
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<td>EIR</td>
<td>Environmental Impact Report</td>
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<td>EMP</td>
<td>Environmental Management Plan</td>
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<tr>
<td>ESKOM</td>
<td>Electricity Supply Commission (South Africa)</td>
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<tr>
<td>GIS</td>
<td>Geographical Information System</td>
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<td>HV</td>
<td>High Voltage</td>
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<tr>
<td>I&amp;APs</td>
<td>Interested and Affected Parties</td>
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<td>Km</td>
<td>Kilometer</td>
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<td>kV</td>
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<td>LSA</td>
<td>Late Stone Age</td>
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<td>mm</td>
<td>Millimeter</td>
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<tr>
<td>MSA</td>
<td>Middle Stone Age</td>
</tr>
<tr>
<td>NAMPOWER</td>
<td>Namibia Power Corporation</td>
</tr>
<tr>
<td>ºC</td>
<td>Degrees Celsius</td>
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<tr>
<td>SVC</td>
<td>Static VAr Compensator</td>
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1 BACKGROUND

1.1 INTRODUCTION

Namibia presently experiences a Uranium boom. This metal’s commodity price has increased significantly as a response to meet current global energy shortages. There is extensive exploration for the mineral in the country, especially in the Erongo Region and in the Aus/Wambad areas in the south. Significant increases in production are expected over the next four years.

Mines in the Erongo Region that have already formally approached NamPower for power supply to their plants include the Valencia and Uramin/Trekkopje Developments; the latter calling for final power supply infrastructure to be in place as soon as February 2009. Both Rössing and Langer Heinrich Uranium Mines also need greater power supply capacity in the not-so-distant future.

In order to meet the increased demand for energy in the uranium sector, NamPower proposes to add a new transmission line and substation to their central and western Extra High Voltage (EHV) transmission system. They will also upgrade some of the existing transmission stations in the system.

Namibia’s Environmental Assessment Policy and Environmental Management Act (2007) require NamPower to carry out an environmental assessment of the proposed new developments. NamPower therefore invited tender bids for suitable consultants to perform the work. Enviro Dynamics, a Namibian environmental management consultancy, was awarded the tender early in 2008.

To this end the environmental assessment process for the proposed transmission line and substation developments has been completed. This document, i.e. the Route Evaluation and Environmental Impact Report, contains the findings of the environmental assessment process. It provides the necessary information for the competent authority, i.e. the Directorate of Environmental Affairs to consider Environmental Clearance for the Project.
1.2 REPORT LAYOUT

The layout of the report has been structured as follows:

- **Section 1:** Background - this present section, dealing with the subject of this EIA, the background to the project, and the Terms of Reference.

- **Section 2:** Administrative, Legal and Policy Requirements - all relevant requirements from applicable laws, regulations, and international conventions.

- **Section 3:** Project Proposal - locality, and technical details of the project, as well as alternatives considered.

- **Section 4:** Public Consultation and Scoping - a summary of the consultation process undertaken with stakeholders and I&AP’s, and the issues identified during this process.

- **Section 5:** The receiving environment - a summary of the environment that will either affect or be potentially affected by the project activities.

- **Section 6:** Route evaluation - an evaluation of the environmental and social acceptability of the route, and an evaluation of alternative route courses considered.

- **Section 7:** Environmental Impact Assessment - An assessment of residual socio-economic and bio-physical impacts, expected during construction and operation of the agreed upon route.

- **Section 8:** Conclusions and recommendations

- **Section 9:** References

1.3 TERMS OF REFERENCE

The following are extracts from the Terms of Reference as stipulated by NamPower for this assignment.

“The main aim of the EIA is to confirm the best route for the power line taking into account all relevant biophysical and social components of the environment, as well as all financial and technical constraints, and then to advise on how best to construct and maintain the lines based on the above criteria...
The consultant shall compile a data model such as a Geographic Information System (GIS)-based data model or similar to act as a decision support system for assessing the acceptability or otherwise of the preferred route and, if applicable, identify a more acceptable route.”

In order for the consultant to fulfil the aims of the EIA, the study shall seek to:

- minimize the negative environmental impacts of the power line and the supporting infrastructure, i.e. the proposed Husab substation (including construction and operational phases),
- establish a data base so that a reasonable level of confidence can be placed on the suitability of the route selected,
- consult all the interested and affected parties (or at least a representative sample) to ensure that their needs and concerns are taken into account,
- work with the project team on an interactive basis, and
- comply with Namibia’s Environmental Assessment Policy.”

1.4 APPROACH TO THE STUDY

Key elements of the EIA team’s approach to the study included:

- **Scoping:** This task involved consultation with stakeholders and I&APs to identify key issues that need to be considered during the study. Two consultation meetings were held, i.e. one in Usakos and another in Swakopmund targeting the farm owners along the proposed route. Farm owners in the Valencia area were consulted further in the process of finding an acceptable crossing over the Khan River canyon. More details in this regard are provided in Section 4. A helicopter survey was conducted during this phase to obtain an overall impression of the area through which the route is planned.

- **Specialist studies:** Specialists visited the area to study key aspects normally of concern in transmission line projects, including vegetation and archaeology. The bird and fauna assessments were desk studies – the specialists have sufficient experience and knowledge of the Study Area so that site visits were not necessary. The specialist studies are attached as **Appendices 1 to 4**.

- **Route evaluation:** From the Omburu substation to approximately 25km west of Usakos the route runs parallel to an existing transmission line. This is
considered the most appropriate route and no alternatives were thus considered for that section.

The most challenging portion of the route is the Khan River crossing. A number of alternatives were considered there in order to optimise socio-economic, ecological, technical, and economic challenges. The alternatives were evaluated in terms of their impact on the social and ecological environments, mapping sensitive elements of the area. The process of identifying the most appropriate route at the Khan River crossing was an interactive one, involving the consultants, NamPower staff, and the farm owners. At the close of the process all parties agreed on the chosen route.

- **Assessment:** Upon the selection of the most optimal route that avoids unwanted impacts by skirting sensitive terrain, an assessment was made of residual impacts that will result from the construction and operation of the transmission line. Mitigation proposals are made where available and feasible to address these negative impacts.

- **Environmental Management Plan (EMP):** NamPower already has a generic EMP that covers general management actions required for power lines. The consultants reviewed this EMP and compiled an addendum that contains management actions required specifically for this project.

### 1.5 ASSUMPTIONS AND LIMITATIONS

The study team obtained its data of affected farm owners from the Surveyor General. This data was last updated in 2003. The EIA team, through obtaining changes to this database from neighbouring farm owners, did everything in their power to obtain the most recent information. Some of the farm owners however could not be reached. See further details in Section 4.

Other constraints that the specialists experienced are discussed in their reports attached as **Appendices 1 to 4.**
2 ADMINISTRATIVE, LEGAL AND POLICY REQUIREMENTS

The procedure of an environmental assessment prescribes the review of applicable and relevant legislation, which serves to inform the developer of the legal requirements and permit applications to be fulfilled before operation of the proposed development commences. The EIA team has studied the national policy and legislative framework as well as international conventions governing the activities of this project.

These applicable policies, laws and conventions, and their implications for this project are summarised below:

2.1 POLICY AND LEGISLATION DEALING WITH ENVIRONMENTAL CONSERVATION AND MANAGEMENT

- The Constitution of the Republic of Namibia is the supreme law of the country and all legislation, including environmental laws, must comply with it. Article 95(1), stipulates that: “The state shall actively promote and maintain the welfare of the people by adopting policies aimed at, the maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilisation of living natural resources on a sustainable basis for the benefit of all Namibians, both present and future”.

- Namibia’s Environmental Assessment Policy, endorsed by Cabinet and published in 1995, seeks inter alia, to give effect to article 95 (1) of the Constitution. It stipulates that all listed programmes and projects should be subjected to a required environmental assessment procedure. Appendix 5 of the document contains a guiding list of activities that require Environmental Assessment and it includes electrical transmission lines.

- The Environmental Management Act (2007) has a similar list, which also includes “...the erection, construction or upgrading of facilities for the commercial transmission and supply of electricity with the exception of power supply lines of less than 2km in length.” This Act is not yet legally binding since its regulations have not yet been passed. Although not legally binding at this stage, the Act will probably be enacted by the end of 2008, in which case this project will have to comply with the Act. Part IV of the Act pertains to Environmental Assessment and lists certain general objectives which include:
− the integration of principles of environmental management (as set out in section 6 of the Act);
− to identify, predict and evaluate actual and potential biophysical, social and other relevant effects which proposals or projects may have on the environment; and
− to ensure adequate public participation throughout the assessment process.

• The **Electricity Act 2 of 2000** provides for the establishment of the Electricity Control Board, which has wide ranging powers. A relevant function of this Board, as contained in the Regulation 2371 of the Government Gazette 12 July 2000, is to have regard to the promotion of health, safety and the environment.

• The **Labour Act of 2004** includes the **Regulations for the Health and Safety of Employees at Work**. These regulations prescribe conditions at the workplace, including construction and electrical safety.

• The **National Veld and Forest Fire Act 101 of 1998** is to prevent and combat veld, forest and mountain fires and to provide for a variety of institutions, methods and practises for achieving this purpose. The Client must familiarise itself with this Act, since lightning to power-lines may cause veld fires.

• The **Pollution Control And Waste Management Bill** stipulates that if NamPower causes, has caused or may cause significant pollution or degradation of the environment it must take reasonable measures to prevent the pollution or degradation from occurring, continuing or re-occurring. Such measures are listed in the Bill. (Note: This Bill is yet to be enacted).

• The **Forest Act (Act 12 of 2001)**, stipulates that a permit should be obtained from the Ministry of Environment and Tourism for the removal of vegetation within 100m from a riverbed. This act also protects certain plant species. Some of these species including the Camelthorn (Acacia erioloba), Shepard’s tree (Boscia albitrunca), and Ringwood tree (Maerua schinzii) occur in the study area.

• The Nature **Conservation Ordinance (Ordinance 4 of 1975)** affords protection to certain plant species in Namibia. NamPower should be aware that permits are required for the removal of some species, should this be required during the construction of the line.
2.2 NAMIBIA’S COMMITMENT TO INTERNATIONAL CONVENTIONS

- In accordance with the *Convention on Biological Diversity* (CBD), to which Namibia is a signatory since 1992, the country is obliged under international law to conserve its biodiversity (Bamard ed., 1998).

- As a signatory to the *Convention to combat Desertification*, Namibia, is bound to prevent excessive land degradation that may threaten livelihoods.
3 PROJECT DESCRIPTION

3.1 LOCALITY OF THE PROPOSED ROUTE

NamPower provided their preliminary route at the outset of the EIA. Figure 3-2 shows the locality of this route. It originates at the existing Omburu Substation, situated on the Farm Spes Bona, some 15km south east of Omaruru. The proposed route then follows the existing 220kV transmission line in a south-westerly direction towards Usakos. Both the existing and the proposed transmission lines cross the B2 Main Road to Swakopmund, some 15km west of Usakos. On the Farm Namibfontein at the existing Khan Substation, the new route digresses from the existing transmission line to cross the Khan River. It heads towards a proposed new substation at the new Valencia Mine where power it to be supplied. The route continues in a southwesterly direction towards the Namib Naukluft Park where it will connect with the Kuiseb Substation via the future Husab substation.

3.2 PROJECT RATIONALE

The recent significant increase of the commodity price of Uranium has resulted in extensive exploration in Namibia for the mineral, especially in the Erongo Region and in the south in the Aus/Warmbad areas. Current production of the metal is expected to increase substantially within the next 4 years. Mines in the Erongo Region that have already formally approached NamPower to facilitate the supply of power to their plants include the Uramin/Trekkopje and Valencia developments, with the Trekkopje development calling for final power supply infrastructure to be in place as soon as February 2009. Both Rössing and Langer Heinrich Uranium Mines have also indicated the need for increased power supply capacity in the not-so-distant future.

3.3 DEVELOPMENT PHASES

Figure 3-1 shows the NamPower central and westem EHV transmission system, and indicates the proposed new transmission lines and substation developments/upgrades required. These new projects will be developed in phases:
Phase 1, to coincide with the power supply to the Trekkopje and Valencia Uranium Mines:

- Omburu Substation upgrades and voltage support.
- 2nd 220kV Omburu – Khan transmission line.
- 220kV Switching Station at or near the Khan Substation.
- Upgrade the communication infrastructure between Khan and Rössing Substations, and also on the 220kV Omburu – Van Eck 1 and 2 transmission lines.
- Customer specific infrastructure (lines, substations) to Trekkopje and Valencia respectively.

The customer specific infrastructure to Uramin/Trekkopje is required to be in place as soon as February 2009, while the remainder of the project should be in place by the third quarter of 2009.

Future stages, dependent on the timing and power supply requirements of the proposed Ida Dome and Goanikontes Uranium Mines and upgrade of the power requirements of Langer Heinrich Uranium Mine are as follows:

- 220kV Transmission line to connect the future Valencia Substation to Kuiseb via the future Husab Substation as indicated in the Figure 1.
- Voltage support at Kuiseb Substation, to be operational on a permanent basis, through for example the installation of an SVC (Static VAr Compensator) or similar dynamic voltage support technology.

The timing of the above developments will be dictated by the respective existing and proposed future uranium mines’ development schedules.
The transmission infrastructure as described above is recommended to be installed and is not influenced by the decision or not to install future generation infrastructure at the west coast (Walvis Bay area).

Phase 1 of the West Coast Transmission Development Project is estimated to cost N$ 269.7 million. The estimated cost of the transmission line per km is N$ 650 000.00. The 230km line, including Phases 1 and 2 will therefore cost an estimated N$ 149.5 million.

### 3.4 PROPOSED ACTIVITIES

A 220V line must be constructed from the Omburu Transmission Station to the Kuiseb Substation. The total length of this line will be approximately 234 km. Phase 1 (i.e. from Omburu to Valencia) is 140km in length, while Phase 2 (from Valencia to Kuiseb via the future Husab substation) is approximately 94 km in total. Substation developments will have to be done, as described in 3.2 above. The Valencia substation will be developed by NamPower for Valencia Mine, while the Husab substation will be NamPower’s infrastructure. This Husab substation will occupy a site of approximately 500m by 500m (i.e. 25 Ha), while the actual built up area will occupy an area of approximately 250m by 250m (i.e. 6,25 Ha).

Construction is scheduled to commence during the first half of 2009, due to the urgency of the power demand.
Figure 3-2: Locality of the proposed route.
3.5 STRUCTURAL REQUIREMENTS OF THE TRANSMISSION LINE

The structures to be used on the proposed transmission line are shown in Figure 3-3 below.

The required servitude width for such a line is 40m, and where the line runs parallel to existing lines, the space needed between lines is a minimum of 45m. It is possible to route the power line parallel to existing power lines as long as both servitudes are honoured (i.e. two servitudes may lie directly next to each other). Two parallel power lines will thus include servitudes from the centre of each line, the outer edge of one servitude may be immediately adjacent to the outer edge of the adjacent servitude. The route of a new power line may also cross existing power lines without any technical difficulties.

The servitude would make up a strip of land under and surrounding the power lines within which no other development would be allowed. Vegetation within these servitudes will be removed for access tracks and for the pylon foundations, and large trees capable of interfering with the line would also require removal. Grasses and shrubs within this servitude will, however be unaffected, hence grazing can continue under the power lines as before.

The distance or span length between towers is 350m except where strain towers are required at bend points.
Figure 3-3: A photograph of the strain tower - these structures will be used at the bend points along the route.

Figure 3-4: The combination of intermediate self-supporting and guyed pylon structures to be used along the proposed transmission line in between bend points.
3.6 CONSTRUCTION ACTIVITIES

All the components for the power line construction (steel pylons, conductors, insulators, etc.) will be transported to site by road on low-bed trailers. Materials and equipment required for the line are transported from via Windhoek (from South Africa and/or Walvis Bay along the Windhoek-Okahandja-Swakopmund main road (i.e. the B1 and B2), the Karibib- Omaruru main road (B33) as well as other district roads such as the C33 in the Namib Naukluft Park. No significant impacts associated with traffic interruption are expected on these roads.

Contractors’ sites of approximately 200m by 300m are normally made along power line routes. The sites for such camps will need to be negotiated with applicable land owners.

It is believed that the construction team will be able to use the existing maintenance roads serving the existing transmission lines, particularly in the north-eastern parts of the area where the route runs parallel to the existing 220kV transmission line. There are also a good number of access roads to farms in these areas. Hopefully only smaller access tracks will be needed in isolated cases.

The Khan River crossing near Valencia is extremely rugged. It is fortunate that a route has been selected, which is accessible for most of the way. It is only the steep slopes in the canyon itself which are inaccessible.

The Namib Naukluft Park is a pristine area with the minimum roads – a new access track will have to be constructed there.

The foundations of the pylons will be concrete blocks above ground.

Bush clearing will not be necessary in this area where vegetation cover is generally low, except where access roads are needed. Usually only vegetation that grows above 4m is pruned to ensure it does not affect the operation of the new line.

The steel towers will be erected on site either by using a crane to place the pre-assembled tower onto the concrete foundation or by building up the tower from its concrete foundation section by section; the latter will probably happen in the less accessible terrain. Concrete will be mixed and poured on site, thus all the concrete constituents (crushed stone, cement, water and sand) will also have to be transported to site. The conductors will be strung using heavy-duty mechanical winches.
3.7 MAINTENANCE ACTIVITIES

Once a power line has been built it requires very little maintenance. Obvious accidents such as lightning strikes or towers blown over by exceptionally strong winds will be repaired by using the access roads under the line or by helicopter.

3.8 NATURAL MATERIAL AND HUMAN RESOURCES REQUIRED

A very small component of this project requires materials from the surrounding natural environment. Unlike other infrastructure projects such as roads, relatively limited amounts of sand and water will be needed for the concrete foundations of the pylons. All other materials will be imported, pre-fabricated components.

NamPower intends calling for tenders from electrical contractors with the relevant experience to construct the power line according to specifications. Since the construction of the line is of such a technical and skilled nature, there will be limited scope for the recruitment of unskilled labour from the area. Local labour can be used for digging the foundation trenches, and for bush clearing of the pylon areas and access roads. This represents a mere 1% or less of the total construction costs. Workforce accommodation would ideally be in the nearby towns, although contractors may negotiate with farm owners to accommodate their workforce in a campsite on the farms. Accommodation camps are likely to move as construction progresses.

3.9 WASTE MATERIALS

Relatively little waste is generated during power line construction activities. Spoil will be generated from the foundation trenches, and there is likely to be some cement, gravel, sand, left over cable, etc, remaining after construction. Apart from the construction waste, normal domestic waste such as plastic bags, tins, bottles, paper, and packaging waste will be generated. Waste generation is an obvious impact on all projects, but it is how waste is minimised, re-used, stored, transported, and disposed of that determines whether this part of the project’s ecological footprint would be acceptable. A section is already dedicated to this in the NamPower EMP.
3.10 ALTERNATIVES TO AND WITHIN THE PROJECT

Although commercial farm owners resist the introduction of another power line crossing their farms, they generally understand the need for the power line. The only suggestions in terms of alternatives concerned the routing of the line. Section 5 specifically deals with alternative routing of the power line.

NamPower believes that it has searched for the best technical, environmental, and economic solution to provide the required power to the new uranium developments.

Some stakeholders enquired whether it is not possible to supply the electricity via underground cable. It is not surprising that people normally ask at public meetings if the power lines could run underground instead of via overhead lines. Overhead power lines have the potential to destroy an area’s “sense of place” and simply look ugly. The option of an underground line is not feasible due to the extremely high costs of HV cables on 220kV as well as the very high level of electrical compensation required with cables over this distance. Although an underground power line will not be visible, it disturbs the habitat it traverses.

From a sustainable energy supply perspective, the question is often asked whether it is possible to supply the power required by different means, for example by solar or wind power. Alternative energy sources such as solar power are often viable as supplementary sources of power, but fail to deliver the round-the-clock, uninterrupted demand required. In the wake of reduced power supplies from ESKOM, alternative energy supply is likely to become more economically viable in the not-so-distant future as electricity prices increase.

3.11 SUPPLYING POWER TO OTHER USERS

NamPower has not considered providing power to any other developments such as villages or towns along the route. All existing villages along the route are connected to the existing bulk supply grid.

NamPower does not intend providing power from the new or the existing lines to the farm owners along the route. The option of tapping power from the existing and new 220kV lines is extremely expensive and not feasible. Power cannot be tapped directly from the line, a T-off and substation needs to be constructed to bring power to an individual household.
There may be cases in the project area where power can be supplied from existing distribution networks leading to the towns or other projects in the area. Farmers are free to approach NamPower so that they may investigate the feasibility of supplying power from one of these networks to their farms. Such options could become affordable if farmers pool together and share the capital costs as a group scheme.

3.12 NO-PROJECT ALTERNATIVE

If this project does not continue, NamPower will not be in a position to supply the growing electricity demand for the Uranium industry. Such a scenario would restrict future economic development in the area. On the positive side, the socio-economic and bio-physical impacts will completely be avoided if the project does not materialise. As will be demonstrated in Section 6, it is possible to mitigate these impacts to acceptable levels, should the project continue.
CONSULTATION WITH Stakeholders AND INTERESTED AND AFFECTED PARTIES

4.1 CONSULTATION APPROACH

The following activities were undertaken to facilitate stakeholder and community participation during this EIA process:

- The I&AP list was compiled by using GIS information on farm owners' names and addresses along the proposed route. The farmers' telephone numbers were searched in the telephone directory and with the assistance of Telecom's Directory Information service. General stakeholders such as regional and local councils, relevant ministries, NGO's, and institutions were incorporated from other databases.

- A Background Information Document (BID) was compiled, which was distributed via Internet, NamPost and by Fax. The BID also served as an invitation to I&APs to attend the public meetings. (See Appendix 6).

- The BID invitation was followed up with telephone calls to all commercial farm owners. The Usakos Municipality and Erongo Regional Council were contacted in the same manner. No Communal Areas are affected by the transmission line.

- Advertisements to invite interested and affected parties to the public meetings were placed in the Republikein and Namibian newspapers on 15 April 2008 and 21 April 2008.

- The public meetings for interested and affected parties were held at Usakos on Thursday morning, 24 April 2008 and at Swakopmund on Thursday evening, 24 April 2008.

- Figure 4-1 provides a map of I&APs consulted along the proposed route.
Apart from the meetings, people were given the opportunity to communicate their input via telephone and e-mail.

### 4.2 KEY ISSUES AND CONCERNS

**Table 4-1** below is a summary of key issues and concerns raised during consultation with Interested and Affected Parties.

<table>
<thead>
<tr>
<th>ISSUES RAISED</th>
<th>MITIGATION MEASURES/COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Priority Issues</td>
<td></td>
</tr>
<tr>
<td>Nuisance on farms during construction and maintenance.</td>
<td>It is recognised that historical projects caused significant disruption and nuisance on farms. Recommendations are being made to address these concerns during construction and maintenance. The Environmental Management Plan will address this issue and provide in detail stipulations for contractors and their staff.</td>
</tr>
<tr>
<td>Waste generation and pollution during construction and maintenance.</td>
<td>Control over contractor is necessary in order to put workable measures in place that would protect the farmers from littering and pollution on the farms. The Environmental Management Plan will address this issue and provide in detail stipulations for contractors and their staff.</td>
</tr>
<tr>
<td>Arrangements with regard to camp sites on the farms need to be made in such a way that it will have the least impact on the land owners.</td>
<td>Camp sites should be combined as far as possible, and in any case predetermined in consultation with the land owners.</td>
</tr>
<tr>
<td>Control over contractor's workers is necessary to prevent fires, indiscriminate littering, pollution and other nuisances to the land owners.</td>
<td>Besides control over fires, toilet facilities, water collection and use and waste and pollution, contractor staff should not be allowed any fire arms nor any alcohol when camping on farms.</td>
</tr>
<tr>
<td>Security is an issue and from experience, farmers expect problems with non-construction workers entering their farms as well as increased illegal hunting and stock theft. (especially at farms close to towns)</td>
<td>Access routes for construction must be secured and workers must be identifiable. Time spent on the farms must be limited to as short as possible. The Environmental Management Plan will address this issue and provide in detail stipulations for contractors and their staff.</td>
</tr>
<tr>
<td>Road servitudes and maintenance contribute to a loss of security. These accesses are often not secured and gates are bent and in poor condition. No or as few as possible additional gates should be installed where the two lines run together.</td>
<td>Arrangements must be made to improve security and to prevent the installation of unnecessary gates. Contractor must negotiate and determine the rules pertaining to contractor movement on farms with land owners. Such arrangements should include restriction of movement to servitude and camp sites, rules pertaining to driving and night movement on or over the farms.</td>
</tr>
</tbody>
</table>
### ISSUES RAISED

<table>
<thead>
<tr>
<th>Poor communication causes farmers not to know what is to be done where and when. This contributes to conflict.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each phase of construction must be communicated to farmers in time before such work starts. The commencement and duration of work must be communicated to each land owner timeously. The Environmental Management Plan will address this issue and provide in detail stipulations for contractors and their staff.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indiscriminate removal of vegetation, particularly large trees such as Camelthorns. The area is mostly sensitive and the creation of service roads should be handled carefully.</th>
</tr>
</thead>
<tbody>
<tr>
<td>An assessment of the minimum roads required to allow adequate access of contractor plant and vehicles must be made on each farm and agreed with the land owner. The principle of minimum disturbance shall be used in all cases. Where there is no need to blade or bulldoze roads, tracks should be used wherever possible. Roads should be minimized in all cases. The Environmental Management Plan will address this issue and provide detailed stipulations for contractors and their staff.</td>
</tr>
</tbody>
</table>

### Other Issues

<table>
<thead>
<tr>
<th>Rehabilitate rivers after construction to prevent erosion.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Environmental Management Plan will address this issue and provide in detail stipulations for contractors and their staff.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Avoid and maintain a reasonable distance from houses and kraals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1km Buffer zones were created around settlements, villages, homesteads and kraals and the proposed route re-aligned to avoid these. See Section 6.3.</td>
</tr>
</tbody>
</table>
Figure 4-1: Consultation with land owners along the route.
5 THE RECEIVING ENVIRONMENT

In this section, a background description of the socio-economic, physical, and biotic environment potentially affected by the proposed power line is given to understand the possible constraints these aspects may impose on the proposed project.

5.1 THE SOCIO-ECONOMIC ENVIRONMENT

5.1.1 Community and stakeholder concerns

During the consultation meetings, the following issues related to the socio-economic environment were raised:

- Visual impacts, particularly cumulative impacts as a result of additional power lines being constructed in addition to existing power lines.
- Impact on sense of place and wilderness qualities of the area; reduced tourism opportunities and a loss of the general unspoilt beauty of the area.
- Damaged habitat and poaching threat to wildlife numbers.
- Compromising security on farms.
- Disruption to farming activities during construction of the power line and non-conformance by contractors to requirements as laid out in the EMP or NamPower standards.
- Increased stock theft as a result of increased accessibility by persons to farms, including construction personnel.
- Impact on existing settlements, and farm infrastructure, i.e. loss of improvements on farms.
- Generation of waste and pollution on the farms by contractor staff during construction.
- Service roads and gates a problem. These are not kept in good condition, are not secure, and have been poorly constructed during previous projects.
5.1.2 Data sources

- 1:50 000 maps.
- Geographical Information System (GIS) dataset of farm boundaries (source: Geo-Business Solutions).
- GIS dataset of existing transmission lines (source: Geo-Business Solutions).
- Public Meetings held at Usakos and Swakopmund (refer to Section 5).

5.1.3 Description

The main economic activity of the project area is cattle farming, although many farms also exploit natural game populations for commercial hunting and/or tourism related purposes as a secondary source of income. All the farms traversed by the line from the Khan substation to Valencia are located in a sensitive area with sensitive vegetation, difficult terrain, and long range vistas.

Another important commercial activity in the project area is tourism establishments, notably Farm Vergenoeg. Activities undertaken at Vergenoeg include accommodation and game drives for guests, particularly along the Khan River.

A list of those commercial farms potentially affected by the proposed power line route and its alternatives, are given in Table 5-1 below.

<table>
<thead>
<tr>
<th>Farm Name</th>
<th>Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>KAMOMBONDE WEST</td>
<td>VAN NIEKERK, D.J.</td>
</tr>
<tr>
<td>KANONA OST</td>
<td>WALDSCHEIDT, O.J.G.H.</td>
</tr>
<tr>
<td>ERONGO OST</td>
<td>VICTOR, A.T. &amp; M.L.</td>
</tr>
<tr>
<td>ERONGO WEST</td>
<td>LUBE, R.U.</td>
</tr>
<tr>
<td>KANONA-WEST</td>
<td>STORBECK, Mr</td>
</tr>
<tr>
<td>SPEIS BONA</td>
<td>NAMIB TAXIDERMY</td>
</tr>
<tr>
<td>KAMOMBONDE OST</td>
<td>LUND, K.A.H.</td>
</tr>
<tr>
<td>SAFER</td>
<td>STEINFURTH, W.H.</td>
</tr>
<tr>
<td>LUKASBANK</td>
<td>KLEIN, S.</td>
</tr>
</tbody>
</table>
A further and important feature of this area includes the existing power lines traversing the project area. Of importance for the impact of the proposed line is the existing 220 kV line running from Omburu to the Khan Substation. The new line will run parallel and some 60m north along this stretch of line. This already represents an attempt to limit the impact of this stretch of line and it is argued that aligning new infrastructure in close proximity to existing infrastructure already limits especially the visual and sense of place impacts of such infrastructure.
5.1.4 Key sensitivities

- Power lines running past areas used extensively for tourism activities, such as for game drives, or areas where lodges and other tourism amenities already exist or close to farmhouses may affect the sense of place of these areas and subsequently the income generated from them and the amenity of the area.

- The power line should avoid crossing existing homesteads, grazing areas, farm infrastructure and other improvements that are of socio-economic value. Maintain a distance of approximately 1km from homesteads.

- A 40m servitude should be kept free of development under the power line. Farm owners will lose these assets if the power line crosses their homesteads, infrastructure, and other improvements. Power lines close to homesteads could break up views from homesteads and so affect owners’ quality of life.

- Avoid areas used for tourism activities or suitable for future tourism development. The power line should maintain a distance of at least 1km from these areas, or otherwise as far as needed to preserve important vistas.

- Protect visual quality along important vistas and areas with particular wilderness qualities, as these may become important tourism attractions in future.

- Keep the power lines off higher ground, and rather align them in valleys and lower lying areas where they will be less obtrusive.

- Keep within the servitudes of existing power lines to minimize as much as possible, new visual impacts.

- Avoid creating additional disturbances by attempting to route power lines along existing farm boundaries where possible.

5.2 CLIMATE

5.2.1 Stakeholder and community concerns

There were no particular concerns related to climate. Consideration to climatic conditions, in particular rainfall and wind data, is required as this information is used to determine the risk of flooding, erosion and wash-aways, as well as the potential nuisance impacts associated with dust generation, in particular during the construction of the proposed line. The climate of an area also reveals much about its ecological sensitivity and resilience to change, and greatly influences settlement patterns and population distribution.
5.2.2 Data sources

Secondary data derived from literature sources were used to sketch the overall climatic conditions of the study area (see the reference list in Section 1).

5.2.3 Description

The climate of the Namib Desert is strongly influenced by four features which enhance its aridity:

- the South Atlantic Anticyclonic Cell,
- the Benguela Upwelling System,
- the Great Escarpment, and
- the absence of major topographical features on the 150-km wide plains.

These features are responsible for the stable climate experienced in the Namib (Ward et al., 1983).

A high-pressure cell overlying the South Atlantic Ocean frequently forces westerly winds up to the escarpment, preventing movement of moist air masses from the east into the Namib. The cool Benguela current prevents moist maritime air from rising and forming rain clouds, although it forms fog at lower levels. When the westerly winds and the temperature inversion occasionally subside, rain clouds, that have crossed Southern Africa from the Indian Ocean, move over the desert bringing scattered thundershowers. In the winter months, the influence of the Atlantic high-pressure cell weakens and desiccating east winds (also called berg winds) cross the Namib to reach the coast.

Temperature

The northeastern parts of the study area between Usakos-Omaruru-Erongo triangle experience very hot summers and mild winters. The average annual temperature is around 22°C with the monthly average maximum temperature of 30°C or more occurring from September to March and the corresponding minimums being between 25°C and 28°C. Average maximum temperatures during the hottest months are around 34°C to 36°C. Winter maximum temperatures are in the upper to mid-twenties. Winter nights are cold with the minimum temperatures often dropping below 10°C.
The western parts of the study area in the Namib experience a typical desert climate with hot and dry conditions and cool nights. Due to the typical desert climatology, the temperature variation can exceed 30°C on any given day, but maximum temperatures are lower than inland, showing a decreasing gradient as one approaches the coast. In the westernmost part of the study area in the Kuiseb substation vicinity, average maximum temperatures during the hottest months 28°C. Average minimum temperatures during the coldest months are in this area are in the region of 6-8°C.

Rainfall

An arid climate exists in the north-eastern part of the Study Area changing into a desert climate towards the southwest. Annual rainfall increases towards the eastern part of the Study Area and ranges from less than 50mm in the west to 250-300mm in the east (Barnard et. al.). Rainfall in the eastern parts usually occurs from February to April. Karibib, for instance, has an average annual rainfall of 224mm (air study, Karibib).

In the western parts rainfall occurs with the typical paucity of desert rains. Whether stations at Ganas and Gobabeb show that March (average 28mm), April (average 9mm), and September (average 22mm) are the peak rainfall months in this west-central part of the Namib Desert. A typical desert rainfall pattern is evident in the data as only two significant rainfall events were recorded during the measurement period (1963 to 1986). The maximum rainfall recorded in one month was 76mm with 26mm during a 24-hour period and 15.7mm in one hour on various occasions.

Rainfall in the entire study area is extremely variable, both in terms of amount of rainfall and distribution.

Wind

Winds are more complex around the eastern part of the study area than the western parts. The prevailing wind towards the eastern parts is a south-westerly. Cool air is pushed from the coastline to the interior due to the cold Benguela current running along the west coast.

In summer, the constant south-westerly is experienced on the coast and the coastal plains. In winter the strong easterly winds is a function of the high-pressure system dominating the Southern African Highveld that causes air to subside and then to drain towards the coast. It is very dry (relative humidity <5%) and can increase to sand storm proportions in about 1 in 7 days of its occurrence. Its frequency and
persistence generally increase from coast inland, while storm strength tends to increase towards the coast (uMoya-NILU Consulting (Pty) Lt, 2008).

The wind speed in winter is stronger than in summer, mostly due to the dominant high-pressure system of the inland regions that result in subsiding air drainage to the coastal regions.

5.2.4 Key sensitivities

Climate data does not have any implications for route planning per se; rather climatic variables need to be taken into account during power line construction.

- Rainfall generally occurs during January to March when streams in the area are likely to flow.
- Intense rainfall events can cause significant erosion of exposed soil surfaces, which will be particularly severe if construction takes place in the high rainfall months.
- The Khan River and its smaller tributaries are subject to flash floods. This run-off is often a powerful force of erosion, even more so where ground has been disturbed and vegetated areas exposed. All structures of the power line therefore need to be designed to withstand intense rainfall, and should be placed well outside flood prone areas in the riverbeds. Drainage lines should be avoided and runoff needs to be carefully managed, particularly at the transmission stations.
- High temperatures in the summer months may result in heat related stresses amongst the workforce constructing the power line.
- Topsoil and other stockpiles should preferably be positioned to the east or south of sensitive dust receptors (such as farmsteads), to reduce the impacts of windblown dust.

5.3 TOPOGRAPHY

5.3.1 Community and stakeholder concerns

The topography forms the landscape and its associated viewscapes. The visibility of power lines are greatly influenced by the occurrence of topographical landmarks such as outcrops, plains, and ridges. From a technical point of view the topography plays a major role in determining the power line route.
5.3.2 Data sources and methodology

1:50 000 and 1:250 000 topographical maps and Google maps of the study area were studied and the area viewed to gain an understanding of its topographical characteristics.

5.3.3 Description

The transmission line route starts at a height of 1281m above sea level; the terrain gradually descending coastward to 283m above sea level at the Kuiseb substation. Slopes are gentle along the route, except for a few distinct topographical features that need to be negotiated.

The most significant topographic feature along the north-eastern part of the route is the upper reaches of the Khan River and its tributaries. The proposed route more or less follows the river, where the existing power line was routed. On the farm Etiro the route crosses the Khan River to deviate from its course before joining it again in the vicinity of Valencia. The route also crosses some of the Khan’s tributaries, such as the Etiro River on the farm Kamombonde West. The upper stretches of the Khan River and its larger tributaries are characterised by flat shallow gravel courses, with significant vegetation growing on the banks. The terrain along the river banks is accessible, so that a crossing there can be managed with technical ease.

In this same vicinity the transmission line will pass a group of rocky ridges known for their rich marble deposits. These ridges are presently being considered for mining of this mineral and the development of a cement factory on the farm Daheim in the area. The proposed transmission line will skirt these ridges.

In this same area the Erongo mountain range lies to the northeast. The Erongo massif is the largest of all the post-karoo complexes, with a diameter of 40km. This mountain range has a distinctive visual appeal as a backdrop to Karibib’s surrounding valley.

The Great Escarpment forms the border of the Namib and is a cliff wall more than 1000m high. At Usakos where the transmission line enters the desert, only partial relics of the escarpment have remained in the form of isolated mountains such as the Erongo Range. This area is called the escarpment gap, caused by less weathering resistant Damara granites and mica schists.

South of Ebony Siding, the proposed line will traverse broken, rocky terrain on the edge of the Namib. To reach the Khan River it crosses a few broad tributary
streams all leading to the rugged canyon below. This part of the route is the most challenging – finding a suitable crossing point without technical and environmental difficulties through this rugged terrain needed much consideration. The terrain offers few lines of access. The landscape there also offers much value from an aesthetic, recreational and wilderness point of view.

South-east of Valencia, before reaching the proposed new Valencia substation, the route follows the marble ridges which form part of the Khan Mountain. The route has been placed along the southern slopes of this ridge. The route however avoids the main Khan Mountain before entering the wide stretch of open gravel plains south of Valencia. Here the Chous Mountains form the dominant feature of the scenery. The route descends southwards towards the Swakop River which presents similar physical barriers to the Khan. Once over the Swakop, the line will cross the Namib plains which are mostly free of physical barriers. Sensitive outcrops in this area are all avoided – they include the Husabberg and the Witpoort berge, both ranges situated in the Namib Naukluft Park. Although the Namib plains are free of physical barriers, they are considered to be a significant visual resource.

Photo 5-1: The Erongo complex and marble outcrops in the Omaruru-Karibib-Usakos area (Photos: Stephanie van Zyl and Coleen Mannheimer).
Figure 5-1: Topography of the Study Area.
Photo 5-2: The gradual slopes leading to the Khan River crossing on the Farm Vergenoeg; the Khan Mountains in the background offer spectacular viewscapes (Photo: Ernst Simon).

Photo 5-3: Typical scenery in the Khan River gorge (Photo: Ernst Simon).
Section 5: The Receiving Environment

Photo 5-4: The plains south of Valencia towards the Namib Naukluft Park (Photo: Coleen Mannheimer).

Photo 5-5: Topography at the Swakop River (Photos: Coleen Mannheimer).
5.3.4 Key sensitivities

- The topography along which the route is planned is mostly flat, with a gradual descent towards the coast. The only technical difficulty where more damage to the surface may be expected is at the Khan River crossings, especially the one near Valencia and the Swakop River crossing.

- The proposed route runs past the Erongo complex and nearby marble ridges, which are regarded as a significant visual resource. The route however follows an existing transmission line in that vicinity thereby concentrating the visual impact in one corridor.

- Transmission lines following higher ground are normally more visible. This route avoids higher ground where possible. The route of the power line and the proposed Husab substation through the Namib plains will be highly visible to those visiting there. These plains are frequently traversed by smaller aircraft – the introduction of the new pylons and conductors could be dangerous new obstacles in this barrier-free landscape.
5.4 **VEGETATION**

5.4.1 **Stakeholder and community concerns**

A very large number of endemic and near-endemic plant species occur in the areas through which the transmission line is planned, notably the Namib Desert sections. This is indicative of the sensitivity of the area and the need to avoid particularly sensitive spots when routing the transmission line.

5.4.2 **Methodology and data sources**

- A field visit and desk study were conducted.
- Specialist report by Ms. Coleen Mannheimer and related references (Refer to Appendix 2).

5.4.3 **Description**

The botanist on the EIA Team divided the Study Area into different zones according to characteristic vegetation cover, as follows:

- **Section A:** Omburu to the rocky ridges forming the canyon of the Khan River, in the vicinity of the border of farm Vergenoeg in the Pro-Namib.
- **Section B:** Khan River Canyon to south of Valencia.
- **Section C:** Valencia to Husab.
- **Section D:** Swakop River Canyon, including river crossing.
- **Section E:** Gravel plains south of the Swakop River.

The specialist report (Appendix 2), contains a detailed description of the characteristic vegetation of each of these zones. **Table 5-2:** below shortly describes the habitat of each zone and the species of conservation concern occurring in each. Study this table together with **Figure 5-2**.
Table 5-2:  Vegetation zones in the Study Area.

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Subdivision</th>
<th>Species of conservation concern</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Slightly undulating sandy-gravel and sandy plains, rocky ridges and koppies, and several ephemeral watercourse/river crossings</td>
<td>1</td>
<td>Plain: Commiphora dinteri, C. saxicola, mainly from Usakos westwards</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Watercourses: Acacia erioloba, Combretum imberbe</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>Ridges: Moringa ovalifolia, Commiphora virgata, Sterculia africana</td>
</tr>
<tr>
<td>B</td>
<td>Hills, ridges and gorges of the Khan River valley</td>
<td></td>
<td>Aloe dichotoma, Moringa ovalifolia, Sterculia africana, Commiphora glaucescens, C. virgata, Adenia pechuelii.</td>
</tr>
<tr>
<td>C</td>
<td>Sandy-gravelly plain and sandy washes</td>
<td></td>
<td>Eucla pseudebenus, Acacia erioloba, Zygophyllum stapflii, Commiphora saxicola</td>
</tr>
<tr>
<td>D</td>
<td>Swakop River and surrounding hillocks</td>
<td></td>
<td>Acacia erioloba, Eucla pseudebenus, Faidherbia albida</td>
</tr>
<tr>
<td>E</td>
<td>Gravel plains and washes</td>
<td></td>
<td>None</td>
</tr>
</tbody>
</table>

Photo 5-7: Aloe dichotoma (kokerboom, quiver tree) (Photos: Coleen Mannheimer).
Photo 5-8: *Adenia pechuelii* on rocky ridges on Valencia (Photos: Coleen Mannheimer).

Photo 5-9: *Commiphora glaucescen* (Photos: Coleen Mannheimer).
5.4.4 Key sensitivities

From a vegetation aspect, the key sensitive habitats along the route are the hills, rocky outcrops, ridges, river crossings, including the Khan River gorge and associated ridges and outcrops, and the Swakop River. In many places, the route may probably affect a few plant specimens, in which plant relocation is being proposed.
Figure 5-2: Vegetation zones of the Study Area.
5.5 VERTEBRATE FAUNA

5.5.1 Community and stakeholder concerns

The high percentage of endemic reptile species (41%) associated with the rocky escarpment region of central western Namibia underscores the importance of this area without formal state protection (Namib Naukluft Park excluded).

5.5.2 Data sources and methodology

Dr. Peter Cunningham carried out a comprehensive desk study of the area, using the experience of own field surveys done there previously.

5.5.3 Description

Reptiles

At least 81 species of reptiles are expected to occur along the proposed transmission line(s) from east to west with 33 (41%) species being endemic. These consist of at least 30 snakes, 8 of which are endemic (27%) to Namibia, 2 tortoises, 1 terrapin, 48 lizards, 25 (52%) of which are endemic to Namibia. Skink’s (10 species), Old World Lizards (11 species) and Gecko’s (19 species) are the most numerous lizards expected from the general area.

Restricted range reptile species

Cunningham (2008) mentions some restricted range reptile species in the Study Area that are 100% endemic:

- **Afroedura africana africana** (sub-species has no common name, similar to African Flat Gheko) is restricted to exfoliating granite outcrops in the Omaruru/Kaibib areas and the placement of pylons on or in close proximity to such areas should be avoided especially along the first section of the transmission line.

- **Pedioplanis husabensis** (Husab sand lizard) is restricted to the Central Namib Desert, between Rössing Mine and the Swakop River on stony substrates (Griffin 2003). Cunningham (2007) noted that they prefer gravel plains (67% of observations) to any other habitat.
**Rhoptropus bradfieldi** (Bradfield’s Namib Day Gheko) is restricted to the coastal and pro-Namib Desert from the Kuiseb River to the Ugab River to rocky outcrops (boulders – i.e. rupicolous behaviour) (Griffin 2003). Cunningham (2007) noted that they prefer boulder outcrops (100% of observations) to any other habitat.

The high percentage of endemic reptile species known and/or expected to occur in the general area underscores the importance of this area for reptiles. The seemingly barren gravel plains in the general area are host to a variety of reptile fauna not often expected and/or acknowledged. Development and recreation often affect these species negatively.

Consult the specialist report (Appendix 3) for a complete list of important reptile species and their distribution in the Study Area.

**Amphibians**

There aren’t any permanent natural surface water bodies in the Study Area; the main habitat for amphibians (i.e. amphibian breeding places), thereby limiting their diversity there. The ephemeral Khan River and its tributaries such as the Ebony, Wildehond, Naab and Chouxab Rivers drain the area although all of these rivers only flow sporadically after heavy local thundershowers. Other water bodies in the area include temporary pools in afore mentioned rivers. Man made ground dams and reservoirs hold water temporarily and could serve as a short term habitat for amphibians in the area.

According to the literature, at least 9 species of amphibians occur in the general area of which 3 species are endemic to Namibia. The Dombe Toad, Hoesch’s Toad and Marled Rubber Frog are endemic to Namibia (i.e. 33%).

**Mammals**

Most endemic mammals are associated with the Namib and escarpment with 60% of these rock-dwelling (Griffin 1998c). According to Griffin (1998c) the endemic mammal fauna is best characterized by the endemic rodent family Petromuridae (Dassie rat) and the rodent genera Gerbillurus and Petromyscus. According to the literature at least 73 species of mammals are expected to occur in the general area of which 12 species (16%) are classified as endemic, 10 species as near threatened, and 4 species as vulnerable.

Important habitats often not realised and/or neglected include mountains and hills (including inselbergs) as well as ephemeral rivers and drainage lines and their...
associated vegetation. Habitat alteration and overutilization are the two primary processes threatening most mammals (Griffin 1998c).

5.5.4 Key sensitivities

- Granite domes, especially in the Omaruru to Usakos area should be avoided as these are viewed as sites of special ecological importance with unique fauna (e.g. Black Mongoose & African Flat Gecko).
- The western or Namib escarpment areas are sensitive and are areas with high endemism (e.g. Anchietae’s Dwarf Python).
- Although often viewed as barren plains devoid of any life these seemingly empty plains are rich in biotic diversity and faunal endemism (e.g. Husab sand lizard) and sensitive to off-road driving.
- Ephemeral drainage lines are associated with water retention and consequently unique flora and related fauna with habitat (cliffs, boulders, etc.) suitable to a variety of faunal species (e.g. Dassie Rat).

5.6 AVI-FAUNA

5.6.1 Community and stakeholder concerns

“It is widely agreed that the Namibian deserts and escarpment are evolutionary nodes holding many endemic taxa, including a suite of endemic and near-endemic birds that have individual ranges exceeding 50,000km²; their conservation is almost entirely Namibia's responsibility.” (Van Rooyen, 2008).

Generally speaking, it is unavoidable that birds get killed through interaction with electricity infrastructure, including power lines, 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.
Figure 5-3: Habitats sensitive to vertebrate fauna.
5.6.2 Methodology and data sources

- Desk top study and risk assessment and related references (Appendix 4).

5.6.3 Description

Van Rooyen (2008) describes the bird habitats in the Study Area in terms of the vegetation structure occurring across the span of the route from East to West. Two vegetation types can be identified, namely the Escarpment in the Savanna Biome and the Namib Desert falling within the Desert Biome.

The Namibian Escarpment is a transitional zone between the savanna biome to the east, the Namib to the west and the Nama Karoo to the south. Topography is variable and vegetation diverse. The altitudinal gradient, isolation, and ecotonal nature have been key factors shaping the escarpment's biological diversity. The extensive network of rivers and stream beds that cross it act as important micro-habitat corridors for species moving across this rugged environment (Simmons et al. 2001).

The Namib contains three distinct bird habitats: rolling sand dunes (not relevant to this study), gravel plains, and watercourses (both relevant to this study). The Namib supports several endemic species; including the Rüppell's Korhaan Eupodotis rueppellii and Gray's Lark Ammomanopsis grayi in the gravel plains. Sporadic rainfall events result in explosive growth and seeding of annual plants, which attract huge flocks of seed-eating birds, such as finch-larks and Larklike Buntings Emberiza impetuani). The Namib also offers a regional stronghold for the threatened Lappet-faced Vulture Torgos tracheliotis (Simmons et al. 2001).

It is widely agreed that the Namibian deserts and escarpment are evolutionary nodes holding many endemic taxa, including a suite of endemic and near-endemic birds that have individual ranges exceeding 50,000km²; their conservation is almost entirely Namibia's responsibility.

Powerline sensitive Red listed species (Simmons & Brown 2006) that have been recorded in the relevant quarter degree squares during the Bird Atlas period from 1970 – 1993 (Harrison et al. 2007) are the Verreaux’s eagle, Black stork, Booted Eagle, Cape Eagle Owl, Greater flamingo, Lesser Flamingo, Lappet-faced Vulture, Martial Eagle, Peregrine Falcon, Tawny Eagle, While-backed vulture, and the Great-white pelican.
Other species that might be impacted upon by the proposed power line also occur along the alignment, although they are not necessarily regarded as threatened in Namibia. Three species that have been recorded from many squares are Ludwig's Bustard, Kori Bustard, and the endemic Rueppell's Korhaan. Ludwig's Bustard are common both on the gravel plains of the central Namib and the dry savanna of the Namibian Escarpment. The two bustard species are very susceptible to power line collisions (EWT unpublished data). Kori Bustards are likely to be found close to dry river courses in the Namibian Escarpment where they take cover during the heat of the day (Harrison et al. 1997). The Ludwig’s Bustard occurs both in the Namibian Escarpment and the central Namib in large numbers. It has been established that seasonal movement occurs between the escarpment and the desert (Harrison et al. 1997). The Rueppell's Korhaan is an endemic of the gravel plains of the central Namib. No records exist of power line collisions for this species, but that might be only because of its remote habitat. It certainly seems plausible that it shares some of the vulnerability as its larger relatives, the bustards, to power line collisions, although it probably flies less often and shorter distances.

5.6.4 Key sensitivities

- The general preservation of habitat is important to avoid declining bird populations. Large trees in particular must not be removed.

- Dry riverbed crossings, particularly the Khan River and the Swakop River, where the line skirts or crosses near high cliffs, hills and inselbergs and particular valleys that are recognised flight paths, as well as a neck between mountains are sensitive habitats for birds. **Figure 5-4** shows the sensitive bird habitats along the route.
Figure 5-4: Sensitive Habitats for birds.
5.7 ARCHAEOLOGY

5.7.1 Data sources and methods

- Desk study for the entire route.
- Field survey from Ebony to Husab power line involving direct examination of selected areas along the proposed power-line route, paying special attention to terrain conditions approximating those of known archaeological site concentrations in the same area, as reported in previous surveys.

5.7.2 Description

Kinahan (2008) has conducted a number of surveys in the Study Area, which reveal that the majority of archaeological sites there are dated to within the last 2,000 years, and “relate to opportunistic Later Stone Age (LSA) hunter-gatherer and pastoralist occupation during seasonal rainfall events or years of higher than average rainfall. There are very few reliable springs or freshwater seepages other than in the Khan and Swakop Rivers, and neither of these were preferred areas of settlement”.

Repeated use of the same water source has resulted in fairly high local site densities, sometimes exceeding 10 sites/km².

The first of these is the late Pleistocene Middle Stone Age (MSA) Phase 2, dating between 127,000 and 80,000 years BP (estimated). The MSA sites comprise isolated artefact finds, small localized scatters associated with granite outcrops, and one very large quarry and artefact factory site situated in a side branch of Panner Gorge, a tributary to the Khan River. All of the MSA artefacts are made from a yellow-brown chert which occurs in a small number of localized outcrops. Detailed research is being carried out on these sites. See the details in this regard in the specialist study, Appendix 1.

The other sequence component of importance is represented by the remains of early historical settlement, including features such as mining sites, fortifications, graves, roads (or track) and railway embankments. Most of these date to the early years of German colonial rule and are considered as important material records of that period.
The archaeologist found two new MSA sites, six LSA sites, and eight historical sites during this field survey. The MSA sites included one isolated artefact find and one extensive artefact scatter dominated by yellow-brown chert. The LSA sites were minor occurrences of stone artefact debris, one in association with a small rock shelter, and three seed digging sites. The historical sites were all associated with the old German narrow gauge railway, and included one probable construction camp site. The southern end of the field survey coincides with the historical road to Tinkas from Goanikontes. Figure 5-5 shows the power-line route and archaeological sites found during the Phase 2 field survey in relation to other archaeological sites in the same area.
5.7.3 Key sensitivities

- The Study Area and specifically the general power line route are considered to be of low sensitivity as far as archaeological resources are concerned. The archaeological sites that are of some significance in the area can be preserved without having to change the course of the route in any way.

- The archaeological sites near the planned Valencia substation (located earlier during the Valencia Mine EA), the historical narrow gauge railway embankment west of Marmor Pforte, and the historical Tinkas track south of the Swakop River are all of importance, although not directly located on the route.


6 ROUTE EVALUATION

6.1 METHODOLOGY

The Terms of Reference for this study required the EIA team to evaluate the preferred route provided by NamPower. If the consultants were of the opinion that this preferred route, or sections of it are unacceptable from an environmental point of view, they are tasked to present the route alternatives, and discuss their technical, financial, and environmental advantages and disadvantages.

The only area where route alternatives were being considered was at the Khan River crossing near Valencia. The technical team and EIA Team worked together to reach a win-win solution along this topographically challenging terrain. The technical team initially presented a number of alternatives for consideration (Alternatives C, D, E, and F on Figure 6-1). The general suitability of these alternatives were considered during a helicopter survey and later presented to the public (see Section 4). At the public meeting, the directly affected farm owners requested that another alternative be considered (i.e. Alternative A on Figure 6-1).

This new possible course for the route was inspected once again, in conjunction with some of the affected farm owners (Mr. Gossouw, and Mr. Meyer from farms Namibfontein and Namib Plaas). The route seemed the most feasible of all the routes from a technical point of view and would be less damaging to the environment (i.e. more accessible, thus less destruction). However, the owners of the affected farm (Mr. Smit of the farm Vergenoeg) objected to this route, stating that it would spoil his prime recreational area and visual resource on the farm. NamPower’s technical team subsequently proposed another alternative that would avoid crossing farms, but rather following farm boundaries (see Alternative B on Figure 6-1).

Figure 6-1 shows all the alternatives considered and the biophysical sensitivities in the area.
Figure 6-1: Route alternatives at the Khan River crossing near Valencia.
### 6.2 LIST OF CRITERIA

Table 6-1 provides a list of criteria that was used for evaluating the suitability of the route alternatives from a biophysical and socio-economic point of view.

**Table 6-1:** Criteria used to evaluate the biophysical and social suitability of the proposed route.

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Criteria</th>
<th>Rationale</th>
</tr>
</thead>
</table>
| Infrastructure                      | Align the route alongside existing infrastructure corridors.            | • Aligning the route along existing infrastructure corridors such as the existing 220 kV power lines, would limit the need to disturb pristine areas and limit further stand-alone intrusions to the landscape. It would also create an opportunity to use the access road of the existing power line(s) instead of creating a new one.  
• Keeping infrastructure in one corridor also limits visual intrusion to one place. |
| Visual impact/tourism and recreational potential | Avoid areas used for tourism and recreation activities and potential that depend on wilderness landscapes. Keep the power line at least 1km from these areas, or as far as needed to preserve important vistas. | • Avoid aligning the route across or in front of areas with scenic and wilderness qualities, particularly areas visited frequently. These may presently attract tourism or do so in future and are valuable to local residents and the public.  
• Keep the power lines off higher ground, and rather align them in valleys and lower lying areas where they will be less obtrusive.  
• Power lines passing areas extensively used for tourism activities such as game drives, or lodges and other tourism facilities, may affect their sense of place and the income generated from them. |
| Homesteads and farm infrastructure  | Avoid crossing existing homesteads, grazing areas, farm infrastructure and other improvements that are of socio-economic value. Maintain a distance of 1km from homesteads where possible. | • Farm owners' assets will reduce in value or may be lost if the power line crosses their homesteads, infrastructure, and other improvements.  
• Power lines close to homesteads could break up views and so reduce quality of life.  
• There is a global concern about the possible health effects of electromagnetic radiation emitted by conductors on power lines. Placing the lines close to human and animal living quarters would be socially unacceptable. |
| Biodiversity                        | Avoid steep slopes, rocky ridges, hilltops and inselbergs and water courses which harbor conservation worthy plant and fauna species and | • To maintain the integrity of conservation worthy biota, in these rugged areas. |
### 6.3 EVALUATION OF ALTERNATIVE ROUTES AT THE KHAN RIVER CROSSING

Using the above criteria, the alternative Routes A to F were evaluated using a scale of Low (-1), Medium (-2) and High (-3) for disadvantages and Low (+1), Medium (+2) and High (+3) for advantages.

Routes A and B ranked the best as far as technical, environmental and social suitability is concerned. Route B is preferred because it is acceptable to the applicable farm owners, would cause the least social disruption, will be shorter to build than Route A, and is relatively acceptable from an environmental point of view.
### Table 6-2: Comparative evaluation of the route alternatives at the Khan River crossing.

<table>
<thead>
<tr>
<th>ROUTE</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Infrastructure</strong></td>
<td>-1</td>
<td>-1</td>
<td>-2</td>
<td>-2</td>
<td>-2</td>
<td>-2</td>
</tr>
<tr>
<td>Parallel to existing power line for app 12km longer than the other alternatives.</td>
<td>Parallel to existing power line for app 2km longer than F. Near an existing road.</td>
<td>Parallel to existing power line for app 2km longer than F.</td>
<td>Parallel to existing power line for app 2km longer than F.</td>
<td>Parallel to existing power line for app 2km longer than F.</td>
<td>Parallel to existing power line for app 2km longer than F.</td>
<td>The least benefit of all the routes in terms of running alongside an existing line.</td>
</tr>
<tr>
<td><strong>Visual impact/tourism and recreational potential (weight of 2)</strong></td>
<td>-4</td>
<td>-2</td>
<td>-3</td>
<td>-4</td>
<td>-2</td>
<td>-6</td>
</tr>
<tr>
<td>Impacts negatively on the key areas around the Khan River for the Vergenoeg Farm.</td>
<td>Optimises the need to construct the power line through this area with due consideration to the current land use and tourism potential.</td>
<td>Impacts negatively on the key areas around the Khan River for the Farm Namibfontein.</td>
<td>Traverses the farms far away from any existing infrastructure or boundaries. Will be very visible across the plains on both Namibfontein and Namibplaas.</td>
<td>Traverses the farms far away from any existing infrastructure or boundaries. Will be very visible across the plains on both Namibfontein and Namibplaas.</td>
<td>Traverses the farms far away from any existing infrastructure or boundaries. Will be very visible across the plains on both Namibfontein and Namibplaas.</td>
<td></td>
</tr>
<tr>
<td><strong>Homesteads and farm infrastructure</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>No homesteads or farm infrastructure within 1 km from the line.</td>
<td>No homesteads or farm infrastructure within 1 km from the line.</td>
<td>No homesteads or farm infrastructure within 1 km from the line.</td>
<td>No homesteads or farm infrastructure within 1 km from the line.</td>
<td>No homesteads or farm infrastructure within 1 km from the line.</td>
<td>No homesteads or farm infrastructure within 1 km from the line.</td>
<td></td>
</tr>
<tr>
<td><strong>Coinciding with existing farm boundaries</strong></td>
<td>-2</td>
<td>-1</td>
<td>-1</td>
<td>-2</td>
<td>-3</td>
<td>-3</td>
</tr>
<tr>
<td>Deviates considerably from existing farm boundaries</td>
<td>Runs fairly close to existing farm boundaries (as far as is practically possible).</td>
<td>Deviates considerably from existing farm boundaries</td>
<td>Deviates considerably from existing farm boundaries</td>
<td>Deviates considerably from existing farm boundaries</td>
<td>Deviates considerably from existing farm boundaries</td>
<td></td>
</tr>
<tr>
<td><strong>Biodiversity</strong></td>
<td>-1</td>
<td>-2</td>
<td>-3</td>
<td>-3</td>
<td>-3</td>
<td>-3</td>
</tr>
<tr>
<td>Habitats traversed rate “low”.</td>
<td>Habitats traversed rate “moderate”.</td>
<td>Habitats traversed are the most problematic at the Khan River.</td>
<td>Habitats traversed are the most problematic at the Khan River.</td>
<td>Habitats traversed are the most problematic at the Khan River.</td>
<td>Habitats traversed rated low.</td>
<td></td>
</tr>
<tr>
<td><strong>Topography</strong></td>
<td>-1</td>
<td>-2</td>
<td>-2</td>
<td>-3</td>
<td>-3</td>
<td>-3</td>
</tr>
<tr>
<td>Khan crossing has moderate slopes.</td>
<td>Steep slopes in the canyon.</td>
<td>Follows gradually sloped tributaries of the Khan, but slopes are steep in the canyon.</td>
<td>Crosses undulating terrain, steep slopes in the canyon.</td>
<td>Crosses undulating terrain, steep slopes in the canyon.</td>
<td>Crosses undulating terrain, steep slopes in the canyon.</td>
<td></td>
</tr>
<tr>
<td><strong>Birds</strong></td>
<td>-1</td>
<td>-2</td>
<td>-3</td>
<td>-3</td>
<td>-2</td>
<td>-2</td>
</tr>
<tr>
<td>Avoids upper water courses; fewer cliffs than alternatives.</td>
<td>Avoids upper water courses; steep cliff slopes.</td>
<td>Runs along cliff slopes and in river bed for a long way.</td>
<td>Runs along cliff slopes and in river bed for a long way.</td>
<td>Steep cliff slopes at crossing.</td>
<td>Steep cliff slopes at crossing.</td>
<td></td>
</tr>
<tr>
<td><strong>Construction costs</strong></td>
<td>-3 (26km)</td>
<td>-2 (13km)</td>
<td>-2 (18km)</td>
<td>-2 (15km)</td>
<td>-2 (17km)</td>
<td>-2 (18km)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>-13</td>
<td>-12</td>
<td>-16</td>
<td>-18</td>
<td>-19</td>
<td>-20</td>
</tr>
</tbody>
</table>
6.3.1 Changes to the course of the remaining route

The EIA Team is satisfied that the preferred route has been aligned sensitively to avoid environmental and social conflict points. The consultants embrace the proposed alignment from Omburu to Usakos along the existing power line there. Impacts will be concentrated in one corridor, and one would avoid the need for additional roads and associated ecological impact. Furthermore, farm owners prefer sacrificing one part of their land instead of scattered areas; breaking up the land use potential even further. There aren’t many options for the route south-west of Valencia; the only criteria there would be to avoid smaller river courses along the way. Larger topographical features have been skirted.

Although the overall route is acceptable, finer adjustments will be necessary to bring about the best fit in the field. Finer details known to the Consultants in this regard are discussed in Section 7.
7 IMPACT ASSESSMENT

After selection of an appropriate route at the Khan River crossing, as discussed in Section 6, the consultants continued with an environmental assessment of the proposed power line, to be constructed along the finally selected route. This section details the findings of the EIA of the preferred route.

Table 7-1 below provides guidelines on the criteria used for describing each impact.

<table>
<thead>
<tr>
<th>Description</th>
<th>The type of effect that a proposed activity will have on the environment. A narrative of the impact.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent</td>
<td>Geographic area. Whether the impact will be within a limited area (on site and immediate surroundings, U(M)), locally (within the power line corridor; L), regionally (R), nationally (N) or internationally (I).</td>
</tr>
<tr>
<td>Duration</td>
<td>Whether the impact will be temporary (during implementation only; T), short term (1-5 years; ST), medium term (5-10 years; MT), long term (longer than 10 years, but will cease after operation LT), permanent (P) or transient (TR).</td>
</tr>
<tr>
<td>Intensity</td>
<td>Whether the impact is destructive or harmless. Low (L) where no environmental functions and processes are affected, Moderate (M) where the environment continues to function but in a modified manner or High (H) (environmental functions and processes are altered) VH Environmental processes cease completely. May also be measured in accordance with acceptable standards, applicable conventions, best practice policy, levels of social acceptance, etc.</td>
</tr>
<tr>
<td>Mitigation</td>
<td>Discusses mitigation options, and whether such options would lessen the impact to an acceptable level.</td>
</tr>
<tr>
<td>Probability</td>
<td>The probability that a certain impact will in fact realise; Uncertain (U), Improbable (I), Probable (P); Highly Probable (HP); Certain (C). If the probability is uncertain, then there is not sufficient information to determine its probability. Because the precautionary principle is followed, this increases the significance of the impact.</td>
</tr>
<tr>
<td>Significance</td>
<td>Low if the impact will not have an influence on the decision or require to be significantly accommodated in the project design. Moderate if the impact could have an influence on the environment which will require modification of the project design or alternative mitigation (the route can be used, but with deviations or mitigation). High where it could have a “no-go” implication regardless of any possible mitigation (an alternative route should be used). Significance is given before and after mitigation.</td>
</tr>
</tbody>
</table>
7.1 VISUAL IMPACT

7.1.1 Discussion

The Study Area from East to West offers a range of visual resources at a regional and local level, including the Erongo massif with various marble ridges in the east, the rugged Khan River Canyon and the Khan, Chous, Pforte, Husab and Witpoort Mountains lining the route all the way from the Valencia area to the Kuiseb substation in the Namib Naukluft Park.

Exposure to a visually contrasting object in the landscape changes as the viewer moves through an area. Exposure to the object reduces greatly with distance, particularly in the hazy Namib environment. Exposure to the objects would be significant at a distance of approximately 3km from the site and reduce in significance as one moves further away. The exposure of sensitive receptors to this radius around the power line is limited to the farm owners and their visitors, road crossings, and areas where the route runs close to the main access roads.

Where the route is in the viewshed of significant visual resources north-east of Karibib, visual impact is minimal because the route follows an existing 200kV power line. The route there is considered to be well hidden from the B2 main road. The visual impact will however be of greater significance to the nearby farm owners.

The desert plains, with the mountains in the distance and the Swakop River canyon in the Namib Naukluft Park offer a significant scenic resource, although not presently developed or utilized for tourism and recreation, except for frequent small aircraft flights made there. Tourism potential may however be developed in future. The Namib Naukluft Park is an area to be kept free of development for conservation and tourism purposes. The visual impact of the proposed Husab substation will particularly be high; a substation of this magnitude is a significant addition to any landscape, particularly in the landscape under discussion with its wilderness qualities. The substation is located next to the C28, a major access route through the Park. The substation may, depending on which mines are developed in future, become a major distribution centre to all the future mines in the Central Namib. One should consider the scarring on the landscape presently being caused by the existing Langer Heinrich Mine and its associated infrastructure, as well as the future Valencia Mine along the project corridor. The landscapes under discussion are no longer entirely pristine. The visual impact of the proposed transmission line in comparison to
the scars caused by the mines is considered low. The cumulative visual impact of all these developments is considered high.

In summary it may be stated that the visual impact of the proposed 220kV transmission line will be moderate at regional level, owing to the fact that it is well hidden from major roads, and follows an existing power line for a large portion of the way. The area of greatest concern in this regard is the Namib Plains in the Namib Naukluft Park, where not only a power line but also a major substation (Husab substation) will be constructed.

At a local level there are a number of farms for whom the owners and visitors will experience an increased visual impact. This impact is the greatest at the Khan River crossing where virgin land is being traversed. However, the selected route follows the farm boundaries where possible; visual impact thereby mitigated to the satisfaction of the farm owners.

### 7.1.2 Mitigation

Options to soften the visibility of the power line were considered in collaboration with NamPower, including aligning the new pylons with the old ones, and painting the structures in a colour matching the surrounds. Unfortunately none of these options are possible from a technical point of view. According to NamPower staff, maintenance of paint on the structures is virtually impossible because personnel cannot easily reach the highest sections of the pylons. Leaving the pylons galvanised fortunately blends relatively well with the surrounds once the initial shine has faded. There are also no practical mitigation measures for screening or reducing the visibility of the proposed Husab substation on the Namib plains.

On the Namib Plains, the visibility of the power line is important to secure the safety of the aircraft that frequent the area. See also Section 7.2.
7.1.3 Summary

<table>
<thead>
<tr>
<th>VISUAL IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Extent</strong></td>
</tr>
<tr>
<td><strong>Duration</strong></td>
</tr>
<tr>
<td><strong>Intensity</strong></td>
</tr>
<tr>
<td><strong>Probability</strong></td>
</tr>
<tr>
<td><strong>Mitigation</strong></td>
</tr>
<tr>
<td><strong>Significance before mitigation</strong></td>
</tr>
<tr>
<td><strong>Significance after mitigation</strong></td>
</tr>
</tbody>
</table>

7.2 BIRD IMPACTS

7.2.1 Description

**Electrocutions**

Large birds of prey are the most commonly electrocuted on power lines. The large transmission lines from 220kV to the massive 765kV 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 to the potentially lethal conductors. In fact, these power lines have proved to be beneficial to birds such as Martial Eagles, Tawny Eagles, White-backed Vultures, and even occasionally Verreauxs’ Eagles by providing safe nesting and roosting sites in areas where suitable natural alternatives are scarce (pers.obs: Van Rooyen).

The proposed Omburu 220kV line should not pose an electrocution risk to birds as the clearances are too large to be bridged by even the largest raptors.
Collisions

Because of the lack of data on impacts on birds from existing power lines, it is difficult to predict and quantify impacts on birds with a high level of confidence. Apart from determining important bird habitats and flyways where birds are likely to be affected, the precautionary principle needs to be followed where uncertainties exist.

Collisions with power lines 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). Bird collisions in southern Africa 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 manoeuvrability (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.

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). 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.

The proposed line will pose a collision hazard for several species, particularly certain raptors, waterbirds and bustards. These species and the threat that the power line could pose to them are discussed under Section 5.6.3 and in the Specialist Bird Impact Assessment, Appendix 4.

Habitat destruction

During the construction phase and maintenance of power lines, some habitat destruction and alteration inevitably takes place. This happens with the construction of access roads, and the clearing of servitudes. These activities could have an impact on birds breeding, foraging, and roosting in or in close proximity of the
servitude, through destruction of habitat. The potential removal of large trees in river courses could impact on several raptor species (see the Specialist Bird Impact Assessment, Appendix 4).

**Disturbance**

The construction of a power line can be highly disturbing to birds breeding in the vicinity of the construction activities. Many birds are highly susceptible to disturbance, and should this disturbance take place during a critical time in the breeding cycle, for example when the eggs have not hatched or just prior to the chick fledging, it could lead to temporary or permanent abandonment of the nest or premature fledging. In both instances, the consequences are almost invariably fatal for the eggs or the fledgling. Such a sequence of events can have far reaching implications for certain large, rare species that only breed once a year or once every two years. The dry river courses are important micro-breeding habitat for several species of raptors and disturbance during the construction phase could have a negative effect on breeding success (see further details in Appendix 4).

**7.2.2 Mitigation**

**Collisions**

The power line will pose substantial risk of collision in several areas to several species. The following areas will have to be mitigated by putting Bird Flight Diverters onto the earth wire of the proposed power line:

- Where dry river beds are crossed, particularly the Kahn River and the Swakop River.
- Where the line skirts or crosses near high cliffs, koppies and inselbergs.
- Where the line crosses certain topographical features e.g. valleys or a neck between mountains.

See 7.2.3 and Figure 5-4 indicating where the mitigation should happen.

**Disturbance and habitat destruction**

Every effort should be taken to restrict the construction activities to the immediate servitude and immediate surroundings. Existing tracks and roads should be used as much as possible.
If an active large raptor nest is encountered, it must immediately be reported to the Environmental Control Officer (ECO), who must immediately inform Raptors Namibia. An appropriate course of action will then be decided upon between the parties to minimise the risk of disturbance to the birds.

Every effort must be made to restrict the habitat destruction to a minimum. Large trees in particular must not be removed.

### 7.2.3 Summary

<table>
<thead>
<tr>
<th>BIRD IMPACTS</th>
<th>Potential collisions could potentially occur at sensitive bird habitats. Sensitive areas are the following:</th>
</tr>
</thead>
</table>
| Description  | • 2115DB: Kahn River crossing.  
|              | • 2115DD: Erongo complex.  
|              | • 2115DC: Groot Rooiberg area.  
|              | • 2215AB: Kahn River crossing and associated rugged area.  
|              | • 2215AD: Kahn River crossing and associated rugged area.  
|              | • 2215AC: Kahn River crossing and associated rugged area.  
|              | • 2215CA: Gravel plain/natural east-west flight path for bustards.  
|              | • 2215CC: Swakop River crossing.  

See Appendix 4 for a mitigation map.

<table>
<thead>
<tr>
<th>Extent</th>
<th>Local.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>Long term in terms of the duration of the project, but permanent and fatal if birds are killed.</td>
</tr>
<tr>
<td>Intensity</td>
<td>High.</td>
</tr>
<tr>
<td>Probability</td>
<td>Highly probable.</td>
</tr>
<tr>
<td>Significance before mitigation</td>
<td>High.</td>
</tr>
<tr>
<td>Significance after mitigation</td>
<td>Moderate</td>
</tr>
<tr>
<td>Mitigation options</td>
<td>Bird Flight Diverters to increase visibility of the line.</td>
</tr>
</tbody>
</table>
7.3 IMPACT ON FARMS DURING CONSTRUCTION

7.3.1 Description

The proposed route avoids most homesteads and tourist areas. On the farm Kranzberg, the route passes directly over an informal homestead and kraals. This is unavoidable because of the Erongo Mountain and a river in the west of the line and the existing line to the east. This particular conflict needs to be addressed and compensated for. The following aerial photo shows this particular point of conflict.

The major socio-economic impacts on the farms are expected during the construction of the proposed new line. The probability of the issues raised during the public consultation exercise actually occurring is high if it is not properly managed during the construction phase. The EIA team regards these issues as significant impacts on the level of satisfaction of farmers, and their subsequent levels of trust in and satisfaction with NamPower in future.

The issues to be addressed include a lack of communication with farm owners, access to farms without prior arrangements being made, indiscriminate and night driving, compromising farm security through the flattening of fences and cutting of
locks, helicopter trips over farms without communicating this to the owners, misconduct by contractor personnel (possible poaching, littering, noise, illegal camping, stock theft, etc.), unnecessary blading by bulldozers during bush-clearing and removal of vegetation, and too many roads and tracks made.

7.3.2 Mitigation:

- The elements of a mitigation strategy for the general good conduct on farms will be included in the Environmental Management Plan. These include procedures to be followed for contractors and maintenance personnel, which should be overseen by an independent person. In practice these should be consolidated into three instruments namely Operational Procedures to be included in the tender documents and the contract with the contractor, a communication programme, and a monitoring programme.

- The Operations Manual should deal with all the issues related to behaviour, rights, responsibilities, and penalties when working on private farms. It should set requirements for making contact with the farmers before entering and working on their land.

- The Communication Plan must consist of a time frame of when work will be done where. It must also include a clear programme of instances where the contractor/NamPower will communicate information to the landowners inclusive of the time programme. All farmers should have access to one person through which all complaints can be made and readily and effectively followed up.

- The monitoring programme should have a local person in charge and the objectives of this programme must be to ensure compliance with the operational procedures, the implementation of the communication programme and to serve as an informed and committed contact person from where farmers can get information and to whom they can direct complaints.

- The locality of individual features on farms is not known. The alignment of the route should be fine-tuned by the surveyor and should keep at least 50m away from any farm infrastructure (such as reservoirs, cattle kraals, pumps etc.).
7.3.3 Summary

<table>
<thead>
<tr>
<th>NUISANCE DURING CONSTRUCTION AND MAINTENANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
</tr>
<tr>
<td>• Poor conduct with respect to housekeeping procedures on farm, particularly during construction but also during maintenance.</td>
</tr>
<tr>
<td>Extent</td>
</tr>
<tr>
<td>• Local – on farms traversed by the power line.</td>
</tr>
<tr>
<td>Duration</td>
</tr>
<tr>
<td>• Short term for construction, long term for maintenance.</td>
</tr>
<tr>
<td>Intensity</td>
</tr>
<tr>
<td>• High.</td>
</tr>
<tr>
<td>Probability</td>
</tr>
<tr>
<td>• Highly Probable.</td>
</tr>
<tr>
<td>Mitigation options</td>
</tr>
<tr>
<td>• Operations Manual, Communications Programme with Interested and Affected parties, and Monitoring Programme to be implemented during construction and operation.</td>
</tr>
<tr>
<td>Significance before mitigation</td>
</tr>
<tr>
<td>• High - the mitigation measures, if implemented would be adequate, but the project should not continue before they are in place and operational.</td>
</tr>
<tr>
<td>Significance after mitigation</td>
</tr>
<tr>
<td>• Low.</td>
</tr>
<tr>
<td>Mitigation</td>
</tr>
<tr>
<td>• Include Operations Manual in tender documents. NamPower to ensure that communications Plan and Monitoring Plan are in place.</td>
</tr>
</tbody>
</table>

7.4 DESTRUCTION OF VEGETATION

7.4.1 Discussion

Mannheimer (2008) notes that there is very little difference between the vegetation composition underneath the existing power line route from Omaruru to Usakos, and those outside it, with the exception of the large woody species that are routinely cleared along the servitude track. This would imply that there has been considerable recovery since the earlier line was constructed and that the same may be expected in the long term in this instance.

The powerline route over this section is confined largely to the plains and thus, providing that protected and endemic/near endemic large woody species on ridges and koppies (see Appendix 2) and along watercourses are avoided as far as possible, the number of individuals affected is expected to be very low, and not to pose any threat to their conservation status.
The species of most concern in the Khan River crossing near Valencia are Aloe dichotoma, Moringa ovalifolia, Sterculia africana, Commiphora glaucescens, C. virgata and Adenia pechuelii. Due to the fact that they occur here mostly on steep slopes makes it unlikely that any meaningful number will be impacted by the power line, which will avoid steep slopes as far as possible for technical reasons. The route does cross a very steep and inaccessible area there, and mechanical works could impact on some of these species.

From south of Valencia to the vicinity of the Husab Mountain at the Swakop River the power line route traverses a sandy-gravelly plain incised in places by sandy washes (Photo 7-1). This plain is characterised by Stipagrostis spp. and many annual herbs, including Jamesbrittenia barbata, Anticharis imbricata, Heliotropium tubulorum and Chascanum garipense.

Photo 7-1: Section C traverses a sandy-gravelly plain from south of Valencia to near Husab Mountain.

No species of conservation concern sufficient to warrant any special mitigation measures were recorded on the plain. However, near where the route crosses into the Namib-Naukluft Park (approximately 0514802E 7500205N) there is a deep wash with rocky slopes that harbour a number of protected and/or endemic perennial and woody species, including Euclea pseudebenus, Acacia erioloba, Zygophyllum stapffii, Commiphora saxicola and Petalidium spp. This wash should be avoided if at all possible, as should any others, because it is in the washes that species of conservation concern are found. None are likely to be affected by this project in sufficient numbers to affect their populations in any meaningful way, but nevertheless damage to them should be avoided as far as possible.
West of the point where the route crosses the boundary fence of the Namib-Naukluft Park there is a line of koppies that harbour numerous species of conservation concern (see Appendix 2). These lie well away from the proposed route, so should not be affected by the project but they should be made out of bounds for all involved in construction.

The undulating hillocks and high mountainous ridges in the Swakop River area appear largely unvegetated, but they are dissected by narrow, sandy-rocky washes that harbour considerable plant life, including endemic and near-endemic, occurring in very low numbers on rocky substrates in lateral gullies on these washes. Aloe asperifolia (endemic, protected) occurs in very low numbers on rocky substrates in lateral gullies on these washes. It is the only listed species of formal conservation concern that was found in this zone. Due to the fact that it is likely to be impacted in very low numbers, if at all, no mitigation measures are needed beyond the control of unnecessary collateral damage in this area.

The riparian vegetation of the Swakop River course and the floodplain supports many other species, including endemics and near-endemics, but it is unlikely that any species will be compromised by this project, providing that unnecessary collateral damage is controlled.

Due to the nature of this project it is highly unlikely that any of the species in the plains south-west of the Swakop River will be compromised, which are all reasonably common and widespread in the central Namib. Track control will be essential in this section.

### 7.4.2 Mitigation

Thus the most pressing need is for the limitation of unnecessary collateral damage through regulation during the construction phase.

- **Tracks:** Strict track control will be essential during construction and operational phases. Tracks to be used should be clearly demarcated from very early on, and transgressors should be penalised. This will ensure that no unnecessary vehicular collateral damage will be done. Tracks should be rehabilitated in cooperation with the Chief Warden of the Namib-Naukluft Park.

- **Firewood:** No collection of firewood should be permitted anywhere along the route, but most particularly in the Park, where it is illegal in any case.
• **Restoration**: Where necessary tracks in the Namib Naukluft Park should be rehabilitated in cooperation with the Chief Warden.

• **Relocation and rescue**: The National Botanic Garden is planning a section where pachycaul trees such as Sterculia africana, Moringa ovalifolia and Commiphora spp. will be planted. Where it is clear that certain large species will be destroyed consideration should be given to offering to rescue the individuals involved and relocate them to the garden in Windhoek. Note that there is an existing relocation project planned for Adenia pechuelii at Valencia. No rescue missions should be undertaken until it is firmly established exactly what areas will be affected to prevent removal of plants that would, in fact, not be affected by project activities.

### 7.4.3 Summary

<table>
<thead>
<tr>
<th>VEGETATION DESTRUCTION: CONSTRUCTION PHASE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Extent</strong></td>
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<tr>
<td><strong>Duration</strong></td>
</tr>
<tr>
<td><strong>Intensity</strong></td>
</tr>
<tr>
<td><strong>Probability</strong></td>
</tr>
<tr>
<td><strong>Mitigation</strong></td>
</tr>
<tr>
<td><strong>Significance before mitigation</strong></td>
</tr>
<tr>
<td><strong>Significance after mitigation</strong></td>
</tr>
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<table>
<thead>
<tr>
<th>VEGETATION DESTRUCTION: OPERATION PHASE</th>
</tr>
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<tbody>
<tr>
<td><strong>Description</strong></td>
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<tr>
<td><strong>Extent</strong></td>
</tr>
<tr>
<td><strong>Duration</strong></td>
</tr>
<tr>
<td><strong>Intensity</strong></td>
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</table>
7.5  FAUNAL DESTRUCTION

Faunal destruction is difficult to predict as the development associated with the transmission line(s) would be localised i.e. specific to each site (depending on the placement of the individual pylons) and depend on the access and maintenance routes. The following table indicates the potential/envisaged impacts expected regarding faunal destruction (which is obviously closely linked to habitat destruction):

Indiscriminate destruction of habitats that harbour conservation worthy species such as the reptiles discussed under 7.5.1, could lead to significant declines in their populations. Some of these species are restricted in their ranges, so activities such as the grading of new tracks along steep slopes to access higher ground can affect these populations, even though the disruption will be localised.

<table>
<thead>
<tr>
<th>Description</th>
<th>Destruction of fauna particularly species of conservation concern with habitats in rocky outcrops and ridges, inselbergs, etc. (See 5.5.4).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent</td>
<td>Localised.</td>
</tr>
<tr>
<td>Duration</td>
<td>Long term.</td>
</tr>
<tr>
<td>Intensity</td>
<td>Medium.</td>
</tr>
<tr>
<td>Probability</td>
<td>Definite.</td>
</tr>
<tr>
<td>Mitigation</td>
<td>Avoid sensitive areas described in 7.5.1.</td>
</tr>
<tr>
<td>Significance before mitigation</td>
<td>High.</td>
</tr>
<tr>
<td>Significance after mitigation</td>
<td>Medium to Low.</td>
</tr>
</tbody>
</table>
7.5.1 Mitigation

- Avoid development & associated infrastructure in sensitive areas – e.g. in/close to drainage lines, cliffs, boulder and rocky outcrops, especially granite domes in. This would minimise the negative effect on the local environment especially unique features serving as habitat to various species.

- Where crossings at such sensitive sites are unavoidable (i.e. the two Khan River crossings, the Swakop River crossing) utmost care is needed to prevent habitat destruction. Blading and bulldozing should not be permitted. Sensitive vegetation and large trees should be identified and protected. The ECO should be with the contractor for the duration of the work at these points.

- Avoid placing access routes (roads & tracks) through sensitive areas – e.g. over rocky outcrops/ridges and along drainage lines.

- Avoid driving randomly through the area (i.e. “track discipline”), but rather stick to permanently placed roads/tracks – especially during the construction phase. A tracks map should be made for each stretch of the route, particularly in the Namib Naukluft Park.

- Stick to speed limits of maximum 30km/h as this would result in fewer faunal road mortalities. Speed humps could also be used to ensure the speed limit.

- Remove (e.g. capture) unique fauna and sensitive fauna before commencing with the development activities and relocate to a less sensitive/disturbed site if possible.

- Prevent and discourage the setting of snares (poaching), illegal collecting of veld foods (e.g. mushrooms, etc.), indiscriminate killing of perceived dangerous species (e.g. snakes, scorpions, etc.) and collecting of wood as this would diminish and negatively affect the local fauna – especially during the development phase(s).

- Attempt to avoid the removal of bigger trees during the development phase(s) – especially with the development of access routes – as these serve as habitat for a myriad of fauna.

- Prevent and discourage fires – especially during the development phase(s) – as this could easily cause runaway veld fires affecting the local fauna, but also causing problems (e.g. loss of grazing & domestic stock mortalities, etc.) for the neighbouring farmers.
• Preferably workers should be transported in/out to the construction sites on a daily basis to avoid excess damage to the local environment (e.g. fires, wood collection, poaching, etc.).

• Implement erosion control. The area(s) towards & adjacent the drainage line(s) are easily eroded and further development may exacerbate this problem. Avoid construction within 20m of the main drainage line(s) to minimise erosion problems as well as preserving the riparian associated fauna. Tracks along steep slopes should be negotiated without blading to avoid unnecessary habitat destruction.

• Prevent the number of domestic pets - e.g. cats & dogs - accompanying the workers during the construction phase as cats decimate the local fauna and interbreed & transmit diseases to the indigenous African Wildcat found in the area. Dogs often cause problems when bonding on hunting expeditions thus negatively affecting the local fauna. The indiscriminate and wanton killing of the local fauna by such pets should be avoided at all costs.

• Avoid “overnighting” at the construction sites during the construction phase as this could lead to problems such as the killing/poaching/collection of local fauna.

7.6 GENERAL NEGLECT

7.6.1 Discussion

As a result of general misconduct by contractors especially during construction, impacts may include erosion, unsightly scars from unnecessary vehicle tracks and roads, littering and dumping, pollution of water sources, and indiscriminate toilet manners.

Erosion has specifically been identified as an issue of concern, particularly on steep slopes where exposed areas wash away after heavy rains. Unnecessary roads can easily degenerate into deep dongas if not sited carefully and not maintained during the rainy season.

Indiscriminate littering and dumping of solid and liquid wastes will leave the area in an unsightly state, and may cause pollution of water sources.

It is particularly the south-western plains of the Namib that deserves special attention as far as track discipline is concerned. Indiscriminate driving and the making of unnecessary tracks will result in unacceptable scars in the landscape. Damage to
the gypsum crust of the valley floor is permanent; all contractors moving there are to “tread lightly” and treat the area with respect. Rehabilitation of all tracks and impacted areas would be crucial, and must be done according to the specifications of the Chief Warden of the Namib Naukluft Park.

7.6.2 Mitigation

- The making of unnecessary roads and tracks should be strictly avoided.
- Track discipline must be maintained at all times during construction and maintenance. Track discipline gets neglected if there is no regular and conspicuous inspection and reminding done; therefore a person specifically tasked to do regular checks and reminding would be crucial. The ECO’s regular presence will particularly be important in the Namib Naukluft Park.
- General waste management is important during construction. Littering must be prohibited, and all construction debris removed and responsibly disposed of. Spills should be cleaned up when they occur.
- Adequate provision for toilet facilities is important during construction, and toilet “etiquette’ should be communicated to construction staff.
- All areas disturbed should be rehabilitated after construction to the satisfaction of the Chief Warden of the Namib Naukluft Park, who will inspect the terrain before completion. Rehabilitation is to be done manually using rakes or brooms, depending on the soil substrate; the aim of which is to obtain a surface as close to its original state as possible.

7.6.3 Summary

<table>
<thead>
<tr>
<th>GENERAL NEGLECT DURING CONSTRUCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Extent</strong></td>
</tr>
<tr>
<td><strong>Duration</strong></td>
</tr>
<tr>
<td><strong>Intensity</strong></td>
</tr>
<tr>
<td><strong>Probability</strong></td>
</tr>
</tbody>
</table>
### GENERAL NEGLECT DURING CONSTRUCTION

<table>
<thead>
<tr>
<th>Mitigation</th>
<th>• Strict supervision and discipline during construction will be required to avoid these impacts.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significance before mitigation</td>
<td>• High – the project should not continue without the required mitigation</td>
</tr>
<tr>
<td>Significance after mitigation</td>
<td>• Low</td>
</tr>
</tbody>
</table>
CONCLUSIONS AND RECOMMENDATIONS

The key ecological and social impacts related to the proposed transmission line from Omburu Substation to Kuiseb Substation are:

- **Cumulative visual impacts** resulting from another power line added to the existing 220kV transmission line in the north-eastern parts, and new visual impacts along the portion of the route south-west of Usakos and into the relatively pristine Namib Naukluft Park. The route has already been optimised to avoid topographical features that would draw attention to the pylon structures, particularly for sensitive receptors such as travellers on the main roads. The proposed Husab substation will have a high visual impact; the site being proposed on the relatively pristine Namib plains and in the Namib Naukluft Park next to the District Road C28. There is no practical mitigation available to reduce the visibility of the substation. Overall, visual impact of the power line from Omaruru to the Kuiseb substation is considered to be of moderate significance.

- Potential **bird collisions** at river crossings, hill slopes, cliffs, and flyways. Mitigation measures proposed include bird diverters to be attached to certain stretches that traverse these sensitive places along the route.

- **Destruction to vegetation.** The botanist considers this impact to be of low significance; individuals that might be affected along the line are not sufficient to significantly reduce the populations of plant species that are of conservation concern. By carefully managing the activities of the construction team, this impact can be successfully mitigated.

- **Disruption to fauna.** The significance of this impact is high if sensitive habitat to fauna (particularly reptiles of which a number of restricted range species occur in the Namib parts of the area), is not avoided as far as possible and treded on lightly where unavoidable. Sensitive habitats for fauna include rocky ridges and outcrops, rugged areas at the Khan and Swakop River crossings, and other river beds.

- **Nuisance and disrespect towards farm owners** during construction and maintenance; examples being gates left open, veld fires, theft and poaching, lack of communication and arrangements prior to working on farms, and offensive toilet manners. The significance of this impact is considered to be high, but can be mitigated to achieve a low significance.

- **General degradation of the area** due to a lack of management during construction. Examples include erosion, littering and dumping, and pollution of water sources. Diligent care and management will be required on the part of
NamPower and its appointed contractor to avoid a repeat of historical problems reported from previous power line projects. The plains of the Namib Naukluft Park are particularly sensitive to disturbance and neglect. Track discipline and rehabilitation there will be of utmost importance. The significance of this impact is high if not mitigated, but can be reduced to a low significance if problems are avoided and managed well.

Final recommendations

The EIA team is confident that the proposed route has been optimised by aligning it alongside an existing disturbed corridor in the north-eastern section and away from most of the sensitive land uses and bio-physical features.

As far as social impacts are concerned, the directly affected population wishes to be treated with respect during construction of the power line.

Apart from the normal control mechanisms that can be included in the construction contracts, it is strongly recommended that a local person independent from the contractor (ECO or Environmental Control Officer) be involved during construction to serve as the contact person with farm owners, and to ensure that complaints and requirements of the EMP are met. Such a person would also be able to tend to general requirements in the EMP such as track discipline, erosion control, waste management, and generally attending to problems as they occur.

It is strongly recommended that the ECO be with the construction team whilst busy at the river crossings, i.e. the Khan River and Swakop River crossings, and all work in the Namib Naukluft Park. All tracks in the Namib Naukluft Park will have to be rehabilitated to the satisfaction of the Chief Warden.

Monitoring and decommissioning plans should be addressed by NamPower. They should inter alia give attention to monitoring of bird impacts and the fate of the power lines once they have become redundant. Monitoring efforts are not always practical, but could be done in conjunction with the farm owners.
9 REFERENCES


