

ENVIRONMENTAL SCOPING
ASSESSMENT REPORT FOR:

2015

**REVIEW OF THE BASIC PLANNING FOR
TR9/1 & TR6/1 WINDHOEK TO HOSEA
KUTAKO AIRPORT**



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1. INTRODUCTION

1.1 BACKGROUND AND IMPORTANCE OF THE PROJECT

Urbanisation, the movement of people to cities, is an international trend that does not elude Namibia's capital and proper planning for this phenomenon is essential. Windhoek's geographic location offers some unique development and growth characteristics in this regard. For instance, the steep mountainous terrain to the north east, south and west inhibit the city's growth in those directions. In addition, the City of Windhoek Council placed a ban on development in certain areas of the city limits to protect Windhoek's groundwater supply. This leaves only narrow corridors in which Windhoek can grow.

These characteristics pose a challenge to the planning and construction of roads to serve the capital. The project now being considered is part of an on-going process by the Roads Authority, started by its predecessors in title, to meet these challenges.

In the 1970's a route determination and basic design for a future freeway between Windhoek and the International Airport was conducted. This road, known as Trunk Road 9 Section 1 (TR9/1), will connect at the current traffic circle junction of the Western Bypass with Auas Road in the vicinity of the Prosperita Industrial area. From there the route runs approximately parallel to the existing road (TR6/1) all the way to the Airport, where it re-connects to the existing road. Interchanges and connecting roads were planned at strategic locations to allow traffic from either road to access the other.

This additional road was designed to ensure efficient and safe transport of goods and persons between the capital and the international airport and beyond. Once development along the road and vehicle movement cause the existing road to reach full carrying capacity this additional road will alleviate congestion and ensure smooth transport along the route. The existing road will then become a so-called service- or main collector road. The reason for designing and proclaiming the road well ahead of its time were to allow planning and development adjacent to the road to happen unhindered. The Western Bypass was for instance developed similarly, and this new road will in the future form an extension of that bypass system.

Since the opening of the Trans-Kalahari Highway in the late 1990's the number of heavy vehicles (trucks and busses) using the route have steadily increased. As a result of increased activity in the tourism and other industry, the number of light vehicles travelling to and from the Airport has also increased over the past 20 years.

To better accommodate this growing traffic volume, the Roads Authority in 1996 commissioned a feasibility study to determine if the new road should be built, or up to what point the Bypass could be extended before re-connecting to the existing road, as an interim measure. Due to the high cost of constructing a road through mountainous terrain, and the still reasonably low traffic volumes at the time, an extension of the bypass was not deemed viable at the time.

1.2 FEASIBILITY STUDY

Since the time the 1996 study was conducted, traffic volumes have increased steadily at approximately 4.5% per annum and several residential and commercial developments have taken place and are planned along the route between Windhoek and the Hosea Kutako International Airport. The Roads Authority is therefore now reviewing the feasibility of constructing the new road, or a section thereof (known as the "Southern Bypass"). Also included in this study is the assessment of the original alignment, as preliminary designed in the 1970's.

The average number of vehicles travelling daily between Windhoek and the Airport is currently 3 690, of which roughly 9% (328) are heavy vehicles. Whilst this number is substantially lower than the estimated carrying capacity of a road designed to good sight distances, it already causes conflict at certain times and locations along the road between heavy and light vehicles, mainly as a result of poor sight distance over sections of the road. This is most notable during peak hours at intersections, but also on the major roads in Windhoek's eastern suburbs. The high cost of road construction, especially in mountainous terrain, inhibits the financial viability of constructing any length of the bypass close to Windhoek. However, the traffic volume and corresponding congestion and higher rates of accidents may provide adequate motivation for the building of a short section of the bypass. This study will therefore assess what part, if any, of the Southern Bypass should be constructed in the interim, to accommodate the heavy vehicles and through-traffic, and to reduce the traffic loading on Windhoek's urban street network.

The freeway, once constructed, will have to safely accommodate a large number of vehicles travelling at high speeds. The road will in all likelihood also remain on the selected alignment for centuries. It will consequently have to be planned and built to the highest standard. This, amongst other, means that it should have curves with large radii (preferably more than 1500m) and as few as possible steep grades (preferably no more than 3%). Access to the freeway will also have to be restricted to strategically placed interchanges in order that traffic can flow smoothly. To ensure that these engineering requirements are met, without the need for unsightly and costly deep cuts and extremely high fills (through mountains and valleys); the Roads Authority has therefore decided on the review of the original design alignment of the freeway in this study.

The review was also necessitated because of:

- a constant demand for more accesses to the existing road as a result of developments along the road, which cannot be allowed too regularly on a Trunk Road, especially where safe sight distances are very limited;
- a number of developments already took place inside the formerly planned corridor which would have to be removed unless the route is re-aligned; and
- the land-use along the route has changed significantly since the 1970's, which may require another route to be followed.

This review has already identified the "middle section" of the future road as the section in which some minor changes could be made to greatly improve the planned road alignment. The impact on the cost, engineering requirements, socially and on the environment, are now being assessed.

1.3 PROJECTED ROUTES

As mentioned above the original alignment of the proposed route was done during the feasibility study conducted in the 1970's. This route is indicated in Figure 1 (Figure 1: Original alignment of the freeway). The original alignment is indicated with a yellow line and the black line represents the current road travelling from Windhoek to the HKIA. The feasibility study found that the selected route was not the best alignment, but was selected because of the specific land-use situation at the time. A better route, according to that study, would have been to the south of the existing bitumen



Figure 1: Original alignment of the freeway

road between the farm Finkenstein and the Dordabis road to the south of the Finkenstein dam.

The following figure (Figure 2: Proposed alternatives) indicates the proposed alternatives that were considered during the investigation phase of the current project. No alternatives were considered for the far western and eastern parts of the original alignment. But there is a central section of the route where alternatives were considered due to engineering, social and practical reasons.

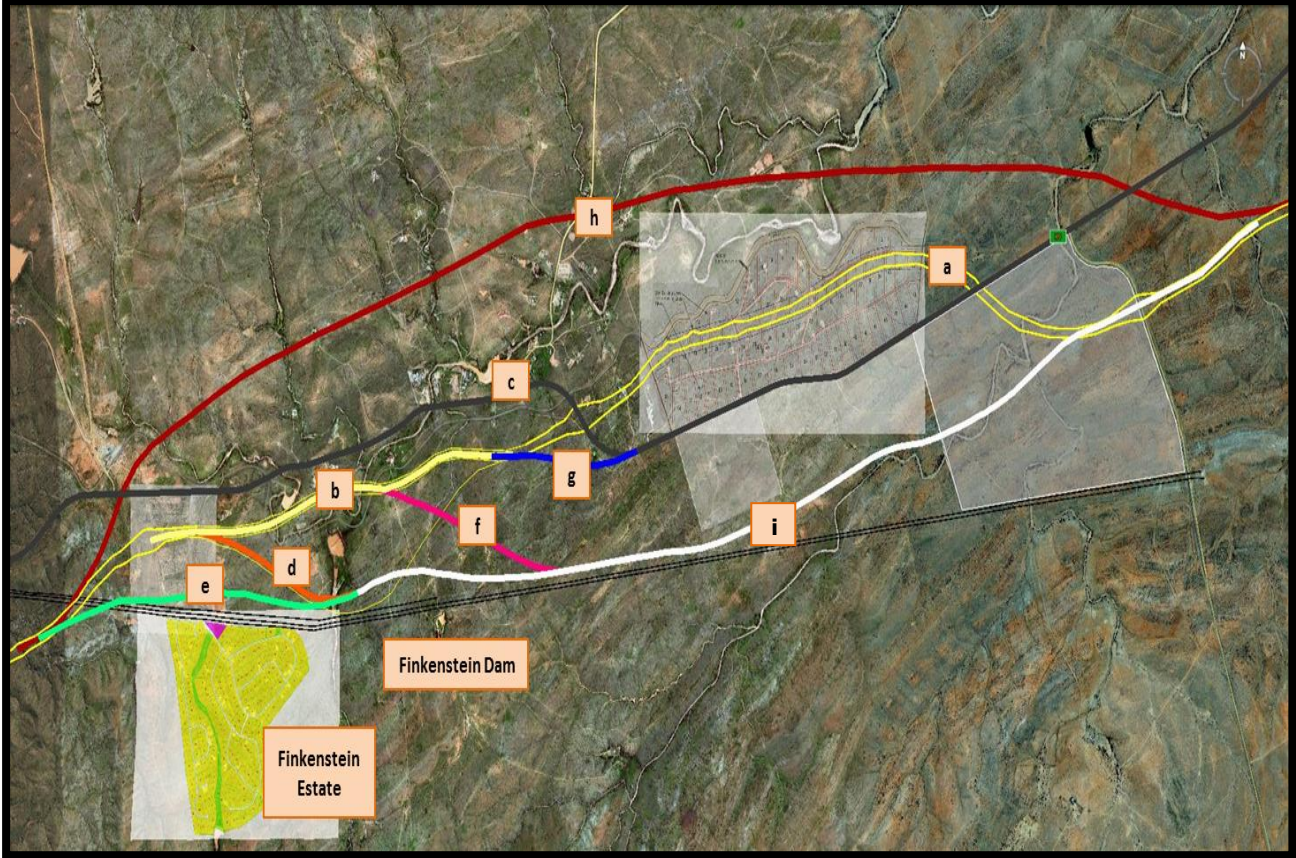


Figure 2: Proposed alternatives

Along the route as indicated above and from left to right there are numerous developments and areas that were taken into consideration during the investigation and selection phase of the project. The first development is the proposed Finkenstein Retirement Village followed by the Finkenstein Estate. Further to the east is Herboth’s Blick with the farm Voigtland adjacent. At the end of the proposed road (eastern side opposite the Hosea Kutako International Airport) is the Sungate development. There are also the Kapps Farm development directly to the north of the existing birumen road at Kapps Farm.

The central portion of the route (as indicated in Figure 2) is the main focus of communication with stakeholders, the Roads Authority and other specialists – ultimately to determine the best alternative route for the section of the road. A pre-selection phase was conducted to eliminate some of the route options as indicated in Figure 2 (Route alternatives a – i). The pre-selection was done according to the following criteria:

1.3.1 Notes on selection criteria:

The following selection criteria were used to rank the identified alternatives along the mid-section of TR9/1 relative to each other. The criteria were selected to take cognisance of the more prevalent engineering, social and environmental considerations for the development of the future freeway system. The ranking was carried out on 2 February 2012 by B Boshoff & H Klink (VKE Namibia), E Simon (Urban Dynamics) and R du Toit (Enviro Management Consultants).

- **Alignment** - Considering the viability and ease with which geometric design requirements to freeway standards can be achieved on the selected alignment
- **System Efficiency** - Considering accesses (current and possible re-locations), distance from a service road, etc. to ensure road system efficiency
- **Cost** - Considering the extent, relative to the other options, of cost incurred (mainly due to expensive cut and fill operations and additional freeway bridges)
- **Households affected:**
 - **Directly** - considering the number of households, erven or farms that will be traversed by the alignment,
 - **Indirectly** - considering those households within 800m of the route,
- **Environmental sensitivity** - identifying ecological "hotspots" that requires special management principles and determining the number of these hotspot areas (rocky outcrops, rivers and larger streams) to be crossed by the various alternative routes.
- **Social sensitivity** – up to date three different meetings were held to inform specific Interested and Affected Parties, as well as larger communities (such as the residents at Finkenstein and Herboth's Blick). One feedback meeting remains where the preferred findings on the alignment will be communicated to the I&APs. Comments, concerns and various inputs were received during these meetings which are incorporated into this report.

The analysis and findings of the various alternatives is done in Section 6 ANALYSIS OF ALTERNATIVES page 29 of this report, using the abovementioned criteria.

Only the best **three** alternatives were then evaluated during the Environmental Impact Assessment phase in this report (ENVIRONMENTAL IMPACT ASSESSMENT page 31). It is imperative to understand that the other alternative routes are thus not evaluated further in this report.

Additional to these alternative routes, it became evident during the Public Participation process and consultation with the Roads Authority of Namibia, that the extension of the proposed route be investigated up to Seeis.

Some alternative access routes towards the new proposed Trunk Roads 6 and 9 were also added during the environmental and social investigation phase. This investigation report is attached as an Addendum (Appendix E) to this document and should be evaluated as such.

It should be reiterated that thorough consultation was done by the Environmental and Social team during the investigation phase and all of the comments / concerns are portrayed in this report and the social impact assessment report.

2. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

This section deals with the regulatory requirements that are applicable to this project.

NAMIBIAN LEGISLATIVE FRAMEWORK

2.1 The Constitution of Namibia

Article 95 (1) of the Constitution of Namibia states that "The State shall actively promote and maintain the welfare of the people by adopting, *inter alia*, policies aimed at the ... " maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of living natural resources on a sustainable basis for the benefit of all Namibians, both present and future; in particular, the Government shall provide measures against the dumping or recycling of foreign nuclear and toxic waste on Namibian territory."

2.2 Environmental Assessment Policy (1995)

Namibia's Environmental Assessment Policy was endorsed by Cabinet and published in 1995. The Policy provides a procedure for environmental assessments, which sets out to:

- Better inform decision makers and promote accountability of decisions taken;
- strive for a high degree of public participation and involvement by all sectors of the Namibian community in the environmental assessment process;
- take into account the environmental costs and benefits of proposed policies, programmes and projects;
- take into account the secondary and cumulative environmental impacts of policies, programmes and projects; and
- promote sustainable development in Namibia, and especially ensure that a reasonable attempt is made to minimize anticipated negative impacts and maximize the benefits of all development.

2.3 Environmental Management Act No.7 (2007)

Namibia's Environmental Management Act was passed in parliament in December 2007, and gives effect to Namibia's Environmental Assessment Policy.

The Environmental Management Act sets out the following principles of environmental management:

- (i) Renewable resources must be used on a sustainable basis for the benefit of present and future generations;
- (ii) community involvement in natural resources management and the sharing of benefits arising from the use of the resources, must be promoted and facilitated;
- (iii) the participation of all interested and affected parties must be promoted and decisions must take into account the interest, needs and values of interested and affected parties;

(iv) equitable access to environmental resources must be promoted and the functional integrity of ecological systems must be taken into account to ensure the sustainability of the systems and to prevent harmful effects;

(v) assessments must be undertaken for projects which may have significant effects on the environment or the use of natural resources;

(vi) sustainable development must be promoted in all aspects relating to the environment;

(vii) Namibia's cultural and natural heritage including, its biological diversity, must be protected and respected for the benefit of present and future generations;

(viii) the option that provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term must be adopted to reduce the generation of waste and polluting substances at source;

(ix) the reduction, re-use and recycling of waste must be promoted;

(x) a person who causes damage to the environment must pay the costs associated with rehabilitation of damage to the environment and to human health caused by pollution, including costs for measures as are reasonably required to be implemented to prevent further environmental damage;

(xi) where there is sufficient evidence which establishes that there are threats of serious or irreversible damage to the environment, lack of full scientific certainty may not be used as a reason for postponing cost-effective measures to prevent environmental degradation; and

(xii) damage to the environment must be prevented and activities which cause such damage must be reduced, limited or controlled.

2.4 Other Applicable Namibian Legislation

Other Namibian legislation of direct relevance to the Project are summarised in Table 1: List of Applicable Legislation below. Also given in this table are the Project specific implications of each relevant piece of legislation.

Table 1: List of Applicable Legislation

Statute	Provisions	Project Implications
Atmospheric Pollution Prevention Ordinance 45 of 1965	<ul style="list-style-type: none"> Part II - control of noxious or offensive gases, Part III - atmospheric pollution by smoke, Part IV - dust control, and Part V - air pollution by fumes emitted by vehicles. 	<ul style="list-style-type: none"> Application for an Air Emissions permit from the Ministry of Health and Social Services (if required).
Forest Act 12 of 2001	<p>Provision for the protection of natural vegetation.</p> <p>No regulations promulgated yet.</p> <p>Section 22(1): It is unlawful for any person to "<i>cut, destroy or remove</i>:"</p> <ul style="list-style-type: none"> any living tree, bush or shrub growing within 100 meters from a river, stream or watercourse on land that is not part of a surveyed erf or a local authority area without a license. Vegetation which is on a sand dune or drifting sand or on a gully unless the cutting, destruction or removal is done for the purpose of stabilizing the sand or gully. 	<ul style="list-style-type: none"> Permits should be obtained from Department of Forestry for the removal of protected trees.
Hazardous Substances Ordinance 14 of 1974	<p>Control of substances which may cause injury or ill-health or death of human beings because of their toxic, corrosive, irritant, strongly sensitising or flammable nature, and for the control of certain electronic products and radioactive material.</p> <p>Does not regulate the transport or dumping of hazardous substances.</p> <p>Regulations only relate to the declaration of certain substances as hazardous substances.</p>	<ul style="list-style-type: none"> The handling and storage of hazardous substances on the Project Site should be carefully controlled. Disposal of hazardous substances needs to be carefully controlled.
National Heritage Act 27 of 2004	Heritage resources to be conserved in development.	All archaeological sites to be identified and protected.
Nature Conservation Ordinance 4 of 1975	Requires a permit for picking (the definition of "picking" includes damage or destroy) protected plants without a permit.	In case there is an intention to remove protected species, then permits will be required.
Preservation of Trees and Forests Ordinance	Protection to tree species.	The Contractor will require a permit to remove any protected trees.

Statute	Provisions	Project Implications
Soil Conservation Act 76 of 1969	<p>Prevention and combating of soil erosion; conservation, improvement and manner of use of soil and vegetation, and protection of water sources.</p> <p>The Minister may direct owners or land occupiers in respect of <i>inter alia</i> water courses. No Regulations exist to this effect.</p>	<p>Removals of vegetation cover to be avoided and minimized at all costs.</p> <p>Soil pollution to be avoided.</p>
Water Resources Management Act 24 of 2004	<p>Section 32 states that no person may abstract or use water, except in accordance with a license issued under this Act. Abstraction of water including open waters, aquifer, brackish or marine water.</p> <p>Section 46 states that any drilling to be conducted or enlargement of an existing borehole can only be conducted under a permit issued under the Act.</p> <p>Section 56 states that a person may not discharge any effluent directly or indirectly to any water resource on or under the ground or construct any effluent treatment facility or disposal site unless in compliance with a permit issued under Section 60 of the Act. Where "effluent" means any liquid discharge as a result of domestic, commercial, industrial or agricultural activities.</p> <p>Section 78 states that a person may not engage in any construction activity that impounds, blocks or otherwise impedes the flow of water in a watercourse without the Minister's written approval authorising such activity.</p>	<p>Obligation not to pollute surface water bodies.</p> <p>The following permits are required in terms of the Water Act:</p> <ul style="list-style-type: none"> • water abstraction permits that will form part of the contract obligations.
Public Health Act 36 of 1919	Provides for the prevention of pollution of public water supplies.	A general obligation for the Contractor not to pollute the water bodies in the area.

3. METHODOLOGY

The activities undertaken as part of the study are outlined below.

3.1 Data Collection

Data collected for the bio-physical environmental assessment comprised the following;

- **Site visit and stakeholder consultation.** A site visit was conducted at the site to determine the bio-physical conditions of the project area. During the site visit focused attention was given to any environmental aspect that might be significantly affected by the construction and operational phases of the proposed project.

During the stakeholder consultation questions were posed to the meeting surrounding any environmental aspect they consider to be sensitive with regards to the project. These comments (if any) are then taken into consideration during the impact identification and evaluation process.

- **Literature review.** No full EIA was required for this project therefore forcing the EA team to make use of available secondary data to compose an overview of the baseline conditions that exist at the proposed site. These sources include, but are not limited to, the following:
 - Atlas of Namibia – Mendelsohn et al. (2003);
 - GIS information available on the internet (MET website – www.met.gov.na);
 - Other literature available commercially (books and reviews);
 - Legislative policies and document which includes the Namibian Environmental Policy, Environmental Management Act (2007) and MCA / MCC policies and guidelines;
 - Other specialist investigations in the area of Windhoek.
- **Obtaining information from team members.** Various inputs were received from team members involved in the project. This includes the technical, design and social team members. Liaising with these teams enhances the understanding of the project and therefore focuses the environmental assessment to make it site and project specific.
- **Specialist Investigation - Flora.** Colleen Mannheimer conducted a specialist flora investigation on the project. This specialist investigation was done to determine the sensitivity of the area and identify any "red flag" issues in this regard.

3.2 Identification and Assessment of Impacts

A checklist is designed to help users identify the likely significant environmental effects of proposed projects during scoping. It is to be used in conjunction with the Checklist of Criteria for Evaluating the Significance of Impacts.

There are two stages:

- **First**, identifying the potential impacts of projects;
- **Second** selecting those which are likely to be significant and therefore require most attention in the assessment.

A useful way of identifying the potential impacts of a project is to identify all the activities or sources of impact that could arise from construction, operation or decommissioning of the project, and to

consider these alongside the characteristics of the project environment that could be affected, to identify where there could be interactions between them. The two parts of the Scoping Checklist have been developed to assist in this process.

Start with the checklist of questions set out below. Complete Column 2 by answering:

- yes - if the activity is likely to occur during implementation of the project;
- no - if it is not expected to occur;
- ? - if it is uncertain at this stage whether it will occur or not.

For each activity for which the answer in Column 2 is "Yes" or "?", refer to the second part of the Scoping Checklist which lists characteristics of the project environment which could be affected, and identify any which could be affected by that activity. Information will be used about the surrounding environment in order to complete this stage. Note the characteristics of the project environment that could be affected, and the nature of the potential effects in Column 3.

Finally, the Checklist of Criteria for Evaluating the Significance of Impacts helps to complete Column 4.

This will identify those impacts which are expected to be significant. The questions are designed so that a "yes" answer will point towards a significant impact. It is often difficult to decide what is or is not significant but a useful simple check is to ask whether the effect is one that is of sufficient importance that it ought to be considered and have an influence on the development consent decision.

3.3 Assumptions and Limitations

The natural environment applicable to this application was studied using various external data sources. These sources must be assumed to be correct and true.

Site specific data was collected during the site visit and gathered during the Public Consultation Process. It must be assumed that no new information / data will influence the contents of this document.

The compilers of this document are well familiar with the site. The identified impacts and aspects as well as the proposed mitigation measures are site specific and applicable to the alternative routes as identified (please refer to 1.3 PROJECTED ROUTES).

4. AFFECTED ENVIRONMENT

4.1 General location

The proposed route is situated in the Khomas Region just east of the capital of Namibia – Windhoek. The areas affected is linear, due to the construction of a road, and can best be described as a corridor of about 1 km wide stretching from Windhoek to the Hosea Kutako International airport partly alongside the existing trunk road flowing to the east up to the airport. Please refer to Figure 1: Original alignment of the freeway.

4.4 Soils

The project is situated in an area dominated by the soil type classical of Lithic Leptosols. These soil types can be described as very thin or shallow soils typically formed in actively eroding landscapes, especially in hilly or undulating areas that cover much of the southern and north-western Namibia. These coarse-textured soils are characterised by their limited depth caused by the presence of a continuous hard-rock, highly calcareous or cemented layer within 30cm of the surface. These soils are therefore the shallowest soil types in Namibia. Water holding capacity is low resulting in high erosion probability.²It is noted that rocky outcrops are found far to the south of the proposed project.

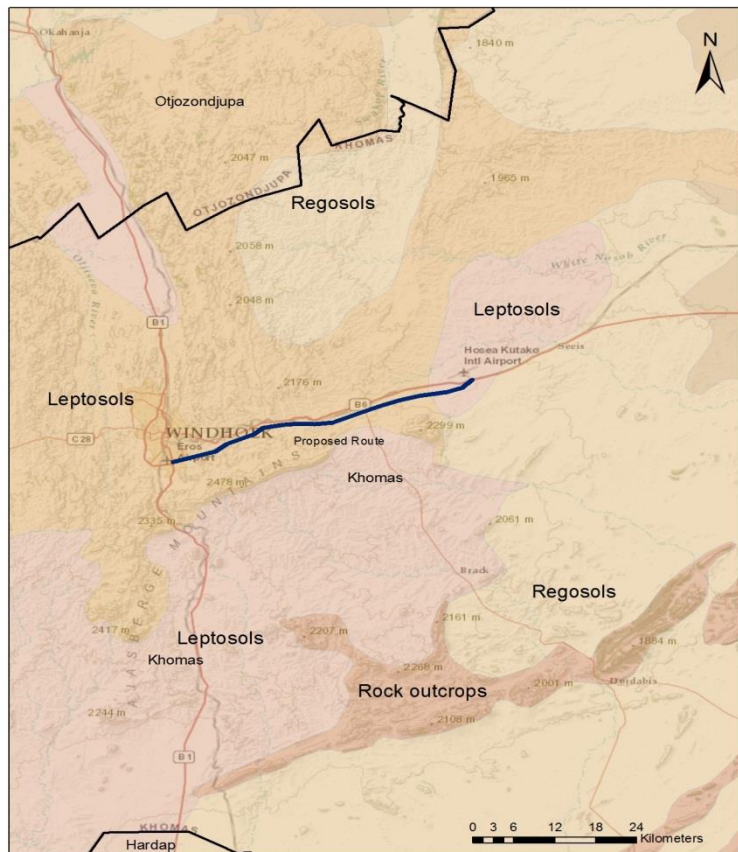


Figure 4: General soils in the study area

4.5 Climate

4.5.1 Temperature

The proposed project falls in the typical Namibian highlands climate with warm summers and cool winters. Average annual temperatures vary between 18-20° C with the coldest months (June – July) recording temperatures below 0° C and the summer months (November – January) temperatures of up to 34° C (Mendelsohn et al. 2002). Frost does occur in this area and is calculated at about 10-15 days per year.

4.5.2 Wind

Easterly and westerly winds dominate the project area with frequencies totalling more than 35 %. These winds are characterised as moderate of speeds below 20km/h. Wind calm days in the Windhoek Region is calculated to be 35% as well (Mendelsohn et al. 2002).

² Atlas of Namibia. 2010. Ministry of Environment and Tourism. Sunbird Publishers.

4.6 Vegetation

Fieldwork confirmed that there are two general vegetation zones in the study area, with the transition between the two roughly at 17° 26' E, which lies just before the turnoff to Dordabis on the M51. The species lists for 2217 Ac and Ca were combined with the Khomashochland Brokenveld list from Mannheimer *et al* 2009 to assess the western section (Zone A) and the lists from 2217Ad and Cb were combined to assess the eastern section (Zone B).

4.6.1 Zone A (Khomashochland Brokenveld , western section of route)

The western section of the route essentially comprises the largely sandy-stony foothills of the Avas Mountains - the Khomashochland Brokenveld as described by Mannheimer *et al* 2009 (Figure 5: Gravelly rolling hills typical of the western section of the study area.). Diversity and endemism are high, with 522 species recorded, of which 41 are endemic and 18 protected. This comprises about one eighth of all the species recorded for Namibia as a whole. Towards Finkenstein the hills flatten out somewhat, but the substrate remains essentially the same. This rolling gravelly area was found to support a high diversity within this zone.



Figure 5: Gravelly rolling hills typical of the western section of the study area.

In addition, small patches of an unusual, limey, somewhat consolidated soil type with quartz inclusions found in the east of Olympia and east of Avis dam support two endemics, namely *Pegolettia pinnatilobata* (Figure 6) and *Lotononis pallidirosea* (Figure 7). This substrate also occurs along the route just before the Finkenstein estate.



Figure 6: Pegolettia pinnatilobata.



Figure 7: Lotononis pallidirosea growing on unusual consolidated limestone soil patch in the Zone A.

Of the protected species in the Zone A, seven are trees. In the section closest to town *Boscia albitrunca* is particularly abundant. *Searsia lancea*, *Ziziphus mucronata* and *Acacia erioloba* are found along the drainage lines throughout the zone. *Albizia anthelmintica* occurs fairly frequently, mainly on the hill slopes.

The high species diversity recorded in this zone is due to niche diversity, with many different substrates and micro-habitats present. The presence of quite deep gorges with shaded aspects and permanent and semi-permanent springs and pools, and the numerous rocky outcrops contribute to the diversity, and carry species not or very seldom recorded in other habitats, including *Obetia carruthersiana*, *Euphorbia avasmontana* and *Steganotaenia araliacea*. The proposed development is, nevertheless, not expected to affect the survival of any plant species of high conservation concern to any real extent.

However, it is inevitable that a considerable number of protected trees will be damaged or destroyed during the construction phase of the proposed project, including some along watercourses.

In the past the protected succulent, *Lithops pseudotruncatella*, has been found in this habitat. Most of these have been stolen by illegal collectors, and none were found during this study or the study done by Mannheimer *et al* 2009.

4.6.2 Zone B (Khomashochland-Camelthorn Savannah Transition, eastern section)

The eastern section of the route is far flatter than the western section (Figure 8), with soils becoming redder and sandier, with far less gravel. The occurrence of large camelthorn trees (*Acacia erioloba*) on the plains argues that there is probably a shallower water table as well. Although still relatively high, species diversity and endemism are lower than in Zone A, at 432 and 29 respectively. This can be largely ascribed to lower niche diversity, although collecting intensity may also be slightly lower. Eleven protected species occur, of which four are trees. Of these, *Acacia erioloba* is, by far, the most abundant and of most concern.



Figure 8: Typical habitat in Zone B

Despite the relatively high diversity and endemism in this zone, the proposed development is not expected to affect the survival of any plant species of high conservation concern to any real extent.

However, as in Zone A, it is inevitable that a considerable number of protected trees will be damaged or destroyed during the construction phase of the proposed project, including some along watercourses. In this zone the population of *Acacia erioloba* is bigger, and many large and impressive individuals are present. *Acacia erioloba* is not only a protected species, it is synonymous with, and a symbol of, Africa, and the impressive population along the route into town from the airport contributes enormously to the aesthetics as you drive into the capital city. It is also under increasing pressure countrywide, particularly in the vicinity of Windhoek, due to overharvesting for wood and pods. Despite it being widespread and common, it is essential to remember that it is extremely slow-growing and to avoid a 'carrier pigeon' attitude towards this species, which should be conserved whenever possible.

4.7 Fauna

Approximately 261 species of reptiles are known or expected to occur in Namibia thus supporting approximately 30% of the continents species diversity (Griffin 1998a). At least 22% or 55 species of Namibian lizards are classified as endemic. The occurrence of reptiles of "conservation concern" includes about 67% of Namibian reptiles (Griffin 1998a). Emergency grazing and large scale mineral extraction in critical habitats are some of the biggest problems facing reptiles in Namibia (Griffin 1998a).

The overall reptile diversity and endemism in the general Windhoek area is estimated at between 71-80 species and 13-16 species, respectively (Mendelsohn *et al.* 2002). Griffin (1998a) presents figures of between 11-20 and 3-6 for endemic lizards and snakes, respectively, from the general area while the closest Government protected areas.

At least 78 species of reptiles are expected to occur in the general Windhoek area with 28 species being endemic – i.e. 35.9% endemic. Four species expected to occur in the area of which 2 are tortoises (*Stigmochelys pardalis*, *Psammobates oculiferus*, *Python natalensis* & *Varanus albigularis*) are classified as "vulnerable" and "protected game". One species – *Python anchietae* – is classified as "protected game", but not as vulnerable. Fifteen species have an international conservation status (11 CITES Appendix II & III species and 4 SARDB species; *Python natalensis* has both a CITES & SARDB status) with *Python natalensis* classified as "vulnerable" and *Naya nigricincta* as "rare" although *N. nigricincta* is however more common in Namibia than South Africa.

The 78 species expected to occur in the general area consist of at least 35 snakes (3 Blind snakes, 2 Thread snakes, 2 Python, 1 Burrowing Asp, 2 Quill Snouted & 25 typical snakes) of which 10 species (28.6%) are endemic and 1 species vulnerable/protected game, 2 tortoises (100% vulnerable & protected game), 1 terrapin, 2 worm lizard, 18 lizards of which 6 species classified as endemic (33.3% endemic), 2 plated lizards, 2 girdled lizards (both endemic), 1 monitor (vulnerable/protected game), 3 agamas (1 endemic), 2 chameleon and 10 geckos of which 8 species classified as endemic (i.e. 80% endemic).

Snakes (35 species with 10 species being endemic) and lizards (18 species with 6 species being endemic) are the most important groups of reptiles expected from the general Windhoek area followed by geckos (10 species with 8 species being endemic). Namibia with approximately 129

species of lizards (Lacertilia) has one of the continents richest lizard fauna (Griffin 1998a). Geckos expected and/or known to occur in the general Windhoek area have the highest occurrence of endemics (80%) of all the reptiles in this area. Griffin (1998a) confirms the importance of the gecko fauna in Namibia.

Tortoises are viewed as the group of reptiles most under threat in Namibia (Griffin 1998a) making *Stigmochelys pardalis* and *Psammobates oculiferus* probably the most important reptiles expected in the area followed by the pythons – *P. anchietae* & *P. natalensis* – and *Cordylus pustulatus* and *Varanus albigularis*. All the above mentioned species (except probably *C. pustulatus*) are either consumed as food or indiscriminately killed when encountered – e.g. *Python natalensis*.

The potential proportion of the range of *Cordylus pustulatus* is viewed as 100% within Namibia with specimens only known from the higher regions of the Auas Mountain range south of Windhoek although they may also occur on the mountains east of Windhoek and even the mountainous areas of the Von Bach Recreational Area (Griffin 2003). *C. pustulatus* is furthermore classified as “Insufficiently known” and together with its restricted range – Auas Mountains – and understudied ecology, probably makes this species one of the most important occurring in Namibia. The following table list the various species mentioned above:

Species: Scientific name	Species: Common name	Namibian conservation & legal status	International status
TURTLES & TERRAPINS			
<i>Stigmochelys pardalis</i>	Leopard Tortoise	Vulnerable; Peripheral; Protected Game	CITES Appendix II
<i>Psammobates oculiferus</i>	Kalahari Tent Tortoise	Vulnerable; Protected Game	CITES Appendix II
<i>Pelomedusa subrufa</i>	Marsh/Helmeted Terrapin	Secure	CITES Appendix III
SNAKES			
Blind Snakes			
<i>Rhinotyphlops boylei</i>	Boyle’s Beaked Blind Snake	Endemic; Secure	
<i>Rhinotyphlops schinzi</i>	Schinz’s Beaked Blind Snake	Endemic; Secure	SARDB Peripheral
<i>Rhinotyphlops schlegelii</i>	Schlegel’s Beaked Blind Snake	Secure	
Thread Snakes			
<i>Leptotyphlops scutifrons</i>	Peters’ Thread Snake	Secure	
<i>Leptotyphlops occidentalis</i>	Western Thread Snake	Endemic; Secure	SARDB Peripheral

Pythons			
<i>Python anchietae</i>	Dwarf Python	Endemic; Insufficiently known; Protected game	CITES Appendix II
<i>Python natalensis</i>	Southern African Python	Vulnerable; Peripheral; Protected Game	CITES Appendix II; SARDB Vulnerable
Burrowing Asps			
<i>Atractaspis bibronii</i>	Bibron's Burrowing Asp	Secure	
Quill Snouted Snakes			
<i>Xenocalamus bicour bicolor</i>	Bicoloured Quill-snouted Snake	Secure	
<i>Xenocalamus mechowii</i>	Elongate Quill-snouted Snake	Secure	
Typical Snakes			
<i>Lamprophis fuliginosus</i>	Brown House Snake	Secure	
<i>Lycophidion capense</i>	Cape Wolf Snake	Secure	
<i>Pseudaspis cana</i>	Mole Snake	Secure	
<i>Prosymna bivittata</i>	Two-striped Shovel-snout	Secure	
<i>Prosymna frontalis</i>	South-western Shovel-snout	Endemic; Secure	SARDB Peripheral
<i>Dipsina multimaculata</i>	Dwarf Beaked Snake	Endemic; Secure	
<i>Psammophylax tritaeniatus</i>	Striped Skaapsteker	Secure	
<i>Psammophis trigrammus</i>	Western Sand Snake	Endemic; Secure	
<i>Psammophis notostictus</i>	Karoo Sand Snake	Secure	
<i>Psammophis leightoni trinasalis</i>	Namib Sand Snake	Secure	
<i>Psammophis brevirostris leopardinus</i>	Leopard & Short-snouted Grass Snakes	Secure	
<i>Philothamnus semivariatus</i>	Spotted Bush Snake	Secure	
<i>Dasypeltis scabra</i>	Common/Rhombic Egg Eater	Secure	
<i>Telescopus semiannulatus</i>	Eastern Tiger Snake	Secure	
<i>Telescopus beetzii</i>	Beetz's Tiger Snake	Secure	

<i>Dispholidus typus</i>	Boomslang	Secure	
<i>Aspidelaps lubricus infuscatus</i>	Coral Snake	Secure	
<i>Aspidelaps scutatus</i>	Shield-nose Snake	Secure	
<i>Elapsoidea sunderwallii</i>	Sundevall's Garter Snake	Endemic; Secure	
<i>Naja (annulifera) anchietae</i>	Snouted Cobra	Secure	
<i>Naja nivea</i>	Cape Cobra	Endemic; Secure	
<i>Naya nigricincta</i>	Black-necked Spitting Cobra	Endemic; Secure	SARDB Rare
<i>Dendroaspis polylepis</i>	Mamba	Secure	
<i>Bitis arietans</i>	Puff Adder	Secure	
<i>Bitis caudalis</i>	Horned Adder	Secure	
Worm Lizard			
<i>Zygaspis quadrifrons</i>	Kalahari Round-headed Worm Lizard	Secure	
<i>Monopeltis infuscata</i>	Dusky Spade-snouted Worm Lizard	Secure	
LIZARDS			
Skinks			
<i>Acontias (percivali) occidentalis</i>	Percival's Legless Skink	Secure	
<i>Typhlosaurus lineatus lineatus</i>	Striped Blind Legless Skink	Secure	
<i>Lygosoma sundevallii</i>	Sundevall's Writhing Skink	Secure	
<i>Trachylepis acutilabris</i>	Wedge-snouted Skink	Secure	
<i>Trachylepis capensis</i>	Cape Skink	Secure	
<i>Trachylepis hoeschi</i>	Hoesch's Skink	Endemic; Secure	
<i>Trachylepis occidentalis</i>	Western Three-striped Skink	Secure	
<i>Trachylepis spilogaster</i>	Kalahari Tree Skink	Endemic; Secure	
<i>Trachylepis striata wahlbergi</i>	Striped Skink	Secure	
<i>Trachylepis sulcata</i>	Western Rock Skink	Secure	
<i>Trachylepis variegata punctulata</i>	Variegated Skink	Secure	

Old World Lizards			
<i>Heliobolus lugubris</i>	Bushveld Lizard	Secure	
<i>Ichnotropis squamulosa</i>	Common Rough-scaled Lizard	Secure	
<i>Meroles suborbitalis</i>	Spotted Desert Lizard	Endemic; Secure	
<i>Nucras intertexta</i>	Spotted Sandveld Lizard	Endemic; Secure	
<i>Pedioplanis lineocellata lineocellata</i>	Spotted Sand Lizard	Endemic; Secure	
<i>Pedioplanis namaquensis</i>	Namaqua Sand Lizard	Secure	
<i>Pedioplanis undata</i>	Western Sand Lizard	Endemic; Secure	
Plated Lizards			
<i>Cordylosaurus subtessellatus</i>	Dwarf Plated Lizard	Endemic; Secure	
<i>Gerrhosaurus validus maltzahni</i>	Giant Plated Lizard	Secure	
Girdled Lizards			
<i>Cordylus jordani</i>	Jordan's Girdled Lizard	Endemic; Secure	CITES Appendix II
<i>Cordylus pustulatus</i>	Auas or Herero Girdled Lizard	Endemic; Insufficiently known	CITES Appendix II
Monitors			
<i>Varanus albigularis</i>	Rock or White-throated Monitor	Vulnerable; Peripheral; Protected Game	CITES Appendix II Safe to Vulnerable
Agama			
<i>Agama aculeata</i>	Ground Agama	Secure	
<i>Agama anchietae</i>	Anchietae's Agama	Secure	
<i>Agama planiceps</i>	Namibian Rock Agama	Endemic; Secure	
Chameleons			
<i>Chamaeleo dilepis</i>	Flap-neck Chameleon	Secure	CITES Appendix II
<i>Chamaeleo namaquensis</i>	Namaqua Chameleon	Secure	CITES Appendix II
Geckos			
<i>Chondrodactylus angulifer angulifer</i>	Giant Ground Gecko	Endemic; Secure	

<i>Lygodactylus bradfieldi</i>	Bradfield's Dwarf Gecko	Endemic; Secure	
<i>Narudasia festiva</i>	Festive Gecko	Endemic; Secure	
<i>Pachydactylus bicolor</i>	Velvety Thick-toed Gecko	Endemic; Secure	
<i>Pachydactylus capensis</i>	Cape Thick-toed Gecko	Endemic; Secure	
<i>Pachydactylus turneri</i>	Turner's Thick-toed Gecko	Secure	
<i>Pachydactylus punctatus</i>	Speckled Thick-toed Gecko	Secure	
<i>Pachydactylus rugosus rugosus</i>	Rough Thick-toed Gecko	Endemic; Secure	
<i>Pachydactylus serval serval</i>	Western Spotted Thick-toed Gecko	Endemic; Secure	
<i>Ptenopus garrulus maculatus</i>	Common Barking Gecko	Endemic; Secure	

Namibia is well endowed with mammal diversity with at least 250 species occurring in the country. These include the well-known big and hairy as well as a legion of smaller and lesser-known species. Currently 14 mammal species are considered endemic to Namibia of which 11 species are rodents and small carnivores of which very little is known. 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*.

Overall terrestrial diversity and endemism – all species – is classified as “high” in the central part of Namibia (Mendelsohn *et al.* 2002). The overall diversity (7-8 species) and abundance of large herbivorous mammals is “high” in the general Windhoek area with Kudu and Oryx having the highest density of the larger species (Mendelsohn *et al.* 2002). The overall abundance and diversity of large carnivorous mammals is “average to low” (3 species) in the general area with Cheetah and Leopard having the highest density of the larger species (Mendelsohn *et al.* 2002). The overall mammal diversity in the general Windhoek area is estimated at between 61-75 species with 5-6 species being endemic to the area (Mendelsohn *et al.* 2002). Griffin (1998c) puts the species richness distribution of endemics also between 5-8 species in the general area while the closest Government protected area – Daan Viljoen Game Park – has 65 species of mammals.

According to the literature at least 81 species of mammals are known and/or expected to occur in the general Windhoek area of which 8 species (9.9%) are classified as endemic. The Namibian legislation classifies 8 species as “vulnerable”, 3 species as “rare”, 2 species as “specially protected game”, 9 species as “protected game”, 4 species as “insufficiently known”, 4 species as “hunnable game” and 3 species as “problem animals”. At least 30.9% (25 species) of the mammalian fauna that occur or are expected to occur in the general Windhoek area are represented by rodents, of which 4 species (16%) are “endemic”. This is followed by bats, with 23.5% (19 species) and 1 species (5.3%) being “endemic” and “rare” (i.e. *Cistugo seabrae*) and carnivores with 21% (17 species) of which 1 species (5.9%) is “endemic”.

Thirty two species (39.5%) have international conservation status of which 5 species as "vulnerable", 12 species as "near threatened", 9 species as CITES Appendix 1 (3 species) or Appendix II (6 species) and 6 species as "data deficient". The House Mouse (*Mus musculus*) is viewed as an invasive alien species to the area. *Mus musculus* are generally known as casual pests and not viewed as problematic although they are known carriers of "plague" and can cause economic losses.

The most important species from the general area are probably all those classified as "near threatened" (e.g. Brown Hyena & Hartmann's Mountain Zebra) under international legislation and "rare" (Namibian Wing-gland Bat, Hedgehog & Black-footed Cat) under Namibian legislation. Other species of concern include various predators, often persecuted as "livestock thieves" – e.g. Cheetah ("Vulnerable" & "Protected Game"); Leopard ("Protected Game" & "Near-threatened"); African Wild Cat ("Vulnerable") – and the little known Pangolin ("Vulnerable" & "Protected Game") which is targeted for traditional healing purposes throughout its range in Namibia.

Habitat alteration and overutilization are the two primary processes threatening most mammals (Griffin 1998c), with species probably underrepresented in the above mentioned table for the general area being the bats and rodents, as these groups have not been well documented from the arid central part of Namibia. For example, Monadjem *et al.* (2010) list the following species of bats that could potentially occur in the Windhoek (i.e. central Namibia) area as determined by habitat modelling although not yet confirmed – *Rhinolophus blasii*, *Rhinolophus hildebrandtii*, *Taphozous mauritanus*, *Chaerephon nigeriae*, *Mops midas*, *Glauconycteris variegata*, *Laephotis botswanae*, *Mimetillus thomasi*, *Nycticeinops schlieffeni*, *Pipistrellus rueppellii*, *Pipistrellus rusticus* and *Scotophilus leucogaster* (Cunningham 2012).

No mayor bird migratory routes are recorded along this project. It is expected that the impacts on birds (road kills) will be limited during the construction phase of the project. It must be noted though that the negative impact will increase during the operation phase of the project due to the increase of traffic volumes and the inevitability of vehicle – bird collisions.

The most sensitive parts of the area can be classified the following:

- Mountainous and rocky features in the Highland Savannah are viewed as unique and often critical habitat to a variety of vertebrate fauna of concern – e.g. *Python anchietae* (endemic; insufficiently known; protected game; CITES Appendix II) & Verreaux's Eagle ("Near Threatened"). Such habitats should be protected, especially isolated patches thereof, as these often have an "island" effect with a variety of rock and crevasse dwelling species dependant on these areas (Cunningham 2012).
- Ephemeral drainage lines with associated riparian habitat, especially bigger trees, and temporary pools (and/or perennial springs and seeps) are also viewed as important habitat for a variety of vertebrate fauna – e.g. bark roosting bats; South African Gallago; cavity nesting birds (Monteiros & Damara Hornbills and Rüppells Parrot), etc.

These areas should be avoided as far possible during planning and construction of the project.

4.8 Surface Hydrology

The surface hydrology alongside the proposed route is characterised as hilly with fast flowing estuaries for short periods of time. Flash floods may occur during heavy rains. Limited natural dams occur in the area, but current existing dams are man-made therefore affecting the natural surface water drainage patterns and retarding the surface water run-off peaks.

The Seeis River dominates the area and is situated to the north east of the proposed project with the Olifants River to the south.

No mayor surface water drainage patterns will be affected by the proposed project. Some smaller drainage lines will be crossed with various alternative routes.

4.9 Land Use

The proclaimed route determined in the 1970's would not have affected any land use during that time, but due to unplanned re-alignment of the route and improper management of the road servitude, some conflicts started to develop over the years. Currently the proclaimed route runs through the Herboth's Blick Development and some infringements (houses) are clearly visible in the proclaimed route. These situations lead to the current Feasibility study to determine the Land Use conflicts and suggest an alternative alignment. A full social impact assessment was conducted to determine the impact the alternative routes might have on land use and social process. As mentioned in this document various residential and other developments are present in the middle section of the proposed route that includes Finkenstein, retirement village, farms and other commercial developments.

All of these uses were taken into consideration during the investigation and evaluation phases of this document to determine the most suitable alternative route (refer to Figure 2: Proposed alternatives).

5. PUBLIC PARTICIPATION PROCESS

The methodology followed during the public participation process was to make use of existing communications between VKE Namibia Consulting Engineers, the relevant stakeholders and interested and affected parties, as well as personal interviews conducted by Enviro Management Consultants Namibia.

The objectives of the meetings were to inform the various Stakeholders and the general public about the project and to receive any comments or concerns with regard to the design of the proposed route, the natural environment that will be affected by the project as well as the social impact this project might have.

A background information document (BID) was also prepared with the objective of providing background information to I&APs in preparation for the public meetings. The BID was sent to all stakeholders on the database by e-mail or fax prior to the meetings. Invitations to a public meeting were published in the Namibian, Republikein and the Allgemeine Zeitung on the 15th and 22th of November 2011.

The first meeting was held on the 23rd September 2011 where the proposed project was introduced to delegates such as the Mayor of Windhoek, KRC Development and Economic Planners, representatives for the City of Windhoek and private interested parties. The objectives of these meetings were to share information about the project with the relevant stakeholders. Some questions were asked with regard to the technical part of the project. The project was well received with very little negative commentary or concerns.

The second meeting was held on the 29th November 2011 at the Nampower Convention Centre where the public was invited to attend and comment on the project. The meeting was well attended and the project was explained to the public at large. Representatives of the various land users were present at the meeting and various inputs were received from the public. A full comment sheet is available in the Social Impacts Assessment – Public Participation Report.

Following these meetings, the residents of Finkenstein Estate requested an additional meeting which its members could attend and air their specific concerns. This meeting was held on 26 January 2012 at the SKW Hall in Windhoek (Refer to the Social Impact Assessment Report, UD).

5.1 Issues and Concerns Raised by Stakeholders³

5.1.1 Homeowners of the Finkenstein Estate

The homeowners of the Finkenstein Estate, a high end residential estate with about 221 erven, can be regarded as one of the key stakeholders in the project. During the public consultation process, only a small number of alternative alignments were presented and this caused great concern among the homeowners. It was felt that the alternatives considered were limited, biased in favour of engineering considerations and that the social and environmental considerations are playing second fiddle. Residents felt that the estate was developed and they bought their erven with the understanding that the future freeway will be aligned as currently proclaimed and that any re-alignment which will bring this road closer to the estate will negatively affect property values and make them subject to much more sound and air pollution than would be the case if the current alignment is retained. Most arguments during the dedicated meeting were objections against the potential alignments proposed and suggestions as to other potential alignments. However, residents also alluded to traffic problems at the entrance to Windhoek and indicated that this should be attended to.

A meeting was also held with the owner of the Farm Finkenstein – Mrs Finke. This meeting was held between EMC Namibia, Mrs Finke, a Geo-hydrologist and Mr Klink from VKE Namibia. Mrs Finke had some concerns with regard to the vegetation found specifically on the site. Mrs Colleen Mannheimer (the flora specialist on this project) was contacted in this regard to verify the concerns Mrs Finke had. After thorough consultation between Mrs Mannheimer and Mrs Finke the concerns were laid at ease when the flora specialist indicated that the various flora species of concern were not listed as protected and are abundant in the area in and around Finkenstein Farm.

³ All of the comments are derived from the Hosea Kutako – Windhoek SIA Report – Urban Dynamics

5.1.2 Homeowners of Herboth's Blick

Herboth's Blick, another low density residential estate, was established with the full knowledge of the current proclaimed alignment of the future freeway. This alignment means that the freeway will run straight through the middle of the estate, to such an extent that some of the plots will basically be totally taken up by the servitude. The purchase agreements for the plots in Herboth's Blick indicated the position of the freeway servitude and buyers were made aware of it.

However, it is alleged by some that they were not aware of the servitude. It also seems that purchasers thought that the road is unlikely to be built and therefore the risk was not significant enough for them not to buy a plot. Others questioned the decision making process and wondered how this could have been approved by the authorities. They are also concerned about their property values, loss of land and the impacts of sound and air pollution which will result from a freeway on the current proclaimed alignment.

In addition, Herboth's Blick owners stated that, as daily road users, the biggest traffic related problem with the current road is the bottle neck where TR6/1 enters Windhoek at Avis as well as the heavy vehicle traffic that has no option but to drive through Windhoek to reach the northern industrial area or the northern and western parts of Namibia.

5.1.3 The Future Retirement Village

A future retirement village is planned to the north of Finkenstein. The developer considered the current freeway servitude and did the layout planning accordingly. Their concern is that an amendment to this alignment will result in abortive town planning costs as well as cause a substantial delay in obtaining the required statutory approvals to commence with the development. This will have a substantial financial cost for the developer.

5.1.4 Other stakeholders.

Other stakeholders listed the following issues:

- Ensuring that local Namibians are employed in the construction of the road;
- Ensuring that the freeway will result in the deviation of traffic (especially heavy vehicles) from Windhoek's streets;
- People who will be negatively affected by the new alignment should be compensated accordingly;
- The issue of opening up borrow pits on the adjacent agricultural land to obtain road building material; and
- Assurance that once the alignment is fixed this time, that the Roads Authority will enforce building restrictions and ensures that the road reserve of the new alignment will not change again.

6. ANALYSIS OF ALTERNATIVES

Initially the following nine (9) alternative route options were considered during the feasibility evaluation of the proposed project:

Preliminary route selection Review of the basic planning study for TR9/1 & TR6/1 Windhoek - Hosea Kutako International Airport Future Trunk Road								
Good/Ideal → Acceptable → Poor/Not acceptable VALUE 5 4 3 2 1								
RANK	SCORE	CRITERIA:	Alignment (Hor/Ver)	System Efficiency	Cost	Directly Affected Households	Indirectly Affected	Enviro Sensitivity
OPTIONS								
8	15	a - Existing '96 proclamation of TR9/1 around Finkenstein Dam (this is the null option)	2	4	3	2	1	3
6	17	b - Original proclamation (i.e. north of Finkenstein dam over rail and rivers)	3	4	2	3	2	3
9	14	c - Upgrade existing TR6/1 to freeway (and provide alternative service road)	1	1	1	4	2	5
3	23	d - follow existing proclamation then change to follow P-line from south of Finkenstein dam	4	4	5	5	3	2
4	22	e - follow existing proclamation then change to follow along P-line from Windhoek/Finkenstein border	5	4	5	5	1	2
1	26	f - Follow old alignment then change to follow P-line from east of Finkenstein dam	4	4	4	5	5	4
5	19	g - follow old alignment and connect to TR6/1 (and provide alternative service road)	3	2	3	4	3	4
6	17	h - Detour proclaimed alignment to north of TR6/1 along mid-section	4	3	2	1	5	2
2	24	i – The route deviates from the proclaimed - shifting south.	4	4	5	5	4	2

Table 2: Alternative selection evaluation criteria

6.1 Horizontal alignment of the roads:

The various route alternatives were considered as mentioned in Section 1.3 of this report. Special attention was given to the impacts on surface water drainage patterns, vegetation and air quality. The social components of the study were also considered and are dealt with in the Social Impact Assessment (Urban Dynamics, 2012).

Taking various inputs into consideration such as the current and future land use of the area, comments and concerns received during the public participation process, specialist investigation and secondary literature data, the **best three (3)** alternative routes were selected.

The best alternative routes are highlighted in **Table 2: Alternative selection evaluation criteria** – they are the following:

Route alternative:	f	pink route - with a total score of 26
	i	white route - with a total score of 24
	d	orange route - with a total score of 23

These routes follow the old proclaimed route (in yellow) and deviates southward just west and east of the Finkenstein dam. The selected routes then converge east of the dam and follow the power line for some distance and join the old proclaimed road to the north east on the farm Voigtland.

6.2 Construction Method

The use of large and heavy earthmoving machines will be the most effective way of constructing the new road. Any other alternative will impact negatively on construction time resulting in higher cost and risks for road user safety.

6.3 Construction Materials

The exploration and testing of materials suitable for the construction of the project still needs to be done. Local knowledge of various existing sources of materials is known (eg those used for the construction of existing roads). These existing sources will be used where not depleted and a few more areas would have to be opened and tested during the detail design phase for suitability.

The G2/G3 materials for the base layer will have to be sourced from a commercial quarry to ensure adequate quality materials for the construction of the road.

6.4 The “No-Go” Option

If this option is selected as the preferred option, the status quo of the natural environment will prevail. The existing road pavement will deteriorate to such an extent that the road surface quality will become unsafe to commuters and other road users and travelling on the deteriorating riding quality surface will increase vehicle operating costs. Fatal accidents will increase, due to increase in traffic, and use of the road will become unacceptable to the public.

7. ENVIRONMENTAL IMPACT ASSESSMENT

Checklists are easy to use and offer the advantages of simplicity and ease of comparison. They bring structure to gathering and classifying information, to identifying potential environmental impacts, and to develop and consider possible mitigation options. They also help in reaching tentative conclusions on the extent of environmental impact.

Checklists are widely used in EIA processes to guide decision-making, especially during the pre-feasibility and planning phases of the project life cycle, when it is most critical to address anticipated adverse impacts and to include mitigating measures. Checklists are designed:

- To help **identify significant negative impacts** by providing the right questions to ask regarding the various project activities and the respective environmental components that may be affected. Checklists can be used to determine environmental impact thresholds, thus indicating whether a full-scale EIA is needed for a particular project;
- To provide a **systematic approach** to the environmental screening of development projects. A checklist forces the assessment to consider a standardised set of activities or effects for each proposed action, thus bringing uniformity to the assessment process;
- To indicate **how and why certain project activities have environmental impacts** which will allow planners to transfer those principles to the screening of projects not specifically addressed by the checklists?
- To assist in **identifying appropriate mitigation measures** to be incorporated into the project design; and,
- To **increase environmental awareness and understanding** of the relationship between environmentally sound practices and sustainable development.⁴

The following questionnaire checklist was used during the identification, evaluation and significant rating of environmental aspects associated with this project based on the methodology mentioned in section 3.2 of this document. The significance ratings are given **not** taking mitigation measures into consideration, but mention is made where successful mitigation measures are possible.

It should again be noted that the impact evaluation will only be applicable to the **THREE** alternative routes (ie d, f, and i).

⁴ Directorate of Environmental Affairs, 2008. Procedures and Guidelines for Environmental Impact Assessment (EIA) and Environmental Management Plans (EMP), Directorate of Environmental Affairs, Ministry of Environment and Tourism, Windhoek.

PART 1 OF THE SCOPING CHECKLIST: QUESTIONS ON PROJECT

CHARACTERISTICS

1. Will construction, operation or decommissioning of the Project involve actions which will cause physical changes in the locality (topography, land use, changes in water bodies, etc.)?

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
1.1	Permanent or temporary change in land use, land cover or topography including increases in intensity of land use?	Yes	The quarry operations will temporary alter the land use and land cover. The topography will permanently be altered. Cutting and filling alongside the road. Land use changes may take place enforcing the alternative routes outside the proclaimed alignment done in the 1970's.	Medium significance because of mitigation measures that can be implemented. Low significance due to the small scale of cutting and filling. Medium significance due to the pre-selection of alternative routes d,f and i.
1.2	Clearance of existing land, vegetation and buildings?	Yes	Clearing of vegetation for construction operations influencing the vegetation, soils and topography.	The effect might be of medium significance. The endemism of the vegetation is high, but the sensitivity is medium.
1.3	Creation of new land uses?	Yes	The alternative routes will change some of the current land uses. Routes d,f and i will change land use from agricultural to roads. The rest of the route is situated on an existing proclamation for roads.	From residential / natural to transport corridor. Significance will be medium.
1.4	Pre-construction investigations for instance boreholes, soil testing?	Yes	Material prospecting will be conducted prior to borrow pit identification and material allocation for construction. The topography will be altered as well as flora and soils.	Low significance due to the extent.
1.5	Construction works?	Yes	Construction activities involve the road, bridge over larger rivers and culverts for the drainage lines.	The impact might be low and the impacts can further be mitigated.
1.6	Demolition works?	No		
1.7	Temporary sites used for construction works or housing of construction workers?	Yes	The construction site will be based in the urban areas of Windhoek or areas suitable for construction camps.	No.
1.8	Above ground buildings, structures or earthworks including linear structures cut and fill or excavations?	Yes	The above ground earthworks will be regarded as primarily for the road construction. Topography will be affected as well as soils.	Yes, the excavations will be prominent during the construction phase. This includes borrow pits.
1.9	Underground works including mining or tunnelling?	No		
1.10	Reclamation works?	No		

1.11	Dredging?	No		
1.12	Coastal structures egg seawalls, piers?	No		
1.13	Offshore structures?	No		
1.14	Production and manufacturing processes?	No		
1.15	Facilities for storage of goods or materials?	No	All materials and goods will be stored in urban areas.	No impact predicted.
1.16	Facilities for treatment or disposal of solid wastes or liquid effluents?	No		
1.17	Facilities for long term housing of operational workers?	No		
1.18	New road, rail or sea traffic during construction or operation?	Yes	Traffic increase due to movement of construction vehicles. Health and safety.	Medium significance due to safety concerns for regular road users as well as construction workers.
1.19	New road, rail, air, water body or other transport infrastructure including new or altered routes and stations, ports, airports etc.?	Yes	Various alternative routes have been identified. Starting from the original proclaimed alignment to the various alternatives as indicated in Section 1.3 of this report.	All of the alternative routes are mentioned in Table 1. Each of these routes was evaluated as mentioned in the Section 1.3.1-Notes on selection criteria. The significance rating of each alternative route varies – as indicated in Table 1. The most preferred routes as identified are: d, f and i. Significance is medium.
1.20	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?	Yes	A new road will be built parallel to the existing Windhoek – HKIA road. No diversion would be necessary; except for a short period of time at the location where the new road will be joined back to the existing TR6/1.	Mitigation measures will limit the significance.
1.21	New or diverted transmission lines or pipelines?	No		
1.22	Impoundment, damming, culverts, realignment or other changes to the hydrology of watercourses or aquifers?	Yes	New culverts will not impact on the surface runoff patterns or the surface water drainage lines or dams.	No significance.
1.23	Stream crossings?	Yes	Surface water drainage lines.	No significance.
1.24	Abstraction or transfers of water from ground or surface waters?	Yes	For the construction of the road some water will be used from an approved water source.	Low significance.
1.25	Changes in water bodies or the land surface affecting drainage or run-off?	No		

1.26	Transport of personnel or materials for construction, operation or commissioning?	Yes	Materials and personnel will be transported during construction and operation phases. Health and Safety.	Medium significance on the health and safety of the personnel as well as the public due to increased traffic volumes.
1.27	Long term dismantling or decommissioning or restoration works?	No		
1.28	On-going activity during decommissioning which could have an impact on the environment?	No		
1.29	Influx of people to an area either temporarily or permanently?	Yes	Temporary influx of people during construction phase.	Low significance due to the small work force.
1.30	Introduction of alien species?	No		
1.31	Loss of native species or genetic diversity?	Yes	Surface disturbances always impact on the bio-diversity of an area. Soils, fauna and flora.	There might be medium significant impact on the genetic diversity due to high endemism of Zone A and Zone B.
1.32	Any other actions?	No		

2. Will construction or operation of the Project use natural resources such as land, water, materials or energy, especially any resources which are non-renewable or in short supply?

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
2.1	Land especially undeveloped or agricultural land?	Yes	The biggest impact will be the borrow pits needed to be opened to obtain the necessary materials for the construction of the road. This will impact on the natural materials excavated from the pits.	The significance will be medium but proper mitigation measures will result in a medium – low significance.
2.2	Water?	Yes	Water is used for domestic and construction purposes.	The available water will be used but the significance might be medium due to the volumes.

3. Will the Project involve use, storage, transport, handling or production of substances or materials which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health?

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
3.1	Will the project involve use of substances or materials which are hazardous or toxic to human health or the environment (flora, fauna, and water supplies)?	Yes	Hydrocarbons, fuels and some chemicals such as battery acid, surface primer and possible pesticides.	The significance might be significant should mitigation measures not be implemented.
3.2	Will the project result in changes in occurrence of disease or affect disease vectors (eg insect or water borne diseases)?	No		

3.3	Will the project affect the welfare of people eg by changing living conditions?	Yes	Road user safety will increase due to better road conditions (operational phase).	Medium – high positive significance.
3.4	Are there especially vulnerable groups of people who could be affected by the project eg hospital patients, the elderly?	Yes	Should the elderly development realise the access to safe roads may enhance access to hospitals and doctors.	Low positive significance.
3.5	Any other causes?	No		

4. Will the Project produce solid wastes during construction or operation or decommissioning?

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
4.1	Spoil, overburden or mine wastes?	Yes	Soil and topography will be affected with the overburden produced during material excavations at the borrow pits and spoils from the construction alongside the road.	Medium significance but can be mitigated successfully.
4.2	Municipal waste (household and or commercial wastes)?	Yes	Domestic waste will be generated at the construction site.	No. The domestic waste can be managed.
4.3	Hazardous or toxic wastes (including radioactive wastes)?	No		
4.4	Other industrial process wastes?	No		
4.5	Surplus product?	No		
4.6	Sewage sludge or other sludge from effluent treatment?	No		
4.7	Construction or demolition wastes?	No		
4.8	Redundant machinery or equipment?	No		
4.9	Contaminated soils or other material?	Yes	There is always a possibility that contamination of soils can occur during construction and operation due to spillage of oils / diesel / bitumen.	No. The scale of contamination is very limited and can further be mitigated.
4.10	Agricultural wastes?	No		
4.11	Any other solid wastes?	No		

5. Will the Project release pollutants or any hazardous, toxic or noxious substances to air?

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
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5.1	Emissions from combustion of fossil fuels from stationary or mobile sources?	Yes	Gasses such as Nox and Sox are deposited in the air from the machines.	No. The quantity of these gasses will not impact negatively on the environment.
5.2	Emissions from production processes?	No		
5.3	Emissions from materials handling including storage or transport?	Yes	Gasses such as Nox and Sox are deposited in the air from the machines.	No. The quantity of these gasses will not impact negatively on the environment.
5.4	Emissions from construction activities including plant and equipment?	Yes	The movement from vehicles will generate dust and gaseous emissions.	The significance will be low and can further be mitigated.
5.5	Dust or odours from handling of materials including construction materials, sewage and waste?	Yes	Dust from mineral handling, crushing and transport.	Yes. Dust might be a nuisance to receptors should the borrow pits be located near residents.
5.6	Emissions from incineration of waste?	No		
5.7	Emissions from burning of waste in open air (eg slash material, construction debris)?	No		
5.8	Emissions from any other sources?	No		

6. Will the Project cause noise and vibration or release of light, heat energy or electromagnetic radiation?

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
6.1	From operation of equipment eg engines, ventilation plant, crushers?	Yes	The mining of borrow pits and production equipment produces noise and vibrations due to crushing and screening.	Depending on the receptors in close proximity of the plant. The significance might be low.
6.2	From industrial or similar processes?	No		
6.3	From construction or demolition?	Yes	Construction might produce noise.	Low significance.
6.4	From blasting or piling?	Yes	Blasting will occur, there will be negative impacts on the environment.	Significance depends on the receptors in the area but are limited to impact small areas.
6.5	From construction or operational traffic?	Yes	The hauling trucks will produce noise and vibration. During operation phase the impact of heavy trucks may be significant depending on the proximity of the receptors.	Operational phase might have a significant impact on residents of the various estates.

6.6	From lighting or cooling systems?	No		
6.7	From sources of electromagnetic radiation (consider effects on nearby sensitive equipment as well as people)?	No		
6.8	From any other sources?	No		

7. Will the Project lead to risks of contamination of land or water from releases of pollutants onto the ground or into sewers, surface waters groundwater, coastal waters or the sea?

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
7.1	From handling, storage, use or spillage of hazardous or toxic materials?	Yes	Impact on soil and surface water quality due to spillage of oils and hydrocarbon liquids (diesel, oil and bitumen) is always a possibility.	Low significance due to proper mitigation measures.
7.2	From discharge of sewage or other effluents (whether treated or untreated) to water or the land?	No		
7.3	By deposition of pollutants emitted to air, onto the land or into water?	Yes	Gasses from the machines.	Low significance during construction. Medium impact during the operational phase.
7.4	From any other sources?	Yes	From blasting. Nitrates and other chemical compounds will be present after blasting.	Low significance due to the scale and possibility of occurrence.
7.5	Is there a risk of long term build-up of pollutants in the environment from these sources?	Yes	Nox and Sox may build-up alongside the route – air quality.	Significance is medium due to the volumes of traffic during operational phase.

8. Will there be any risk of accidents during construction or operation of the Project which could affect human health or the environment?

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
8.1	From explosions, spillages, fires etc from storage, handling, use or production of hazardous or toxic substances?	Yes	Blasting might take place.	Low significance due to the scale and mitigation measures.
8.2	From events beyond the limits of normal environmental protection eg failure of pollution controls systems?	No		
8.3	From any other causes?	No		

8.4	Could the project be affected by natural disasters causing environmental damage (eg floods, earthquakes, landslip, etc)?	No		
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9. Will the Project result in social changes, for example, in demography, traditional lifestyles, employment?

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
9.1	Changes in population size, age, structure, social groups etc?	No		
9.2	By resettlement of people or Demolition of homes or communities or community facilities eg schools, hospitals, social facilities?	Yes	Resettlement of people might occur should some alternatives be considered and be approved.	Please refer to Section 6 – Analysis of Alternatives.
9.3	Through in-migration of new residents or creation of new communities?	No		
9.4	By placing increased demands on local facilities or services eg housing, education, health?	No		
9.5	By creating jobs during construction or operation or causing the loss of jobs with effects on unemployment and the economy?	Yes	The unemployment rate in Windhoek is high. Such a project can benefit the local community during the construction phase by creating temporary employment.	The significance might be positive medium due to lack of work in the area and better access to properties.
9.6	Any other causes?	No		

10. Are there any other factors which should be considered such as consequential development which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality?

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
10.1	Will the project lead to pressure for consequential development which could have significant impact on the environment eg more housing, new roads, new supporting industries or utilities, etc?	Yes	New supporting industries that might require more services.	Low to medium significance. Better access will lead to more developments alongside the existing and new road.

10.2	<p>Will the project lead to development of supporting facilities, ancillary development or development stimulated by the project which could have impact on the environment eg:</p> <ul style="list-style-type: none"> • supporting infrastructure (roads, power supply, waste or waste water treatment, etc) • housing development • extractive industries • supply industries • other? 	Yes	Increased transport efficiency and safety will have positive impacts on the socio-economic environment of the area. Where further development will impact negatively on the natural environment.	Unknown – Please refer to the Socio-economic Impact Assessment Report.
10.3	Will the project lead to after-use of the site which could have an impact on the environment?	No		
10.4	Will the project set a precedent for later developments?	?		Unknown – Please refer to the Socio-economic Impact Assessment Report.
10.5	Will the project have cumulative effects due to proximity to other existing or planned projects with similar effects?	?		Unknown – Please refer to the Socio-economic Impact Assessment Report.

PART TWO OF THE SCOPING CHECKLIST: CHARACTERISTICS OF THE PROJECT ENVIRONMENT

For each project characteristic identified in Part One consider whether any of the following environmental components could be affected.

<p>Question - Are there features of the local environment on or around the Project location which could be affected by the Project?</p> <ul style="list-style-type: none"> • The natural habitat will be affected. Specialist flora study conducted indicates that the area is well known for endemic species and some protected flora, but the impact of the proposed project is not of high significance. • Even though no specialist report was conducted concerning the fauna, it is predicted that the impact of the project will not be significant. There were no inputs in this regards during the Public Participation process. • There is a very low possibility of features of high historic or cultural importance. • Surface drainage patterns will be addressed through proper engineering design. • The aesthetic characteristics of the area will be affected by the project negatively. Proper mitigation measures should be implemented to prevent significant impacts in this regard.
<p>Question - Is the Project in a location where it is likely to be highly visible to many people?</p> <p>The topographical characteristics of the area are such that the visual impact will be medium. The hilly topography “breaks” the visual aspect associated with linear structures such as roads.</p>
<p>Question - Is the Project located in a previously undeveloped area where there will be loss of Greenfield land?</p> <p>The new route will be constructed mostly in underdeveloped land earmarked for this road. The only challenge is where there are some alternatives that have been identified. These areas not only affect the natural but also the social environment.</p>
<p>Question - Are there existing land uses on or around the Project location which could be affected or altered?</p> <p>The land use for the current transport corridor will not be altered.</p>
<p>Question - Are there any plans for future land uses on or around the location which could be affected by the Project? Yes. Secondary land uses will be developed such as residential, commercial or industrial land uses.</p>
<p>Question - Are there any areas on or around the location which are densely populated or built-up, which could be affected by the Project?</p> <p>Yes, there are various areas that might be affected by the proposed route that include: Finkenstein Estate, Herboth’s Blick Estate, Retirement Village, farms and the industrial park opposite the HKIA. Some impacts might be negative, but some are also positive.</p>
<p>Question - Are there any areas on or around the location which are occupied by sensitive land uses which could be affected by the Project?</p> <p>The natural environment surrounding the project is known as habitat for some protected and endemic flora.</p>
<p>Question - Are there any areas on or around the location which contain important, high quality or scarce resources which could be affected by the Project?</p> <p>There are some scarce resources found around the project that could be influenced by the construction or operational phases of these projects. The focus falls on the protected and endemic flora.</p>
<p>Question - Are there any areas on or around the location of the Project which are already subject to pollution or environmental damage e.g. where existing legal environmental standards are exceeded, which could be affected by the project?</p> <p>No. Even though levels of pollution have not been tested it is unlikely that legal levels of pollution has been or will be exceeded.</p>

Question - Is the Project location susceptible to earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions e.g. temperature inversions, fogs, severe winds, which could cause the project to present environmental problems?

Winds are moderate with limited fog days. Flooding does not occur in these areas.

Question - Is the Project likely to affect the physical condition of any environmental media?

Yes, the project has got an impact on the environmental media which includes the atmosphere (local), surface water run-off drainage patterns, soils (compaction, crusting, and erosion) and natural ground conditions due to quarrying and construction.

The physical condition of the environment will be changed – some permanently and other during the construction phase of the project.

Question - Are releases from the Project likely to have effects on the quality of any environmental media?

- The air quality might deteriorate during construction and operational phases.
- The quality of soil might deteriorate without proper management.
- Acidification of soils or waters will probably not occur.
- There will be some noise generated during the construction and operational phase of the road, but will be limited to the site.
- Impact on vegetation will be evident for some time but will re-generate after some time. The sensitivity of the vegetation is regarded to be medium (Flora Specialist Investigation Report)

Question - Is the Project likely to affect the availability or scarcity of any resources either locally or globally?

- The project will use fossil fuels in liquid (diesel).
- Water will also be used for dust suppression, construction and domestic use.
- The quarrying activity extracts minerals on a non-renewable basis.

Question - Is the Project likely to affect human or community health or welfare?

- The quality of air will be affected due to construction activities and hauling. Even though this is the case, human health will not be affected.
- No mortality or morbidity might be experienced by human receptors.
- The project will have a positive impact on the social economic welfare of the region.
- Better access between the HKIA and Windhoek will promote development and increase road safety.

In the Scoping checklist, the significance must be indicated. To facilitate this procedure, the following questions were considered during the rating:

Questions that were considered to determine significance:

1. Will there be a large change in environmental conditions?
2. Will new features be out-of-scale with the existing environment?
3. Will the effect be unusual in the area or particularly complex?
4. Will the effect extend over a large area?
5. Will there be any potential for Trans -Frontier impact?
6. Will many people be affected?
7. Will many receptors of other types (fauna and flora, businesses, facilities) be affected?
8. Will valuable or scarce features or resources be affected?
9. Is there a risk that environmental standards will be breached?
10. Is there a risk that protected sites, areas, features will be affected?
11. Is there a high probability of the effect occurring?
12. Will the effect continue for a long time?
13. Will the effect be permanent rather than temporary?
14. Will the impact be continuous rather than intermittent?
15. If it is intermittent will it be frequent rather than rare?
16. Will the impact be irreversible?
17. Will it be difficult to avoid, or reduce or repair or compensate for the effect?

7.1 Environmental Impact Assessment Summary

The following environmental impacts were identified during the assessment procedure as described above. The impacts are classified as either positive or negative and the significance ratings as low, medium and high. Mitigation measures are not reckoned for the significance classification.

Ref.	Activity	Aspect / Impact	Positive / Negative	Significance
1.1	Land use / topography, and land use cover.	The quarry operations will permanently alter the land use, land cover and, for the borrow pits - topography of the area.	Negative	Medium
		Land use changes may take place enforcing the alternative routes outside the proclaimed alignment done in the 1970's.	Negative	Medium
		Cutting and filling along the road will impact on the topography, soils and vegetation.	Negative	Low
1.2	Clearance of existing land, vegetation and buildings.	Clearing of vegetation for construction operations influencing the vegetation, soils and topography.	Negative	Medium
1.3	Creation of new land uses.	The alternative routes will change some of the current land uses.	Negative	Medium
1.4	Pre-construction investigators egg boreholes, soil testing?	Material testing will be conducted prior to borrow pit identification and material allocation for construction. The topography, soils and vegetation will altered.	Negative	Low
1.5	Construction works.	Construction activities involve the road, bridge over larger rivers and culverts for the drainage lines.	Negative	Low
1.8	Above ground buildings, structures or earthworks including linear structures cut and fill or excavations?	The above ground earthworks will be regarded as primarily for the road construction. Topography will be affected as well as soils.	Negative	Medium
1.18	New road, rail or sea traffic during construction or operation?	Traffic increase due to movement of construction vehicles. Health and safety.	Negative	Medium
1.19	New road, rail, air, water body or other transport infrastructure including new or altered routes and stations, ports, airports etc.?	The current proclaimed route established in the 1970's with some 3 alternative in the mid-section of the existing proclamation.	Negative	Medium
1.20	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?	Temporary limitations, deviations or routes will be constructed during the projects. Health and Safety.	Negative	Low
1.24	Abstraction or transfers of water from ground or surface waters?	New culverts will not impact on the surface runoff patterns or the surface water drainage lines or dams.	Negative	Low

1.26	Transport of personnel or materials for construction, operation or commissioning?	Materials and personnel will be transported during construction and operation phases. Health and Safety.	Negative	Medium
1.29	Influx of people to an area either temporarily or permanently?	Temporary influx of people during construction phase.	Negative	Low
1.31	Loss of native species or genetic diversity?	Surface disturbances always impact on the biodiversity of an area. Soils, fauna and flora.	Negative	Low
2.1	Land especially undeveloped or agricultural land?	The biggest impact will be the borrow pits needed to be constructed to obtain the necessary materials for the construction of the road. This will impact on the natural materials excavated from the pits.	Negative	Medium
2.2	Water?	Water is used for domestic and construction purposes.	Negative	Medium
3.1	Will the project involve use of substances or materials which are hazardous or toxic to human health or the environment (flora, fauna, and water supplies)?	Hydrocarbons, fuels and some chemicals such as battery acid, surface primer and pesticides may impact on the soil, water and air (pollution).	Negative	Medium
3.3	Will the project affect the welfare of people eg by changing living conditions?	Road user safety will increase due to better road conditions (operational phase).	Positive	High
3.4	Are there especially vulnerable groups of people who could be affected by the project eg hospital patients, the elderly?	Should the elderly development realise the access to safe roads may enhance access to hospitals and doctors.	Positive	Low
4.1	Spoil, overburden or mine wastes?	Soil and topography will be affected with the overburden produced during material excavations at the borrow pits and spoils from the construction alongside the road.	Negative	Medium
5.4	Emissions from construction activities including plant and equipment?	The movement from vehicles will generate dust and gaseous emissions.	Negative	Low
5.5	Dust or odours from handling of materials including construction materials, sewage and waste?	Dust from mineral handling, crushing and transport. Might impact on the air quality and health and safety.	Negative	Low
6.1	From operation of equipment eg engines, ventilation plant, crushers?	The mining of borrow pits and production equipment produces noise and vibrations due to crushing and screening.	Negative	Low
6.4	From blasting or piling?	If blasting will occur, there will be negative impacts on the environment.	Negative	Low

6.5	From construction or operational traffic?	The hauling trucks will produce noise and vibration. During operation phase the impact of heavy trucks may be significant depending on the proximity of the receptors.	Negative	High
7.1	From handling, storage, use or spillage of hazardous or toxic materials?	Impact on soil and surface water quality due to spillage of oils and hydrocarbon liquids (diesel, oil and bitumen).	Negative	Low
7.3	By deposition of pollutants emitted to air, onto the land or into water?	Gasses from the machine will impact on the air quality.	Negative	Low
7.4	From any other sources?	From blasting. Nitrates and other chemical compounds will be present after blasting.	Negative	Low
8.1	From explosions, spillages, fires etc from storage, handling, use or production of hazardous or toxic substances?	Blasting might take place. Noise, dust, nitrogen deposits, health and safety.	Negative	Low
9.5	By creating jobs during construction or operation or causing the loss of jobs with effects on unemployment and the economy?	The local community will benefit from the construction phase.	Positive	Medium
10.1	Will the project lead to pressure for consequential development which could have significant impact on the environment eg more housing, new roads, new supporting industries or utilities, etc?	New supporting industries that might require more services.	Positive	Medium

8. MINIMUM REQUIREMENTS FOR THE MITIGATION PLAN

The Minimum Requirements for the Environmental and Social Management Programme (ESMP) are attached in this document. It sets out as the minimum generic standards applicable to such a project. A detailed site specific ESMP should be drafted before commencement of the Construction phase.

The ESMP is intended to bridge the gap between the Environmental Assessment (EA) and the implementation of the project, particularly with regards to implementing the mitigation measures recommended in the Environmental Assessment (EA). Monitoring, auditing and taking corrective actions during implementation are crucial interventions to successfully implement the ESMP.

The ESMP detail actions to ensure compliance with regulatory bodies and further ensures that environmental performance is increased through mitigation measures on impacts as they occur.

ESMP implementation is a cyclical process that converts mitigation measures into actions and through cyclical monitoring, auditing, review and corrective action, ensures conformance with stated ESMP aims and objectives. Through monitoring and auditing, feedback for continual improvement in environmental performance must be provided and corrective action taken to ensure that the ESMP remains effective.

8.1 ESMP Administration

Copies of the ESMP shall be kept at the site office and will be distributed to all senior contract personnel. All senior personnel shall be required to familiarize themselves with the contents of this document.

8.2 Roles and Responsibilities

The implementation of the ESMP requires the involvement of several stakeholders, each fulfilling a different but vital role to ensure sound environmental management during each phase.

A) Engineer's Representative (ER)

The Engineer will delegate powers to the Engineer's Representative (ER) on site who would act as the Employer's implementing agent and has the responsibility to ensure that the Employer's responsibilities are executed in compliance with relevant legislation and the ESMP. The Engineer also has the responsibility to approve the appointment of the Environmental Control Officer (ECO).

Any on-site decisions regarding environmental management are ultimately the responsibility of the ER. The ER will have the following responsibilities in terms of the implementation of this ESMP:

- Controlling that the necessary environmental authorizations and permits have been obtained by the Contractor.
- Assisting the Contractor in finding environmentally responsible solutions to problems with input from the ECO where necessary.
- Taking appropriate action if the specifications are not followed.
- Ordering the removal of person(s) and/or equipment not complying with the ESMP specifications.
- Recommending and issuing fines for transgressions of site rules and penalties for contravention of the ESMP.
- Advising on the removal of person(s) and/or equipment not complying with the specifications.
- Receive and record any complaints (concerning environmental matters) from landowners or the public.
- Auditing the implementation of the ESMP and compliance with authorization on a monthly basis.
- Undertaking a continual review of the ESMP and recommending additions and/or changes to the document after completion of the contract.

B) Environmental Control Officer (ECO)

The Environmental Control Officer (ECO) will be a competent person from the staff of the Engineer to implement the on-site environmental management of this ESMP by the Contractor. The ECO shall be on site daily and the ECO's duties will include the following:

- Assisting the ER in ensuring that the necessary environmental authorizations and permits have been obtained.
- Maintaining open and direct lines of communication between the ER, Contractor and interested and effected parties (I&APs) with regard to environmental matters.
- Convening and facilitating public meetings.
- Regular site inspections of all construction areas with regard to compliance with the ESMP.
- Monitoring and verifying adherence to the ESMP, monitoring and verifying that environmental impacts are kept to a minimum.
- Assisting the Contractor in finding environmentally responsible solutions to problems.
- Monitoring the undertaking by the Contractor of environmental awareness training for all new personnel coming onto site.

C) The Contractor

The duties of the Contractor are as follows:

- The Contractor shall be familiar with the contents of the ESMP in order to understand the mitigation measures and the reasons for the measures.
- The Contractor's site agent and his Safety Health and Environmental Officer (SHE) shall at all times be in possession of this ESMP.
- Attend lectures / training that deals with environmental issues and the content of the ESMP.
- The Contractor shall through the SHE ensure that he complies fully with the Environmental Specifications. This includes all plant operators, transport vehicles, and sub-contractors.
- The Contractor should also notify the ER of any activity that could or did impact negatively on the environment.

8.3 Environmental Awareness Training

Before any work is commenced on the Site, the Contractor shall ensure that adequate environmental awareness training of senior site personnel takes place and that all construction workers receive an induction presentation on the importance and implications of the ESMP. The Contractor shall liaise with the Engineer during the establishment phase to fix a date and venue for the training and to agree on the training content.

The Contractor shall provide a suitable venue and ensure that the specified employees attend the course. The Contractor shall ensure that all attendees sign an attendance register, and shall provide the ER with a copy of the attendance register. The presentation shall be conducted, as far as is possible, in the employees' language of choice.

As a minimum, training should include:

- Explanation of the importance of complying with the ESMP.
- Discussion of the potential environmental impacts of construction activities.
- The benefits of improved personal performance.
- Employees' roles and responsibilities, including emergency preparedness.
- Explanation of the mitigation measures that must be implemented when carrying out their activities.
- Explanation of the specifics of this ESMP and its specification (no-go areas, etc.)
- Explanation of the management structure of individuals responsible for matters pertaining to the ESMP.
- A HIV/AIDS awareness programme as part of Health and Safety issues.
- The Contractor shall keep records of all environmental training sessions, including names, dates and the information presented.

The Code of Conduct list is attached to this document and serves as the minimum Environmental Awareness and Training curriculum to be conveyed to the construction workers. This list should also be incorporated into any induction training sessions of new workers.

8.4 Public Participation

An on-going process of public participation shall be maintained during construction to ensure the continued involvement of interested and affected parties (I&APs) in a meaningful way. Public meetings to discuss progress and any construction issues that may arise shall be held at least every three months and more regularly if deemed necessary by the ER. These meetings shall be arranged by the ECO but shall be facilitated by the ER. The Contractor shall present a progress report at each public meeting. All I&APs that participated in or were informed during the EIA shall be invited to each of the public meetings.

8.5 Minimum Required Environmental / Social Mitigation Measures

COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	RESPONSIBILITY/ PARTNERSHIPS
8.5.1 MANAGEMENT AND MONITORING	To ensure that the provisions of the ESMP are implemented during construction.	<ul style="list-style-type: none"> a. The Environmental and Social Consultants shall ensure that all aspects of the ESMP are implemented during construction. b. The Environmental and Social Consultants shall attend regular site inspections and meetings and minutes shall make provision for reporting on every aspect of the ESMP. 	Environmental and Social Consultants together with the ECO.
8.5.2 COMMUNICATION AND STAKEHOLDER CONSULTATION	To ensure that all stakeholders are adequately informed throughout construction and that there is effective communication with and feedback to the Consultant and Client.	<ul style="list-style-type: none"> a. The Contractor shall appoint an ECO from the construction team to take responsibility for the implementation for all provisions of this ESMP and to liaise between the Contractor, Community, Client and Consultants. The ECO must be appointed within 14 days after the site-handover. b. The Contractor shall at every site meeting report on the status of the implementation of all provisions of the ESMP. c. The Contractor shall implement the environmental awareness training as stipulated in Section 8.3 above. d. The Contractor shall liaise with the Social and Environmental consultants regarding all issues related to community consultation and negotiation as soon as possible after construction commences. 	Contractor/ Environmental and Social Consultants to monitor.
8.5.3 HEALTH AND SAFETY	To ensure health and safety of workers and the public at all times during construction	<ul style="list-style-type: none"> a. The Contractor in consultation with the Engineers shall determine a strategy to ensure the least possible disruption to traffic and potential safety hazards during construction. b. The strategy should include a schedule of work indicating when and how road crossings (construction at existing intersections) will be made. The schedule will be updated and distributed to all stakeholders. c. The Contractor shall also liaise with the Traffic Authorities in this regard. d. Proper traffic and safety warning signs will be placed at the construction site to the satisfaction of the Engineer and the Roads Authority. e. The Contractor will adhere to the regulations pertaining to Health and Safety, including the provision of protective clothing (PPE), failing to do so the Contract may be temporarily suspended until corrective actions are taken. f. Dust protection masks shall be provided to task workers if they complain about dust. g. Surface dust will be contained by wetting dry surfaces periodically with a water 	Contractor will ensure the mitigation measures are enforced at his own expense. The ECO will monitor.

COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	RESPONSIBILITY/ PARTNERSHIPS
		<p>bowser, sprinkler system or any suitable method. This applies for the construction site as well as all the roads.</p> <p>h. Potable water shall be available to workers to avoid dehydration. This water shall be of acceptable standards to avoid any illness. At least 5 liters of drinking water per person per day shall be made available during construction.</p> <p>i. The Contractor shall comply with relevant Labour Laws as stipulated by the Labour Act of Namibia.</p> <p>j. The Contractor shall implement a HIV/AIDS awareness programme as part of Health and Safety.</p> <p>k. Blasting may only be conducted by a qualified person and all laws and regulations will be enforced before and during blasting. Furthermore Clause 1222 of the Standard Specification of the Roads Authority of Namibia shall apply.</p>	
<p>8.5.4 CONSERVATION OF THE NATURAL AND HISTORICAL ENVIRONMENT</p>	<p>To minimise damage to soil, vegetation and historical resources during the construction phase. This includes soil crusting, soil erosion and unnecessary vegetation destruction.</p> <p>Management of water (domestic and construction).</p> <p>Management of other sensitive areas.</p>	<p>a. At the outset of construction (or during construction as may be applicable), the ECO and the Contractor shall visit all proposed borrow pits, haul roads, access roads, camp sites, and other areas to be disturbed outside the road reserve. Areas to be disturbed shall be clearly demarcated, and no land outside these areas shall be disturbed or used for construction activities. Detailed instructions and final arrangements for protection of sensitive areas, preserving of topsoil and rehabilitation of disturbed areas shall be done, in line with the guidelines portrayed in this document.</p> <p>b. Driving outside the road reserve shall not be allowed, except on the agreed haul and access roads.</p> <p>c. Vegetation may be cleared within the road reserve as necessary for the construction of the road. The area on either side of this corridor may not be cleared of vegetation, unless permission is given to do so for detours or access roads. This measure is subject to the Roads Authority of Namibia's specifications with regard to the road reserve.</p> <p>d. A prescribed penalty will be deducted from the Contractor's payment certificate for every mature tree removed without approval.</p> <p>e. Where compaction has taken place in disturbed areas, these areas will be ripped and covered with topsoil kept separate for this purpose. These areas include, but are not limited to, stockpile areas, batching plant areas and crusher areas.</p>	<p>Contractor will ensure the mitigation measures are enforced at his own expense. The ECO will monitor.</p>

COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	RESPONSIBILITY/ PARTNERSHIPS
		<ul style="list-style-type: none"> f. Poaching or collecting of wild animals is prohibited. g. The killing of any animal (reptile, bird or mammal) is prohibited. h. A prescribed penalty will be deducted from the Contractor's payment certificate if it is shown that any of his staff or sub-contractors are involved in trapping, hunting or any kind of collecting of wild animals in the vicinity of the work sites. Offenders will be handed to the authorities for prosecution. i. Pipelines for the pumping of construction water shall as far possible run within the road reserve and along existing tracks and other roads. j. Water will not be allowed to be wasted. This includes water required for construction and domestic purposes. k. Collection of plants or parts of plants (including fire wood of any size or description) is forbidden. l. Where possible protected plants will be relocated. 	

COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	RESPONSIBILITY/ PARTNERSHIPS
<p>8.5.5 BORROW PIT MANAGEMENT AND REHABILITATION</p>	<p>To ensure proper soil management (combat soil erosion and promote biological activities).</p> <p>Preserve and manage natural vegetation.</p> <p>To ensure health and safety around the borrow pits (decommissioning phase).</p> <p>To stimulate ecological processes after decommissioning (to stimulate vegetation and other biological activities).</p> <p>To establish borrow pits which are aesthetically pleasing after decommissioning.</p>	<ol style="list-style-type: none"> a. Rocky outcrops and surface water drainage lines are the most sensitive areas associated along the route. Borrow pits should not be placed / opened in these highly sensitive areas. b. The removal of construction material shall be focused where the least significant vegetation exists and where suitable materials are available. c. The Engineers and Surveyors must draft a plan for approval before commencement of a borrow pit. This plan must indicate the required resources and sensitive areas that may not be mined d. All borrow pits must be rehabilitated. e. The borrow pits shall be rehabilitated by trimming the sides to a slope not steeper than 18° (1:3) and evenly spreading the top soil over the slopes to allow for the growth of new vegetation. f. No berms or stockpiles are allowed in or around the borrow pits. These topographical high areas should be levelled. g. All spoil material at the borrow pits shall be neatly shaped and no oversize loose material must be left inside the borrow pits, before spreading of topsoil. h. Access to borrow pits shall be controlled (using gates or manned positions). i. The borrow pit floor shall be leveled evenly as part of rehabilitation. j. The disturbed areas shall, where trimming cannot be done neatly by machine, be raked by hand after sloping rehabilitation to limit possible visual impacts. k. A Borrow Pit Rehabilitation Plan will be compiled indicating the rehabilitation schedule (timeframes) for the various borrow pits to be rehabilitated. l. Rehabilitation of the borrow pits will be done in consultation with the land owner. m. Once the pits are scheduled for rehabilitation, the pit should be rehabilitated according to this ESMP. Once rehabilitation is complete, the Borrow Pit Rehabilitation Checklist will be completed (attached to this document). After signing of the Checklist the borrow pit is closed and NO more activities will be allowed in or around the closed borrow pit. 	<p>Contractor will ensure the mitigation measures are enforced at his own expense. The ECO will monitor.</p>

COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	RESPONSIBILITY/ PARTNERSHIPS
<p>8.5.6 WASTE AND POLLUTION MANAGEMENT</p>	<p>To avoid contribution to potential surface and groundwater pollution.</p> <p>To avoid contribution to potential soil pollution.</p> <p>To ensure that sound waste management practices are adhered to during construction.</p>	<ol style="list-style-type: none"> a. Construction rubble and other waste generated during construction will be disposed of on a regular basis at an approved waste disposal site, which could be mined out borrow pits deep enough to properly bury construction waste such as concrete and oversize gravel and cover it with at least 1m of overburden material. A temporary waste site may be demarcated for temporary storage of waste, but this area will be identified and clearly marked. b. The temporary domestic waste site will be fenced off with access control to the area. c. Adequate separate containers for hazardous and domestic waste will be provided on site and at the construction camp. d. The workforce will be sensitized to dispose of waste in a responsible manner and not to litter. e. Waste bins will be placed in and around the construction site to facilitate proper waste management. f. Toilet facilities will be available in the site camp to the following ratio: 2 toilets for every 50 females and one toilet for every 50 males. g. Temporary toilets should be available at areas of concentrated activities that last for 3 days or more. These include, but are not limited to, the construction of culverts and bridges. The toilets should be such that it can be transported for various site selections and to be emptied at an approved sewage site. No person should have to walk more than 1km for the use of a toilet. h. Written permission shall be obtained from an approved sewage facility to dispose the sewage. Written records of sewage disposal shall be kept in the Environmental file for inspection. i. A demarcated vehicle service area will be provided. This area will be large enough to accommodate the servicing of vehicles. This area will have an impermeable floor (lining or concrete), oil trap at the workshop and dedicated wash bay area. At the wash bay all used water will first run through an oil-water separator (that will be constructed and maintained) before the effluent is allowed to exit. The oil trap and oil-water separator will be cleaned on a regular basis to ensure its efficiency. j. Servicing of vehicles is only permitted in the demarcated vehicle service area, except for large immobile vehicles which may be serviced on site, on condition that oils and lubricants are prevented from spilling through the use of drip trays or 	<p>Contractor will ensure the mitigation measures are enforced at his own expense. The ECO will monitor.</p>

COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	RESPONSIBILITY/ PARTNERSHIPS
		<p>other suitable containers.</p> <p>k. Drip trays will be available for all vehicles that are intended to be used during construction. These trays will be placed underneath each vehicle while the vehicles are parked. The drip trays will be cleaned every morning and the spillage handled as hazardous waste.</p> <p>l. Machines operating during the day that shows signs of excess leaking (verified by ECO or ER) should be withdrawn from the task and repaired by the Contractor.</p> <p>m. Accidental spills will be cleaned immediately. The contaminated soil will be suitably disposed of in a container suitable for hazardous waste.</p>	
		<p>n. Oil, lubricants, and other hazardous materials (batteries) will be stored in separate containers. These containers will have an impermeable floor and will be bunded.</p> <p>o. Disposal of used oils and other hazardous materials will be done at an approved waste disposal site or for collection by an oil recycling company such as WESCO Salvage. Collection or disposal documentation will be kept in the Environmental file for inspection purposes.</p> <p>p. The use of drip trays at the bitumen storage tanks is compulsory. It is proposed that the sprayer nozzles be cleaned on the bypass – where possible.</p> <p>q. Bitumen shall not be allowed to be uncontrollably spilled or dumped. Bitumen waste areas shall be constructed and be lined with thick plastic sheets and be fenced.</p> <p>r. Fuel tanks on site will be properly bunded. The volume of the bunded area will be sufficient to hold 1.5 times the capacity of the storage tanks. The floor of the bunded area will be impermeable (either lining or concrete) and the sides high enough to achieve the 1.5 times holding capacity. There will be a valve installed in the bunded area to allow rain water drainage.</p> <p>s. Foam fire extinguishers will be in close proximity to fuel kept on site. There will be trained personnel to handle this equipment. At least two extinguishers will be placed at every fuel storage area.</p>	
8.5.7 REHABILITATION OF CONSTRUCTION	To rehabilitate the site office, work sites, servitude areas, tracks and other areas disturbed during construction as close to	<p>a. All bunded areas, equipment, waste, temporary structures, stockpiles etc. must be removed from the camp and work sites.</p> <p>b. All disturbed areas shall be reshaped to their original contours; as close as</p>	Contractor will ensure the mitigation measures are

COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	RESPONSIBILITY/ PARTNERSHIPS
SITE, SERVITUDES AND CLEARED AREAS (WHICH INCLUDES STOCKPILES)	their original state as reasonably possible.	<p>possible to the natural conditions before construction commenced, including the road reserve, detours, construction camps, and temporary access routes.</p> <ul style="list-style-type: none"> c. All cuttings must be shaped with a slope to provide a natural appearance, without having to destroy significant vegetation on top of the slope. d. Existing borrow pits adjacent to main roads need also be rehabilitated during rehabilitation phase. e. No domestic, construction or hazardous waste may remain on site after completion of the project. f. All bitumen areas shall be pumped out and the plastic linings removed. No bitumen spillage or wastes will be left on site. g. All temporary water reservoirs will be flattened. h. All areas where soil compaction took place will be ripped. 	<p>enforced at his own expense. The ECO will monitor.</p>

8.6 Non-Compliance

A) Procedures

The Contractor shall comply with the environmental specifications and requirements on an on-going basis and any failure on his part to do so will entitle the ER to impose a penalty. In the event of non-compliance the following recommended process shall be followed:

- The ER shall issue a notice of non-compliance to the Contractor through the ECO, stating the nature and magnitude of the contravention.
- The Contractor shall act to correct the non-conformance within 24 hours of receipt of the notice, or within a period that may be specified within the notice.
- The Contractor, through the ECO, shall provide the ER with a written statement describing the actions to be taken to discontinue the non-conformance, the actions taken to mitigate its effects and the expected results of the actions.
- In the case of the Contractor failing to remedy the situation within the predetermined time frame, the Engineer shall impose a monetary penalty based on the conditions of contract.
- In the case of non-compliance giving rise to physical environmental damage or destruction, the Engineer shall be entitled to undertake or to cause to be undertaken such remedial works as may be required to make good such damage and to recover from the Contractor the full costs incurred in doing so.
- In the event of a dispute, difference of opinion, etc. between any parties with regard to or arising from interpretation of the conditions of the ESMP, disagreement regarding the implementation or method of implementation of conditions of the ESMP, etc. any party shall be entitled to require that the issue be referred to specialists for determination.
- The Engineer shall at all times have the right to stop work and/or certain activities on site in the case of non-compliance or failure to implement remedial measures.

B) Offences and Penalties

Where the Contractor inflicts non-repairable damage upon the environment or fails to comply with any of the environmental specifications, he shall be liable to pay a penalty fine over and above any other contractual consequence.

The Contractor is deemed NOT to have complied with this Specification if:

- a. within the boundaries of the site, site extensions and haul/access roads there is evidence of contravention of the Specification;
- b. environmental damage due to negligence;

- c. the Contractor fails to comply with corrective or other instructions issued by the ER within a specific time;
- d. the Contractor fails to respond adequately to complaints from the public.

Penalties for the activities detailed below, might be imposed on discretion of the ER should the Contractor and/or his Subcontractors be found to be Non-Compliant (Section 8.6):

- | | |
|---|--|
| a. Actions leading to major erosion. | A penalty equivalent in value to the cost of rehabilitation plus 20%. |
| b. Oil spills due to negligence and/or reluctance towards mitigation measures mentioned in the ESMP. | A penalty equivalent in value to the cost of clean-up operation plus N\$ 3000. |
| c. Damage to indigenous vegetation due to reluctance towards the ESMP. | A penalty equivalent in value to the cost of restoration plus N\$ 5 000. |
| d. Damage to demarcated sensitive environments. | A penalty equivalent in value to the cost of restoration plus N\$ 5 000. |
| e. Damage to demarcated cultural sites. | A penalty to a maximum of N\$100 000 shall be paid for any damage to any cultural/ historical sites identified during the EIA and made known to the Contractor. |
| f. Damage to trees. | A penalty to a maximum of N\$5 000 shall be paid for each tree removed without prior permission, or a maximum of N\$5 000 for significant damage to any tree, which is to be retained on site. |
| g. Damage to natural fauna (due to negligence and/or reluctance towards the mitigation measures mentioned in the ESMP). | A penalty to a maximum of N\$5 000 for deliberate injury to any natural occurring animal. |
| h. Any persons, vehicles, plant, or thing related to the Contractors operations within the designated boundaries of a "no-go" area. | N\$4,000 |
| j. Litter on site. | N\$ 1,000 |
| k. Deliberate lighting of illegal fires on site. | N\$ 1,000 |

- | | |
|---|----------|
| l. Individuals not making use of the site toilet facilities. | N\$100 |
| m. Any person, vehicle, item of plant, or anything related to the Contractors operations causing a public nuisance outside the demarcated construction areas. | N\$1,000 |

- Penalties may be issued per incident at the discretion of the Engineer. The Engineer will inform the Contractor of the contravention and the amount of the fine, and will deduct the amount from monies due under the Contract.
- For each subsequent similar offence the fine may, at the discretion of the ER, be doubled in value to a maximum value of N\$10, 000.
- Payment of any fines in terms of the contract shall not absolve the offender from being liable from prosecution in terms of any law.
- In the case of a dispute in terms of this section, the Engineer shall determine as to what constitutes a transgression in terms of this document.

8.7 Environmental Monitoring and Auditing

Environmental monitoring should be conducted at least once every six months during construction. Benefits derived from the monitoring and final audit process might include:

- identification of environmental risk;
- development or improvement of the environmental management system;
- avoidance of financial loss;
- avoidance of legal sanctions;
- increase in staff awareness;
- identify potential cost savings;
- improve dealings with employees, environmental groups, the community, regulators, media, shareholders, or insurance & finance institutions; and
- establish a history of environmentally responsible operations, e.g. through environmental incident reports, environmental monitoring & recording, & reporting to committees or Authorities.

Commonly, the environmental monitoring or audit of a site will cover all management procedures, operational activities & systems, and environmental issues. The environmental monitoring and final audit will be compiled objectively and be conducted by an independent, competent entity.

8.8 Documentation, Record Keeping and Reporting Procedures

It is vital that an appropriate document handling and retrieval system be developed for all EMP documentation. This will ensure that there is adequate EMP documentation control and will facilitate easy document access and evaluation. EMP documentation should include:

- EMP implementation activity specifications;
- training records;
- site inspection reports;
- monitoring reports; and
- Performance Assessment reports.

Responsibilities must be assigned to relevant personnel for ensuring that the EMP documentation system is maintained and that document control is ensured through access by and distribution to, identified personnel.

Document control is important for the effective functioning of an EMP. A document handling system must be established to ensure adequate control of updating and availability of all documents required for the effective functioning of the EMP. This procedure applies to the EMP as well as procedures and policies relating to the EMP, which must be controlled (i.e. identified, registered and changes recorded).

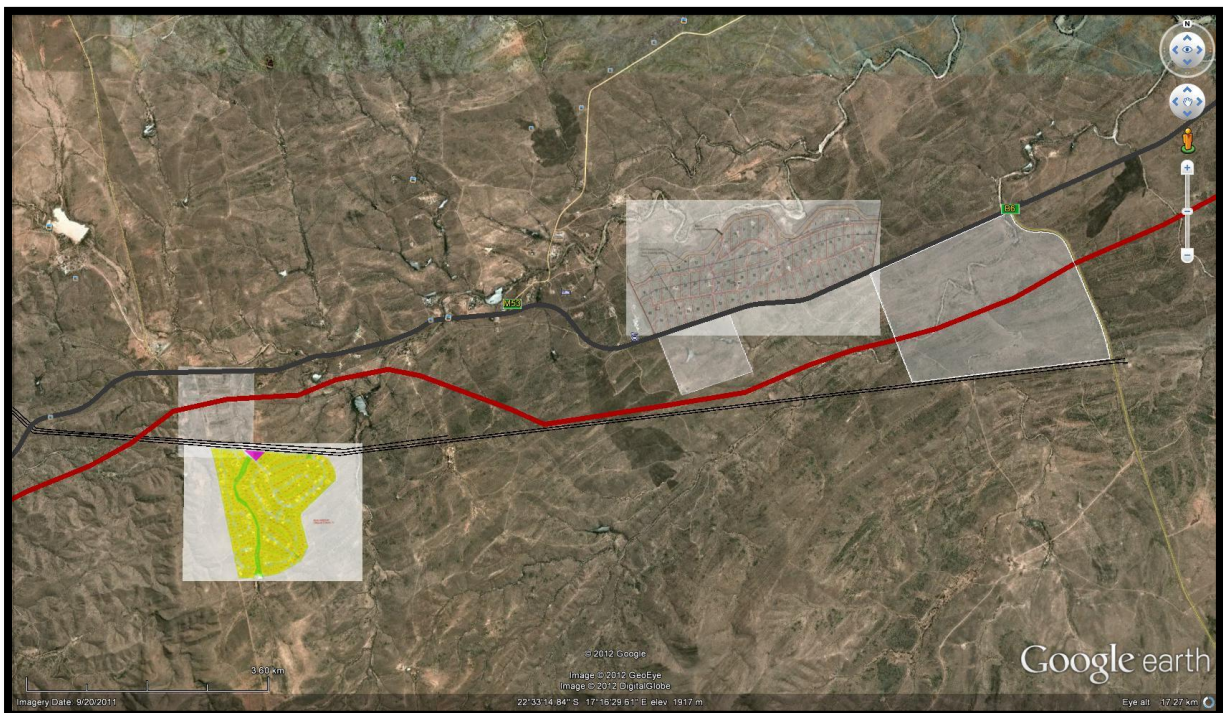
The Environmental Officer is responsible for ensuring that the registration and updating of all relevant EMP documentation is carried out. It is the responsibility of the Project Manager of the Contractor to ensure that all personnel are performing according to the requirements of this procedure and to initiate the revision of controlled documents, when required by changes in process, operating procedures, legislation, specifications, monitoring or audit findings or any other circumstances, by informing the Environmental Officer of the changes. A controlled document is official only if the issue/revision has been approved. The Environmental Officer and Project Manager are responsible for ensuring that the latest versions of documents are used to conduct tasks which may impact on the project environment.

9. CONCLUSION AND RECOMMENDATIONS

Thirty two environmental impacts were identified during the investigation phase of the project. Four (4) impacts are considered to be positive (mostly associated with increase of road safety and secondary economic developments) and twenty eight to be negative ranging from low negative impacts (15), medium negative (12) and high negative impacts (1). These high significant negative impacts are associated with the social environment of this project (land use changes and socio-economic impacts).

During the environmental investigation and impact assessment phase the various route alternatives were considered. Impact on vegetation is certain, but the high significance of these impacts will be limited to "hotspot" areas around surface water drainage lines and the one dam located near Finkenstein as well as rocky outcrops in the area. These areas are to be avoided or highly mitigated once the detailed design of the road is finalised. The impact on vegetation is not necessarily permanent where borrow pits are to be opened, but sensitive hotspot areas may be affected permanently.

Taking the natural environmental and social impacts into consideration it was decided the best route will be the red line as indicated below. This alternative route follows the proclaimed alignment done during the 1970's and then change southwards east of Finkenstein dam and continue alongside the power lines eastward and joins the proclaimed route at the Dordabis road. The black route is the existing route between Windhoek and the HKIA.



Should the mitigation measures be implemented as stipulated, the project will not have a detrimental negative impact on the natural environment during the construction and operational phases.

10. REFERENCES

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APPENDIX A

PUBLIC PARTICIPATION PROCESS

Please refer to the Social Impact Assessment conducted by Urban Dynamics for this project –

SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF TRUNK ROAD 9/1 FROM WINDHOEK TO THE HOSEA KUTAKO AIRPORT.

APPENDIX B

CODE OF CONDUCT LIST

BASIC RULES OF CONDUCT

The following list represents the basic Do's and Don'ts towards environmental awareness, which all participants in this project must consider whilst carrying out their tasks. These are not exhaustive and serve as a quick reference aid.

NOTE: ALL new site personnel must attend an environmental awareness presentation. Please inform your foreman or manager if you have not attended such a presentation or contact the ECO.

DO:

- Use the toilet facilities provided;
- Report dirty or full facilities;
- Clear your work areas of litter and building rubbish at the end of each day;
- Use the waste bins provided and ensure that litter will not blow away;
- Report all fuel or oil spills immediately & stop the spill continuing;
- Dispose of cigarettes and matches carefully (littering is an offence);
- Confine work and storage of equipment to within the immediate work area;
- Use all safety equipment and comply with all safety procedures;
- Prevent contamination or pollution of soil, streams and water channels;
- Ensure a working fire extinguisher is immediately at hand if any "hot work" is undertaken e.g. Welding, grinding, gas cutting etc;
- Report any injury of an animal;
- Drive on designated routes only;
- Prevent excessive dust and noise.

DO NOT:

- Remove or damage vegetation without direct instruction;
- Make any fires;
- Injure, trap, feed or harm any animals - this includes birds, frogs, snakes, lizards etc;
- Enter any fenced off or marked area.
- Allow cement or cement bags to blow around;
- Speed or drive recklessly;
- Allow waste, litter, oils or foreign materials on the ground or in any streams;
- Swim in any dam;
- Litter or leave food laying around;
- Waste water;
- Use vehicles that are leaking oil or any hydrocarbon substance.

APPENDIX C

BORROW PIT REHABILITATION CHECKLIST

REHABILITATION CHECKLIST FOR THE FINALIZATION OF BORROW PITS

Borrow Pit Name and Number: _____ Date: _____

It is essential that a borrow pit meet the requirements set out in the approved EMP before closure. After the requirements are met, the borrow pit can be signed off and regarded as rehabilitated. After the borrow pit has been signed off, the contractor or any other party may not be allowed to engage in any activities in or around the signed off borrow pit. This includes, but is not limited to activities such as further excavations, dumping of overburden or spoils, sloping, etc.

Criteria for rehabilitation according to the EMP:

Item Number	Description	Comments	Complied
			Yes / No
1	Gradient of the borrow pit walls are less than 18 degrees (1:3).		
2	The walls is covered with overburden/top soil with a thickness of more than 150 mm.		
3	The floor of the borrow pit is level and no material is found within the pit.		
4	The compacted areas are ripped to a minimum depth of 300mm.		
5	No man made topographical high or low points are found in or around the borrow pit. These might include berm walls, excavation holes, stock piles, etc.		
6	The site is clear of any illegal dumping of foreign or other materials in and around the borrow pit.		
7	All invasive vegetation has been removed from site.		

When the answer to **all of the above** statements are "Yes" then the R.E. or authorized person can sign off the borrow pit and regard it as closed.

Land Owner: _____

Contractor: _____

Residing Engineer / Authorized Person

Environmental Consultant or ECO

APPENDIX D

SPECIALIST ASSESSMENT: VEGETATION STUDY

APPENDIX E

ADDENDUM FOR REVIEW OF THE BASIC PLANNING FOR TR9/1 &
TR6/1WINDHOEK TO HOSEA KUTAKO AIRPORT

APPENDIX F

CURRICULUM VITAE OF COMPILER