




ECC-118-269-REP-15-D

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

PROPOSED BIOMASS PROCESSING (RETORT SYSTEM), STORAGE AND PACKAGING PLANT ON FARM GAI //KHAISA NO. 159 OTJOZONDJUPA REGION, NAMIBIA

PREPARED FOR

RETORT CHARCOAL PRODUCERS (PTY) LTD

FEBRUARY 2021

TITLE AND APPROVAL PAGE

Project Name:	Proposed construction and operation of a biomass processing (retort system), storage and packaging plant on farm Gai//Khaisa No. 159, Otjozondjupa Region
Project Number:	ECC-118-269-REP-15-D
Client Name:	Retort Charcoal Producers (Pty) Ltd
Ministry Reference:	NA
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EXECUTIVE SUMMARY

Bush thickening is defined as "the invasion and/or thickening of aggressive undesired woody species (i.e., target spp.) resulting in an imbalance of the grass: bush ratio, a decrease in biodiversity, and a decrease in carrying capacity", causing severe economic losses for Namibia – in both the commercial (freehold) and communal (non-freehold) farming areas. The owners of Gai //Khaisa no.159 intends to utilise the encroacher bush species as raw material for their biomass processing plant. Should this business venture be successful, the utilisation of encroacher bush species for socio-economic purposes and rangeland management will be marketed to neighbouring famers and further afield within the broader region.

The biomass from bush thickening species is seen as a natural resource for downstream value addition industries and energy supply. The thinning of the identified bush thickening species is also seen as a means to improve biodiversity and ecological restoration (NFSS, 2019).

The impacts of bush thinning processes using mechanised means with respect to ecological functioning is considered beneficial as it will be done in a controlled manner and will result in ecological restoration of farm Gai//Khaisa no.159 and restore the land towards more natural conditions.

The impacts of biomass processing using the retort carbonisation system with respect to airborne particle emissions whether it be smoke, dust or gas are expected to be limited to onsite biomass processing and bush thinning activities. There will be some release of exhaust fumes from machinery that will impact the immediate vicinity but will be of short duration. Additionally, there will be ancillary machinery noise, which could be a disturbance to immediate neighbours, but this will be of short duration as well.

Through further investigation, it was determined that the effects from noise are considered to be of minor significance, however with additional mitigation, the significance is reduced to low. The additional mitigation measures include:

- Labour intensive activities will be minimized to allocated daylight working hours;
- Continual engagement with residents shall be undertaken by the proponent to identify any concerns or issues, and appropriate mitigation and management measures shall be further agreed; and
- Noise suppression measures shall be applied if excessive noise occurs in locations that may affect residents.

The study area is located in the Omatako Groundwater Basin. The general direction of the groundwater flow is east and southeast towards the Omatako River. In the west the groundwater potential is less favourable, but it improves towards the east and southeast, and then following the same direction as the Omatako River (Christelis and Struckmeier, 2001). The proposed project will not have significant impacts on the ground and surface water conditions of the area as the

operations will not adversely affect its ability to adapt in a modified form. In essence the proposed bush thinning activities will reduce the pressure on existing water resources.

The overall potential impact of this proposed project is not considered significant as it does not widely exceed recognised levels of acceptable change, does not threaten the integrity of the receptors, and it is not material to the decision-making process. The assessment is considered to be comprehensive and sufficient to identify impacts, and it is concluded that no further assessment is required.

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LIST OF ACCRONYMS AND ABBREVIATIONS

ABBREVIATIONS	DESCRIPTION
<	Less than
>	More than
AIDS	Acquired Immune deficiency Syndrome
BE	Bush Equivalent
C	Carbon
COVID19	Corona Virus Disease 2019
DAS	De-Bushing Advisory Services
DB	Distribution Board
DEA	Directorate of Environmental Affairs
E&SDD	Environmental and Social Due Diligence
ECC	Environmental Compliance Consultancy
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
FSC	Forest Stewardship Council
H	Hydrogen
Ha	Hectares
HIV	Human Immunodeficiency Virus
I&AP	Interested & Affected Parties
IFC	International Finance Corporation
Km/hr	Kilometer per hour

ABBREVIATIONS	DESCRIPTION
Km²	Square kilometer
MAWLR	Ministry of Agriculture, Water and Land Reform
MEFT	Ministry of Environment, Forestry and Tourism
NDP4	National Development Plan four
NFSS	Namibian Forestry Stewardship Standard
NSA	National Statistics Agency
NTFP	Non-Timber forest Products
NTS	Non-Technical Summary
O	Oxygen
ºC	Degree Celsius
PSC	Policy and Standards Committee
S	Sulfur
SOP	Standard Operating Procedure
SQM	Square Meters
St1, St2, St3	Translated from the German word “Staub” which means “Dust”. These abbreviations represent the class of combustible dusts.
TB	Tuberculosis
WHO	World Health Organisation

1 INTRODUCTION

1.1 PROJECT OVERVIEW

Farm Gai //Khaisa no.159 is located approximately 30km south east of the Kombat settlement and 42 km south-west of Grootfontein town and can be accessed via the D2512 district road that branched out from the B8 main road in the Otjozondjupa Region. The necessary bush-thinning activities and construction of the processing (charcoal burning retort system), storage and packaging plant will be operated by the Retort Charcoal Producers (Pty) Ltd company (the proponent).

The proposed project aims thin out encroacher bush species on said farm (project site). Please see the locality map below (Figure 1).

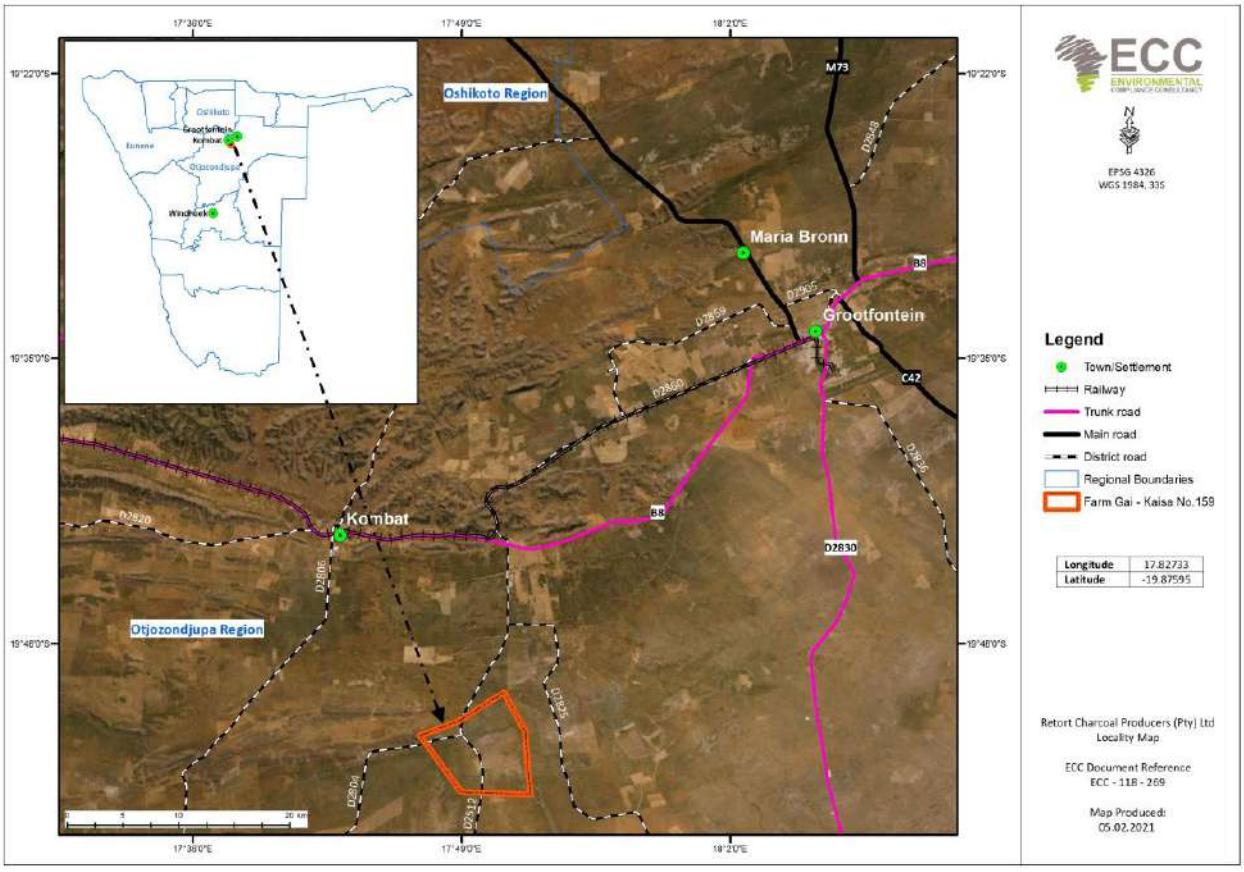

FIGURE 1 - LOCALITY MAP OF FARM GAI //KHAISA

1.2 SCOPE OF WORK

Environmental Compliance Consultancy (ECC) has been engaged by the proponent, to undertake the ESIA and an Environmental Management Plan (EMP) in terms of the Environmental Management Act, 2007 and its regulations.

The purpose of this report is to present the findings of the scoping study for the proposed project. This scoping report has been outlined in terms of the requirements of the Environmental

Management Act, No. 7 of 2007 and its regulations, promulgated in 2012 (referred to herein as the EIA Regulations).

An environmental clearance application will be submitted to the relevant competent authority; the Ministry of Ministry of Environment, Forestry and Tourism (MEFT).

ECC has prepared this report. ECC's terms of reference for the assessment is strictly to address potential effects, whether positive or negative and their relative significance, explore alternatives for technical recommendations and identify appropriate mitigation measures.

This report provides information to the public and stakeholders to aid in the decision-making process for the proposed project. The objectives are to:

- Provide a description of the proposed activity and the site on which the activity is to be undertaken, and the location of the activity on the site;
- Provide a description of the environment that may be affected by the activity;
- Identify the laws and industry guidelines that have been considered in the assessment and preparation of this report, including applicable IFC guidelines.
- Provide details of the public consultation process;
- Describe the need and desirability of the activity;
- Provide a high level of environmental and social impact assessment on feasible alternatives that were considered; and
- Report the assessment findings, identifying the significance of effects, including cumulative effects.

In addition to the environmental assessment, an EMP (Appendix A) is also required in terms of the Environmental Management Act, No. 7 of 2007. An EMP has been developed to provide a management framework for the planning and implementation of exploration activities. The EMP provides exploration standards and arrangements to ensure that the potential environmental and social impacts are mitigated, prevented and/or minimised as far as reasonably practicable, and that statutory requirements and other legal obligations are fulfilled.

1.3 THE PROPONENT OF THE PROPOSED PROJECT

The details of the proponent are set out in Table 1 below.

TABLE 1 - PROPONENTS DETAILS

CONTACT	EMAIL ADDRESS	TELEPHONE
Retort Charcoal Producers (PTY) Ltd	david@biomassnamibia.com	+264 0816222969

1.4 ENVIRONMENTAL COMPLIANCE CONSULTANCY

ECC, a Namibian consultancy (registration number Close Corporation 2013/11401), has prepared this scoping report and impact assessment on behalf of the proponent. ECC operates exclusively in the environmental, social, health and safety fields for clients across Southern Africa, in both the public and private sectors. ECC is independent of the proponent and has no vested or financial interest in the proposed project, except for fair remuneration for professional services rendered.

All compliance and regulatory requirements regarding this ESIA report should be forwarded by email or posted to the following address:

Environmental Compliance Consultancy
PO BOX 91193 Klein Windhoek, Namibia
Tel: +264 81 669 7608
Email: info@eccenvironmental.com

1.5 ENVIRONMENTAL LEGAL REQUIREMENTS

The Environmental Management Act, No.7 of 2007 stipulates that an environmental clearance certificate is required to undertake listed activities in terms of the Act and its regulations. Listed activities triggered by the proposed project in terms of the Environmental Management Act, No. 7 of 2007 and its regulations are as follows:

TABLE 2 - LISTED ACTIVITIES

LISTED ACTIVITY	DESCRIPTION
WATER RESOURCE DEVELOPMENT	8.1. The abstraction of ground or surface water for industrial or commercial purposes – The abstraction of groundwater is obtained from existing boreholes in the proposed project area. An abstraction permit should be applied for from the Ministry of Agriculture, Water and Land Reform (MAWLR) to abstract water for commercial purposes.
ENERGY GENERATION, TRANSMISSION AND STORAGE ACTIVITIES	1. The construction of facilities for – – The generation of electricity – The project will generate electricity through generators.
WASTE MANAGEMENT, TREATMENT, HANDLING AND DISPOSAL ACTIVITIES	2.2. Any activity entailing a scheduled process referred to in the Atmospheric Pollution Prevention Ordinance, 1976. – The project will generate dust due to the operation of machinery for bush thinning, transporting of biomass and sieving of charcoal. The installation of a dust collector and jet cleaning machine to minimise dust emissions will occur within the plant.

	– Minimum smoke pollution is envisaged to be emitted into the atmosphere, due to all gases released during the carbonisation process which will be fed into the system as fuel (an advantage of retorts). Waste generated during construction, which shall be collected and removed from the site for re-use, recycling, or final disposal at permitted landfill facility. Waste disposal and handling shall comply with waste management specifications as detailed in the Environmental Management Plan.
FORESTRY ACTIVITIES	– The clearance of forest areas, deforestation, afforestation, timber harvesting or any other related activity that requires authorisation in terms of the forest Act, 2001 (Act No. 12 of 2001) or any other law.

2 METHODOLOGY AND APPROACH

2.1 PURPOSE AND SCOPE OF THE ASSESSMENT

The aim of this assessment is to determine which impacts are likely to be significant (the main focus of the assessment); scope the available data and any gaps which need to be filled; determine the spatial and temporal scope; and identify the assessment methodology.

Scoping of the ESIA was undertaken by the ESIA team. The scope of the assessment was determined through undertaking a preliminary assessment of the proposed project against the receiving environment obtained through a desk-top review, available site-specific literature, monitoring data and site reports.

ECC's terms of reference for the assessment is strictly to address potential effects, whether positive or negative and their relative significance, explore alternatives for technical recommendations and identify appropriate mitigation measures.

2.2 THE ASSESSMENT PROCESS AND METHODOLOGY

The ESIA methodology applied here has been developed using the International Finance Corporation (IFC) standards and models, in particular Performance Standard 1, 'Assessment and management of environmental and social risks and impacts' (International Finance Corporation, 2017) (International Finance Corporation, 2012), which establishes the importance of:

- Integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects;
- Effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and
- The client's management of environmental and social performance throughout the life of the project

Furthermore, the Namibian Draft Procedures and Guidance for ESIA and EMP (Republic of Namibia, 2008) as well as the international and national best practice; and over 25 years of combined EIA experience, were also drawn upon in the assessment process.

This impact assessment is a formal process in which the potential effects of the project on the biophysical, social and economic environments are identified, assessed and reported, so that the significance of potential impacts can be taken into account when considering whether to grant approval, consent or support for the proposed project.

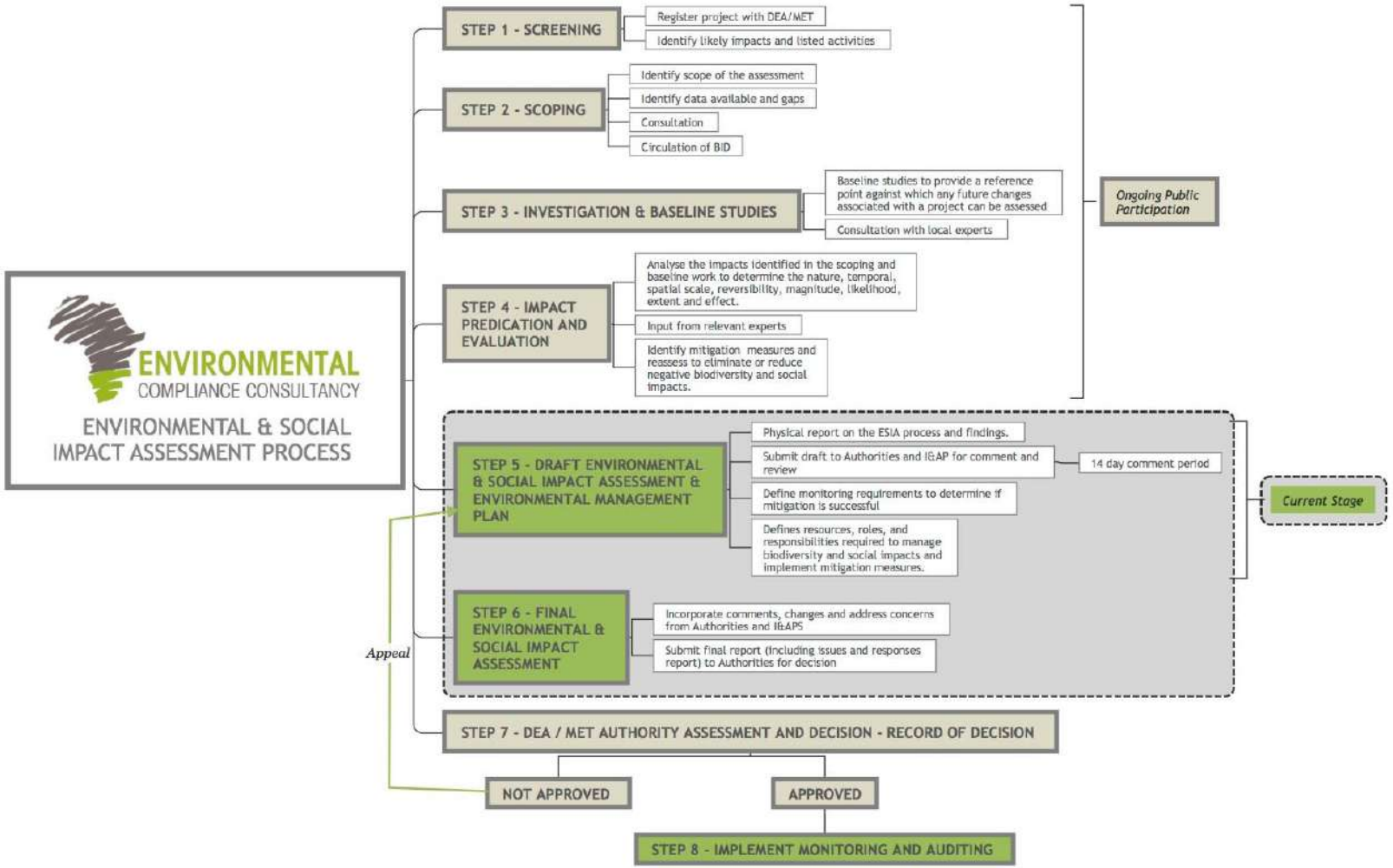

FIGURE 2 - ECC ESIA METHOD

2.3 SCREENING OF THE PROJECT

The first stages in the ESIA process are to register the project with the DEA and undertake a screening exercise to determine whether it is considered as a listed activity under the Environmental Management Act, No. 7 of 2007 and associated regulations and if significant impacts may arise from the project. The location, scale and duration of project activities will be considered against the receiving environment.

It was concluded that an ESIA (i.e., scoping report and EMP) is required, as the proposed project is considered as a listed activity and there may be potential for significant impacts to occur.

2.4 SCOPING OF THE ENVIRONMENTAL ASSESSMENT

Where an ESIA is required, the second stage is to scope the assessment. The main aims of this stage are to determine which impacts are likely to be significant (the main focus of the assessment); scope the available data and any gaps which need to be filled; determine the spatial and temporal scope; and identify the assessment methodology.

The screening phase of the project is a preliminary analysis to determine ways in which the project may interact with the biophysical, social and economic environment. Impacts that are identified as potentially significant during the screening and scoping phases are taken forward for further assessment in the ESIA process. The details and outcome of the screening process are discussed further in sections 6 and 7.

Subsequently, scoping of the ESIA was undertaken by the EIA team. The scope of the assessment was determined through screening the proposed project against the receiving environment obtained through a high-level desktop review. Feedback from consultation with the client and stakeholders also informed this process.

The following environmental and social topics and subtopics were scoped into the assessment, as there was potential for significant impacts to occur:

SOCIO-ECONOMIC ENVIRONMENT

- Employment creation for locals with the availability of approximately 50 jobs;
- Limited goods and services procurement within the local economy; and
- Downstream spending by locals within the region.

BIOPHYSICAL ENVIRONMENT

- Dust Air emissions, including dust from bush thinning activities;
- Soil integrity;
- Terrestrial ecology;
- Terrestrial biodiversity (including fauna and flora); and
- Groundwater (potential cumulative impact). Water management suggestions are contained in the EMP.

HERITAGE

- Two recently dated grave sites were identified on farm Gai//Khaisa no.159 and a graveyard within which one of the graves are located. These sites have a heritage connotation but are not regarded as archaeologically sensitive (Kinahan, 2020).

2.5 BASELINE STUDIES

Baseline studies are undertaken as part of the scoping stage, which involves collecting all pertinent information from the current status of the receiving environment. This provides a baseline against which changes that occur as a result of the proposed project can be measured.

For the proposed project's baseline information was obtained through a desktop study and site visits conducted by specialists, focussing on environmental receptors that could be affected by the proposed project, verified through site-specific information. The baseline information is covered in Section 5.

A robust baseline is required in order to provide a reference point against which any future changes associated with a project can be assessed, and it allows for suitable mitigation and monitoring actions to be identified.

The existing environment and social baseline for the proposed project were collected through various methods:

- Desktop studies;
- Specialist studies (desktop and on-site survey);
- Consultation with stakeholders; and
- Engagement with Interested and Affected Parties (I&APs). See Appendix C.

2.6 IMPACT PREDICATION AND EVALUATION

Impact prediction and evaluation involves predicting the possible changes to the environment as a result of the development/project. The recognized methodology was applied to determine the magnitude of impact and whether or not the impact was considered significant and thus warrant further investigation. The impact prediction and evaluation methodology used is presented in Section 6 of this report. The findings of the assessment are presented in Section 7.

2.7 ESIA CONSULTATION

Public participation and consultation are requirements stipulated in Section 21 of the Environmental Management Act, No. 7 of 2007 and associated regulations for a project that needs an environmental clearance certificate. Consultation is a compulsory and critical component in the ESIA process in achieving transparent decision-making and can provide many benefits.

The objectives of the stakeholder engagement process are to:

- Provide information on the project to I&APs: introduce the overall concept and plan;
- Clarify responsibility and regulating authorities;

- Listen to and understand community issues, concerns and questions;
- Explain the process of the ESIA and timeframes involved; and
- Establish a platform for ongoing consultation.

2.8 INTERESTED AND AFFECTED PARTIES

Farm Gai //Khaisa no 159 is surrounded by several privately owned farms (See figure 4). Two district roads, the D2512 and the D2804, passes through the farm. The two district roads provide direct access to the project site.

The owners of the farms that border the project site were identified as I&APs, as well as the relevant local authority bodies. Other I&APs was identified through invitations such as the newspaper advertisements and site notices.

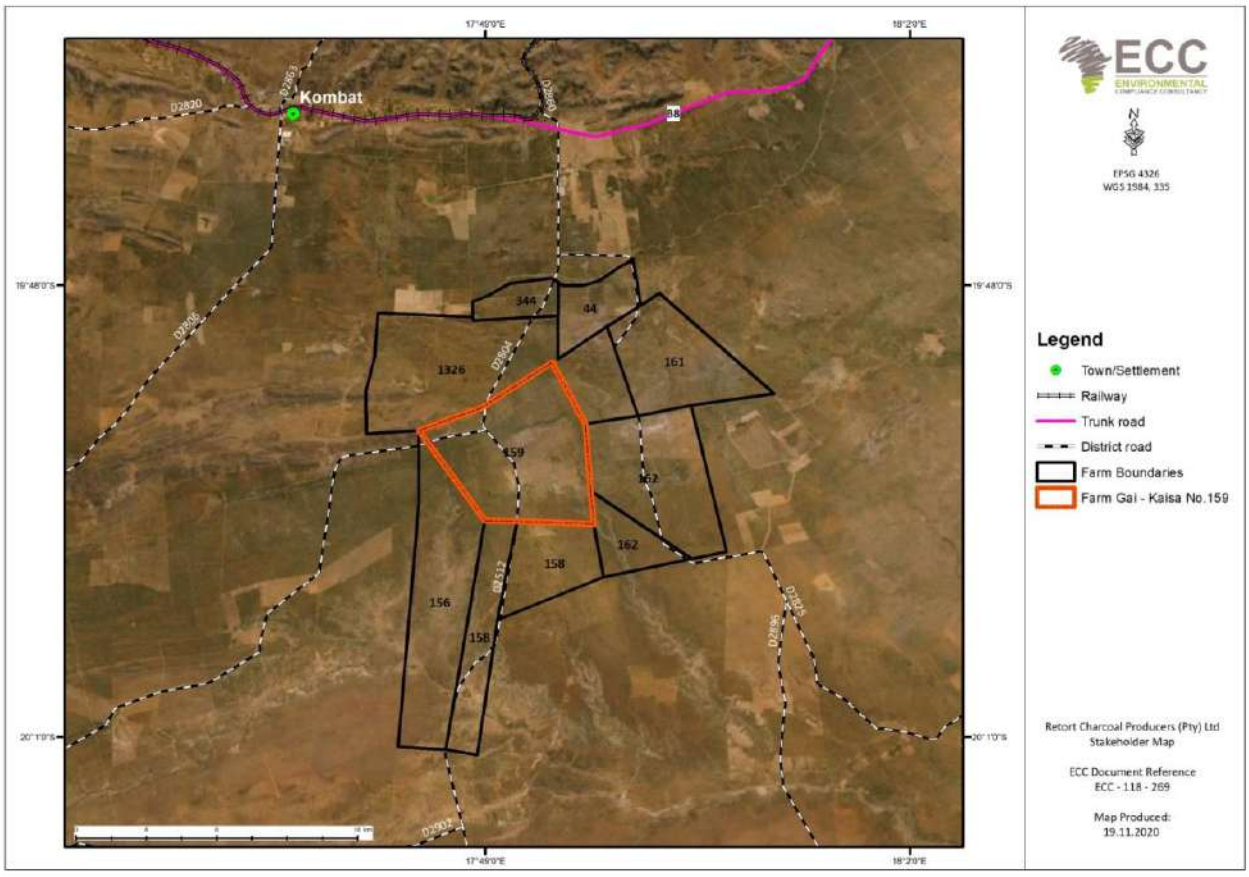

FIGURE 3 – FARM GAI//KHAISA NO.159 SURROUNDED BY SEVERAL FARMS

2.9 SITE NOTICES

A site notice ensures neighbouring properties and stakeholders are made aware of a proposed project. A site notice was set up at the D2804 and D2512 intersection as well as at the entrance gate to farm Gai //Khaisa no.159. The site notices are illustrated in Appendix C.

2.10 NEWSPAPER ADVERTISEMENTS

Notices regarding the proposed project and associated activities were circulated in three newspapers namely the 'Republikein', Allgemeine Zeitung' and the 'Sun" on the 17th November and 24th of November. The purpose of this was to commence the consultation process and enable I&APs to register an interest with the project. The adverts can be found in Appendix C.1.

2.11 NON-TECHNICAL SUMMARY

The Non-Technical Summary (NTS) presents a high-level description of the proposed project; sets out the ESIA process and when and how consultation is undertaken; and provides contact details for further project-specific inquiries to all registered I&APs. The NTS was distributed to all registered and identified I&APs for the project. The NTS can be found in Appendix B.

2.12 SUMMARY OF ISSUED RAISED

The initial public participation phase involving the notifications of the project through media such as the newspaper adverts, direct mail sent to identified I&APs and the display of site notices delivered very few interactive communications from the public. The comments received from this phase will be contained in the final assessment documentation.

All comments received from I&APs during the review period of the draft report will be contained in this section in the final assessment documentation.

2.13 DRAFT ESIA AND EMP

This report and EMP for the project's environmental clearance includes an assessment of the biophysical and social environment, which satisfies the requirements of Step 5 (Figure 2).

The ESIA report documents the findings of the assessment process, provides stakeholders with the opportunity to comment and continued consultation and forms part of the environmental clearance application. The EMP provides measures to manage the environmental and social impacts of the proposed project and outlines specific roles and responsibilities to fulfil the plan.

This ESIA report focuses on the significant impacts that may arise from the proposed project as described in Step 4 (Figure 2). These impacts are discussed in Chapter 6.

The aim of this stage is to ensure all stakeholders and I&APs have the opportunity to provide final comments on the assessment process and findings and register their concerns. Should any significant changes arise that were not captured in the scoping report an addendum report will be submitted to the DEA incorporating such comments.

2.14 FINAL ESIA AND EMP

The final ESIA report and associated appendices are available to all stakeholders on the ECC website www.eccenvironmental.com. All I&APs was informed via email of the report's availability. The ESIA report and appendices were formally submitted to the Office of the Environmental Commissioner, DEA as part of

the application to for an environmental clearance certificate. Should I&APs raise any issues that were not addressed in this ESIA, ECC will develop an addendum report and submit to the competent authority, the Ministry of Environment, Forestry and Tourism (MEFT).

2.15 AUTHORITY ASSESSMENT AND DECISION MAKING

The Environmental Commissioner in consultation with other relevant authorities will assess if the findings of the ESIA presented in the ESIA report is acceptable. If deemed acceptable, the Environmental Commissioner will revert to the proponent with a record of decision and any recommendations.

2.16 MONITORING AND AUDITING

In addition to the EMP being implemented by the proponent, a monitoring strategy and audit procedure will be determined by the proponent and competent authority. This will ensure key environmental receptors are monitored over time to establish any significant changes from the baseline environmental conditions caused by project activities.

3 REGULATORY FRAMEWORK

This chapter outlines the regulatory framework applicable to the proposed project. Table 2 provides a list of applicable legislation and the relevance to the project. An environmental clearance is required for any activity listed as per Government Notice No 29 of 2012 of the EMA.

3.1 NATIONAL LEGISLATION

TABLE 3 - LEGAL FRAMEWORK

NATIONAL REGULATORY REGIME	SUMMARY	APPLICABILITY TO THE PROJECT
Constitution of the Republic of Namibia of 1990	The Constitution of the Republic of Namibia, 1990 clearly defines the country's position in relation to sustainable development and environmental management. The constitution refers that the state shall actively promote and maintain the welfare of the people by adopting policies aimed at the following: *"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."*	The proponent is committed to engage the local community for the proposed project by providing local jobs as well as, exploring ways of finding rich recourses to that could contribute to the mining sector in Namibia.
Environmental Management Act, (No. 7 of 2007) and its regulations, including the Environmental Impact Assessment Regulation, 2007 (No. 30 of 2012)	The Act aims to promote sustainable management of the environment and the use of natural resources by establishing principles for decision-making on matters affecting the environment. It sets the principles of environmental management as well as the functions and powers of the minister. The Act requires certain activities to obtain an environmental clearance certificate prior to project development. The Act states an EIA may be undertaken and submitted as part of the environmental clearance certificate application. The MEFT is responsible for the protection and management of Namibia's natural environment. The Department of Environmental Affairs under	This environmental scoping report (and EMP) documents the findings of the environmental assessment undertaken for the proposed project, which will form part of the environmental clearance application. The assessment and report have been undertaken in line with the requirements under the Act and associated regulations.

NATIONAL REGULATORY REGIME	SUMMARY	APPLICABILITY TO THE PROJECT
	the MEFT is responsible for the administration of the EIA process.	
Water Act, No. 54 of 1956	Although the Water Resources Management Act, No. 11 of 2013 has been billed, but not promulgated, it cannot be enacted as the regulations have not been passed – so the Water Act 54 of 1956 is still in effect. This act provides for *"the control, conservation and use of water for domestic, agricultural, urban and industrial purposes; to make provision for the control, in certain respect and for the control of certain activities on or in water in certain areas".* The Department of Water Affairs within the Ministry of Agriculture Water and Land Reform (MAWLR) is responsible for the administration of the Act. The Minister may issue a permit in terms of the regulations 5 and 9 of the government notice R1278 of 23 July 1971 as promulgated under section 30 (2) of the Water Act no. 54 of 1956, as amended.	The Act stipulates obligations to prevent pollution of water. Should wastewater be discharged, a permit is required. The EMP sets out measures to avoid polluting the water environment. Measures to minimise potential groundwater and surface water pollution are contained in the EMP. Abstraction of water from boreholes requires an abstraction permit. Abstraction rates need to be measured and reported to the authorities in accordance with the requirements of this legislation. In addition, annual reporting on the environmental impacts of water abstraction is recommendable.
Soil Conservation Act, No. 76 of 1969) and the Soil Conservation Amendment Act, No. 38 of 1971)	Makes provision for the prevention and control of soil erosion and the protection, improvement and the conservation, improvement and manner of use of the soil and vegetation.	This will be taken into consideration during the intention of the works to be undertaken on farm Gai //Khaisa no.159. Measures in the EMP set out methods to avoid soil erosion.
The Forestry Act, No. 12 of 2001 as amended by the Forest Amendment Act, No. 13 of 2005	All harvesting of trees and wood in Namibia is governed by this Act and its regulations 2015. Section 22 requires permits to be obtained for harvesting, charcoal production, bush control and transportation. Section 24 requires a permit for the cutting, destruction or removal of vegetation that are	The planned project activities will include semi mechanised bush thinning activities to supply the biomass production plant to be constructed on the same farm. The necessary permits should be obtained from the MEFT, where the application should satisfy that

NATIONAL REGULATORY REGIME	SUMMARY	APPLICABILITY TO THE PROJECT
	classified under rare and or protected species; clearing the vegetation on more than 15 hectares on any piece of land or several pieces of land situated in the same locality which has predominantly woody vegetation; or cut or remove more than 500 cubic metres of forest produce from any piece of land in a period of one year.	the cutting and removal of vegetation will not interfere with the conservation of soil, water or forest resources. Further management actions are contained in the EMP.
National Heritage Act, No. 27 of 2004.	The Act provides provision of the protection and conservation of places and objects with heritage significance. Section 55 stipulates that biomass processing companies must report any archaeological findings to the National Heritage Council after which a heritage permit needs to be issued.	There might be potential for heritage objects to be found on site, therefore the stipulations in the Act have been taken into consideration and are incorporated into the EMP. Section 55 compels biomass processing companies to report any archaeological findings to the National Heritage Council after which a permit needs to be issued before the find can be disturbed. In cases where heritage sites are discovered the 'chance-find procedure' will be used.

3.2 NATIONAL REGULATORY REGIME

TABLE 4 - NATIONAL POLICIES

NATIONAL REGULATORY REGIME	SUMMARY	APPLICABILITY TO THE PROJECT
Vision 2030	Vision 2030 sets out the nation's development programmes and strategies to achieve its national objectives. It sets out eight themes to realise the country's long-term vision. Vision 2030 states that the overall goal is to improve the quality of life of the Namibian people to a level in line with the developed world.	The planned project shall meet the objectives of Vision 2030 and shall contribute to the overall development of the country through continued employment opportunities.
The Fifth National Development Plan (NDP5)	NDP5 is the fifth in the series of seven five-year national development plans that outline the objectives and aspiration of Namibia's long-term vision as expressed in Vision 2030. NDP5 is structured on the pillars of economic progression, social transformation, environmental sustainability and good governance. Under the social transformation pillar is the goal of improved education.	The planned project supports meeting the objectives of NDP5 by creating opportunities for employment to the nearby community and the Namibian nation.
Labour Act, No. 11 of 2007	The Labour Act, No. 11 of 2007 (Regulations relating to the Occupational Health & Safety provisions of Employees at Work promulgated in terms of Section 101 of the Labour Act, No. 6 of 1992 - GN156, GG 1617 of 1 August 1997).	The proposed project will comply with stringent health and safety policies, including the compulsory use of specific PPE in designated areas to ensure adequate protection against health and safety risks. Proper storage and labelling of hazardous substances are required. The project will ensure employees in charge of and working with hazardous substances need to be aware of the specific hazardous substances and how to handle them in order not to compromise worker and environmental safety.

3.3 PERMITS AND LICENSES

3.3.1 RELEVANT LICENCES NEEDED

Several permits must be in place for the project in order to be legally compliant and able to operate the proposed project. A list of such licences is contained in Table 4. The permits listed have conditions (i.e., no aerial application of herbicides, amongst others) attached and must be adhered to strictly.

TABLE 5 – PROJECT RELATED PERMIT REQUIREMENTS

PERMIT AND LICENCES	RELEVANT AUTHORITY	PROJECT BEARING	VALIDITY/DURATION
WATER ABSTRACTION PERMITS	Ministry of Agriculture, Water and Land Reform	An abstraction permit is required for the abstraction of water form a borehole for commercial purposes.	Valid for a five-year period.
BUSH CONTROL LICENCE	Ministry of Environment, Forestry and Tourism	Legally required under Section 22 of the Forestry Act.	Permit dependent
FOREST LICENCE FOR HARVESTING	Ministry of Environment, Forestry and Tourism	A Harvesting Permit is required for any tree cutting and/or harvesting of wood in an area greater than 15 hectares per annum as stated under Section 22 (1), 23 (1), 24 (2&3) and 33 (1&2) of the Forest Act (Act 12 of 2001).	Renewed every 3 months after an inspection of the farm is done by a licencing officer.
CHARCOAL PRODUCTION LICENCE	Ministry of Environment, Forestry and Tourism	Legally required under Section 22 of the Forestry Act.	Permit dependent
FOREST PERMIT FOR TRANSPORTING	Ministry of Environment, Forestry and Tourism	A Transport Permit is required to convey any wood or wood products (i.e., charcoal, and firewood). It is obtainable from any Forestry Office.	Valid for 7 days
FOREST PERMIT FOR MARKETING	Ministry of Environment, Forestry and Tourism	A permit for marketing of forest produce is required as set out on Form 17 of section 21 of the forest regulations (12) of the Forest Act of 2001	Permit dependent

3.4 WORLD BANK STANDARDS

The International Finance Corporation (IFC) is a member of the World Bank Group and is the largest global development institution focusing on the private sector in developing countries. Its standards have become a global benchmark for environmental and social performance. They form the basis for the Equator Principles (IFC, 2013), a voluntary environmental and social risk-management framework used by 77 financial institutions worldwide. The Equator Principles are a framework and set of guidelines for evaluating social and environmental risks in project finance activities and apply to all new projects with a total capital cost of US$10 million or more, no matter what industry sectors, without geographic requirement. The Equator Principles are not applicable to this specific project; however, the industry specific IFC Occupational Health, Safety and Environmental guidelines are used in the assessment of the proposed development.

The proposed project falls within category C of the IFC Environmental and Social Due Diligence (E&SDD) categorization approach under the 2012 sustainability framework. The proponent will not receive funding from the IFC to fund this project, but from private investors. Therefore, IFC's environmental and social guidelines and management actions are adhered to, as best practice to ensure project-specific environmental and social sustainability is achieved.

3.5 FOREST STEWARDSHIP STANDARD FOR NAMIBIA

It is the proponent's intention to have the property (farm Gai//Khaisa no.159) aligned and possibly become certified by the Forest Stewardship Council (FSC) standard, the following summarised background information on the operations of the Namibian Forest Stewardship Standard (NFSS) should be understood.

The Forest Stewardship Council (FSC) was established in 1993, as a follow-up to the United Nations Conference on Environment and Development (the Earth Summit at Rio de Janeiro, 11992) with the mission to promote environmentally appropriate, socially beneficial and economically viable management of the world's forests (NFSS, 2019).

FSC is an international organization that provides a system for voluntary accreditation and independent third- party certification. This system allows certificate holders to market their products and services as the result of environmentally appropriate, socially beneficial and economically viable forest management. FSC also sets standards for the development and approval of FSC Stewardship Standards which are based on the FSC Principles and Criteria. In addition, FSC sets standards for the accreditation of Conformity Assessment Bodies (also known as Certification Bodies) that certify compliance with FSC's standards. Based on these standards, FSC provides a system for certification for organizations seeking to market their products as FSC certified.

The FSC standard is centred around three main pillars, Environmental, Economic and Social. Environmentally appropriate forest management ensures that the production of timber, non-timber products and ecosystem services maintains the forest's biodiversity, productivity, and ecological processes. Socially beneficial forest management helps both local people and society at large to enjoy long term benefits and also provides strong incentives to local people to sustain the forest resources and adhere to long-term management plans. Economically viable forest management means that forest operations are

structured and managed so as to be sufficiently profitable, without generating financial profit at the expense of the forest resource, the ecosystem, or affected communities.

4 PROJECT DESCRIPTION

4.1 NEED FOR THE PROJECT

Namibia has established a viable and profitable biomass production industry for more than 30 years utilising invader and endemic encroacher species as source material. A number of successful operations are located within the central region of Namibia (i.e., Jumbo Charcoal, established in 1989 outside Okahandja) up to the central northern regions of the country. The proposed development will expand the local biomass production industry further. Namibia is also known as the world's 5th largest exporter of charcoal products. On a local scale, the proposed development will restore ecological ecosystem functioning and improve rangeland management on farm Gai//Khaisa no.159.

The proposed project presents an opportunity to monetize natural biomass present (encroacher bush species) on farm Gai//Khaisa no.159 whilst creating an environmentally sustainable rangeland and maintain ecosystem functioning. The proposed project has the potential to create limited but long-term employment opportunities and to contribute to national income. Moreover, in the event that the proposed bush thinning, charcoal and briquette production activities are successful, and more support for charcoal production in the local area can be secured, the same approach can potentially transcend into a regional operation which can result in multiple socio-economic benefits to the region and the country at large.

4.2 BUSH ENCROACHMENT (THICKENING) AND CAUSES

Bush thickening is defined as "the invasion and/or thickening of aggressive undesired woody species (i.e., target spp.) resulting in an imbalance of the grass: bush ratio, a decrease in biodiversity, and a decrease in carrying capacity", causing severe economic losses for Namibia – in both the commercial (freehold) and communal (non-freehold) farming areas (NFSS, 2019).

Bush thickening (encroachment) problems are experienced in the general area of Kombat, which include farm Gai//Khaisa no.159 with densities of between 4,000-12,000 plants/ha for *Dichrostachys cinerea* (sickle bush - an aggressive encroacher specie) as an example being the most contentious species (Bester 1996, Cunningham 1998). Several other encroacher species may occur on farm Gai //Khaisa no.159 as well and is covered in section 5.5.1.

4.2.1 CAUSES

There is no one single cause of bush encroachment in Namibia, but rather a combination of factors that have a combined effect on rangeland. Some of these are attributed to climate change, disruption of the balance between grass and bush in the savanna due to non-adaptive grazing, the suppression of fires, and overgrazing (DAS, 2017) to name but a few.

Figure 4 is a visual illustration of these factors in no specific combined order.

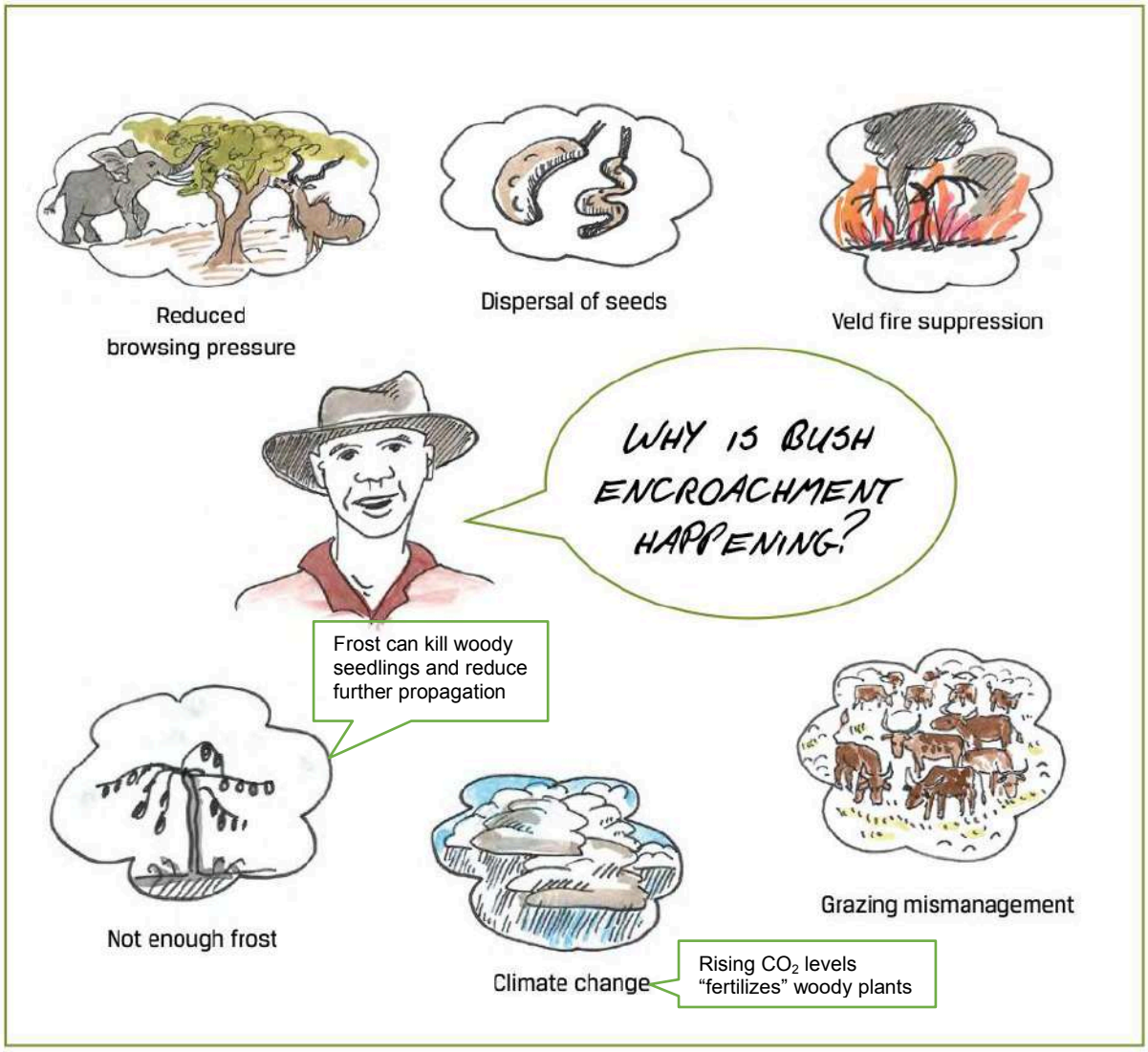

FIGURE 4: CAUSES OF BUSH CONTROL (SOURCE: DAS, 2017, WITH INSCRIPTIONS ADDED BY ECC)

4.3 BUSH THINNING DEFINITION

Thinning refers to the selective removal of bush, leaving enough large individuals to suppress small individuals to repair and stabilise the grass: bush balance (DAS, 2017).

Bush thinning alone does not alter the botanical composition of the grass sward, which is the topsoil layer that contains a discontinuous mat of grass and grass roots in arid environments. The sustainable extent of thinning the encroacher species from farm Gai//Khaisa no.159 is depended on the calculated density of vegetation per hectare from a small representative sample used. A special formula is used to do this, and the result is expressed in bush equivalents (BE) per hectare. A bush equivalent (BE) is a standardised 1.5-metre-high bush (DAS,2017). The proponent should use this formula to establish the thinning ratio on farm Gai//Khaisa no.159. As a rule, if a project area is near Grootfontein with a long-term average annual rainfall of 650mm, the recommended bush density is 1300 BE/ha (DAS,2017).

4.4 CURRENT STATE OF THE PROJECT AREA (FARM GAI//KHAISA NO.159)

The Farm Gai//Khaisa no.159 does not have any major unique habitats (including vertebrate fauna and flora); is not in a pristine condition and is heavily impacted by current/past charcoal harvesting activities (Cunningham, 2020). The project area however has thick stands of vegetation which includes a dense coverage of sickle bush.

The biomass from bush thickening species is seen as a natural resource for downstream value addition industries and energy supply. The thinning of the identified bush thickening species is seen as a means to improve biodiversity and ecological restoration (NFSS, 2019).

Sensitive areas that should be avoided and excluded from mechanical harvesting operations on Farm Gai //Khaisa No.159 include the rocky ridges (red dotted oblong); ephemeral pan system (blue dotted oblong) and ephemeral drainage lines (white dotted oblongs). Note the open areas currently/previously impacted by charcoal harvesting operations throughout most of the farm (Cunningham, 2020). All areas outside these demarcated areas can be utilised for bush thinning purposes.

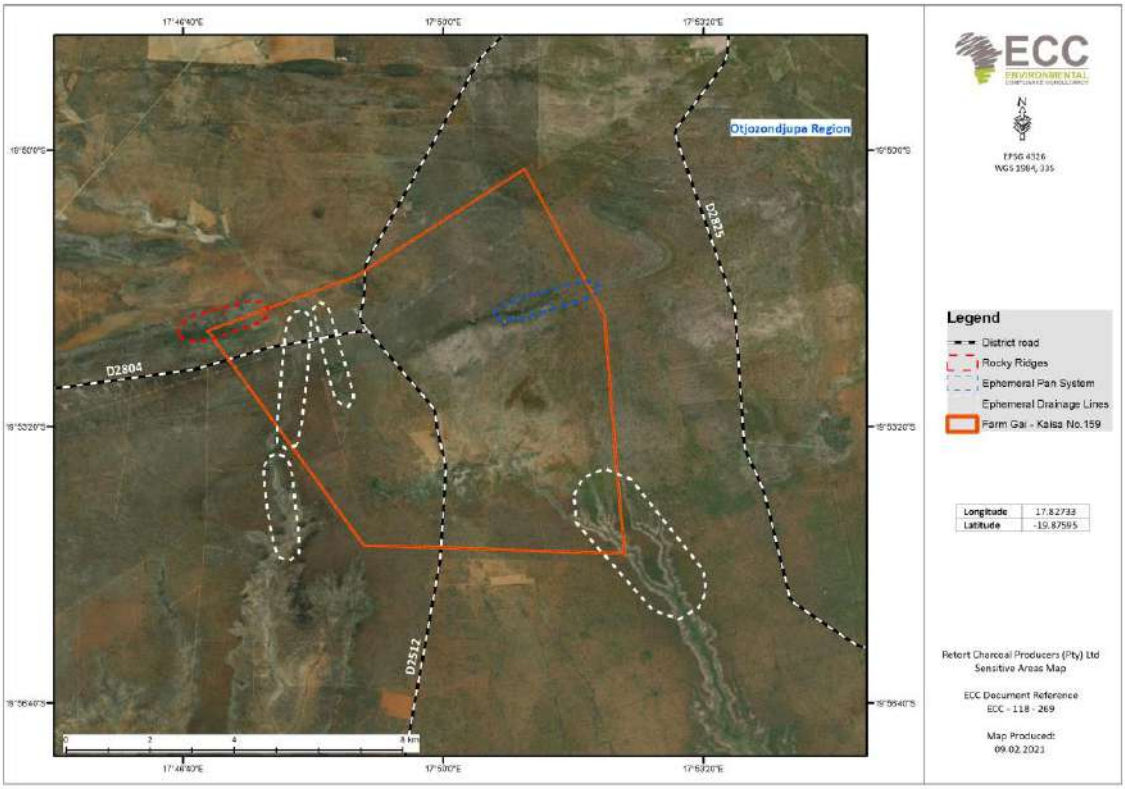

FIGURE 5: SENSITIVE AREAS TO BE AVOIDED ON FARM GAI//KHAISA NO.159 NO. 159 (SOURCE: P. CUNNINGHAM 2020)

4.5 MECHANISED BUSH THINNING EQUIPMENT

Thinning out of encroacher bush on farm Gai//Khaisa no.159 will be done by rubber wheeled timber logging machines in-field.

These machines have a relatively low impact on soil structure due to the large high flotation tyres fitted on them as opposed to steel tracks as illustrated in the figure 6 below.

FIGURE 6: RUBBER WHEELED TIMBER LOGGING MACHINES

Once cut, the bush is hauled with a tractor-trailer combination out of the field along the camp fence line roads to a central processing area as illustrated by figure 7 below.

FIGURE 7: TRACTOR-TRAILER COMBINATION (IMAGES ARE FOR ILLUSTRATION PURPOSES ONLY)

4.6 THE PRODUCTION PROCESS

4.6.1 CHARCOAL PRODUCTION

Charcoal is produced by slow heating wood (carbonization) in airtight retorts, in chambers with various gases (Demirbas, et al., 2016). Charcoal consists of carbon (C), hydrogen (H), oxygen (O), nitrogen (N), sulfur (S), and ash at very low concentration levels (Demirbas, et al., 2016).

Wood carbonisation at the correct coaling temperatures (700° - 1000°C) and slow heating rates (carbonisation) is to ensure the least amount of volatile organic matter remains within the raw material and a cleaner gas is formed which is fed back into the carbonisation process as fuel. If the coaling temperatures are too low, excessive amounts of volatiles will remain in the charcoal and cause heavy smoke when it burns.

Properties of charcoal are:
(1) a low sulfur content;

(2) a high carbon to ash ratio;
(3) relatively few and unreactive inorganic impurities;
(4) a specific pore structure with a large surface area, and
(5) little smoke discharge.

4.6.2 BRIQUETTE PRODUCTION

Several types of biomass (i.e., encroacher bush from farm Gai//Khaisa no.159) produce charcoal fines that have to be agglomerated, either before or after the carbonization process. Commercially sold charcoal briquettes are typically made from a binder and filler. The charcoal is crushed finely and passed through a variety of screens to ensure the particle size is small enough. A binder, typically starch, is added to the fines, as well as water. Starch is preferred over other alternatives (wax and wood pitch) because of its economical price and availability (Demirbas, 2016).

The briquetting of charcoal improves and provides more efficient use of biomass-based energy resources such as wood and agricultural wastes (Demirbas et al., 2016).

Charcoal comprises 75% of the briquette mixture, while water and starch comprise 20 and 5%, respectively (Demirbas, 2016). The press for briquetting must be well designed, strongly built, and capable of agglomerating the mixture of charcoal and binder sufficiently for it to be handled through the drying process.

The manufacturing of briquettes on farm Gai//Khaisa no.159 is an integral part of the charcoal-producing facility, and not an independent operation. Briquettes are a processed biomass fuel that can be burned as an alternative to wood or charcoal for heat energy (Demirbas, 2016).

4.6.3 AIR EMISSIONS

Wood has very low sulfur content. Therefore, when combusted in retorts, the potential release of noxious sulfur will be negligible. Continuous production of charcoal is generally more agreeable to emission control than batch production because emission composition and flow rates are relatively constant. The burning of briquettes is widely accepted as a cleaner burning fuel in the local and international markets (Demirbas, 2016).

Charcoal processing activities are associated with charcoal dust exposure, which may increase the risk of workers developing adverse respiratory outcomes. There are no documented studies on dose–response relationships between respiratory symptoms and dust levels exposure among charcoal workers.

4.7 INFRASTRUCTURE LAYOUT ON SITE

Figure 8 is an illustration of the site's physical components that will be constructed on farm Gai//Khaisa no.159.

- The yellow block represents the processing plant of 3000sqm;
- The brown patch is the materials lay-down area of timber yard of about 2ha;
- The grey patch is a hardened / paved area where the containers will be stacked; and

- the four grey blocks represent the retorts (weather proof) with their conveyors.

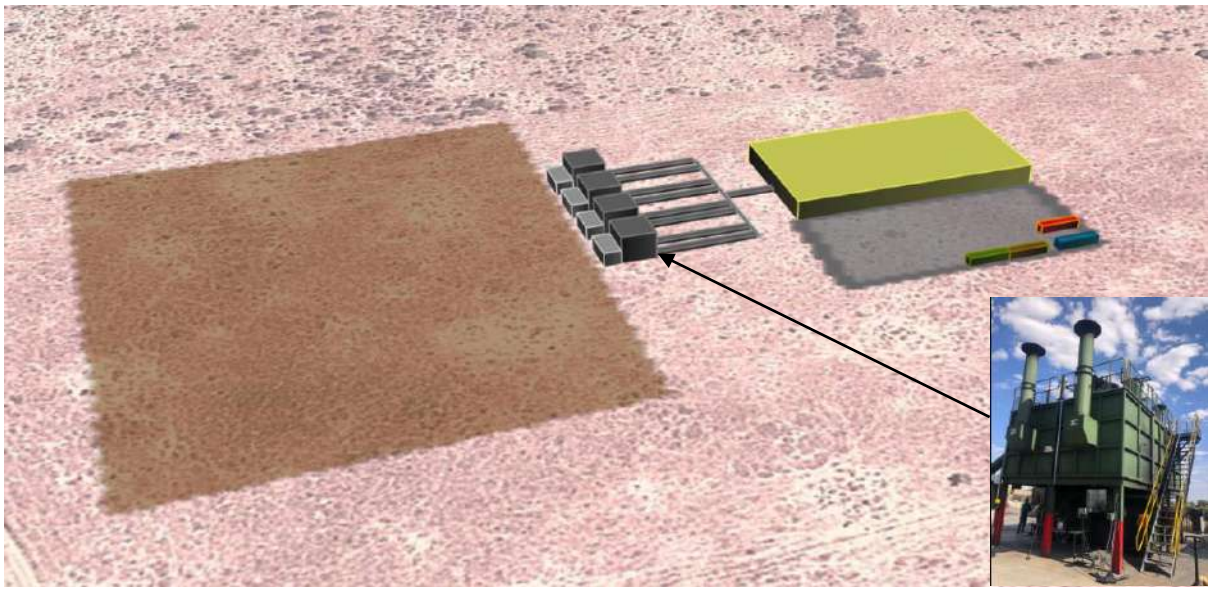

FIGURE 8: LAYOUT OF ONSITE OPERATIONAL AREAS WITH INSET OF A RETORT CHAMBER. SOURCE: RETORT CHARCOAL PRODUCERS (PTY) LTD, (2020).

4.8 EQUIPMENT REQUIREMENTS

Vehicles and equipment will comprise of the following:

- Two 4x4 vehicles for personnel and operational use on the farm;
- Four Bell 2-wheelde loggers;
- Four Bell tractors with trailers:
- One road grader;
- One front end loader;
- One container reach stacker; and
- One water truck.

4.9 INDUSTRIAL DUST COLLECTOR SYSTEM

The proponent will utilise an industrial dust collector system, imported from South Africa, to capture and handle dust and gas emissions from the production process during normal operations. The system is called the LCP cartridge dust collectors. See figure 9.

"All LCP Ex, LCP units have generously sized integral pre- separation chambers to increase their dust load capacity whilst reducing the load on the filter cartridges. Maintenance is from the top, within handrails if specified. A range of space saving integral fans from 5,5 kW to 18,5 kW may be specified, with optional air silencers. Larger units may be served by floor mounted high efficiency Combi-fab fans".

FIGURE 9: LCP CARTRIDGE DUST COLLECTOR SYSTEM ILLUSTRATION. SOURCE: ENVIROX, 2020

LCP cartridge dust collectors are designed for continuous operation in process and general dust extraction applications with free-flowing dust. The LCP dust collector is also fitted with specialised components called ATEX certified explosion relief panels and a back-pressure flap valve when handling explosive dusts St1, St2 or St3 which is generated from the carbonisation process in a gaseous form at high temperatures. The system also includes dedicated control systems for complete dust extraction. The system collects dust particles of 2.5mm size.

FIGURE 10: ILLUSTRATION OF THE FIRE CONTROL SYSTEM WITH A BACK-PRESSURE FLAP VALVE. SOURCE: ENVIROX, 2020

Combustible dusts are ranked into one of four classes: ST0, ST1, ST2, ST3 according to Dr. Ashok (Fauske and Associates, LLC., 2020). The proposed project will produce charcoal dust which is classified as an ST1 class combustible dust. The LCP cartridge dust collector system includes equipment that is ATEX certified and will prevent explosions (Envirox, 2020). In the event of a possible dust explosion the unit will vent the explosion into a safe atmospheric area ensuring no employees or products are harmed in any way (Envirox, 2020). See Appendix G.

4.10 ALTERNATIVES CONSIDERED

The proposed project has been subjected to a process of design evolution, informed by both consultation and an iterative environmental assessment. In terms of the Environmental Management Act, No. 7 of 2007 and its regulations, alternatives considered should be analysed and presented in the scoping assessment and ESIA report. This requirement ensures that during the design evolution and decision-making process, potential environmental impacts, costs, and technical feasibility have been considered, which leads to the best option(s) being identified.

Alternatives that were considered are:

- Dust collector technology (section 4.9) reducing emissions by 99%;
- Mechanical bush thinning equipment (section 4.5) with a lesser footprint;
- Retort carbonisation system (section 4.6); and
- Change in the onsite ablution types from long drops to a French drain system (section 4.15).

The most suitable options and methods were identified and recommended to ensure the impacts on the environment and society from these activities are minimised.

4.11 NO-GO ALTERNATIVE

Should this project not be implemented, no change in the current biophysical environment on farm Gai //Khaisa no.159 will occur. No impacts to the biophysical or socio-economic environment will occur.

However, the current encroachment situation on the farm would worsen and would most likely be exacerbated by ongoing unsustainable subsistence farming activities characterised by grazing mismanagement. The opportunity for socio-economic advancement of locals would not be realised.

4.12 POWER SUPPLY

Power will be generated from silenced diesel power generation sets linked up to a central Distribution Board (DB) between the plant and the retorts.

4.13 FUEL

Diesel fuel will be supplied and stored on site by Northern Fuel Distributors whose headquartered in Otjiwarongo. A supply of 14 000 litres of diesel fuel will be kept in an above ground bowser. Fuel will only be used to power bush thinning machinery. Fuel handling will be according to risk mitigation measures contained in the EMP.

4.14 WATER SUPPLY AND USE

Estimated water consumption of about 200m³/month for production plus household consumption for about 40 people.

Relatively small quantities of water will be used for the manufacturing process of the briquettes. Briquettes are typically manufactured from mainly charcoal and a small percentage (5-10%) binding agent and water.

Water will solely be obtained from onsite boreholes. The proponent will ensure that all abstraction permits are in place prior to project commencement. If an additional borehole is required, the relevant abstraction permit shall be obtained from the Ministry of Agriculture Water and Forestry. Water shall be abstracted according to the sustainable yield figure stipulated on the abstraction permit.

4.15 WORKERS ACCOMMODATION

Approximately 50 possible job opportunities are foreseen to be created for the Retort Charcoal Producers development. The workers will be deployed at various components of the business including but not limited to bush thinning, charcoal and briquette production, maintenance and general operations.

Existing infrastructure and houses on site will be renovated and changed to be used by personnel on site. The proponent will provide adequate housing to staff with basic amenities included (ablution facilities i.e., flush units linked to a French drain system) per accommodation quarter on farm Gai//Khaisa no.159.

4.16 WASTE MANAGEMENT (SOLID AND EFFLUENT WASTE)

Solid and effluent waste will be generated by the project. Waste produced on site will include sewerage and solid waste such as packaging.

Examples of further types of wastes include spent solvents and oily rags, empty paint cans, chemical containers; used lubricating oil; used batteries (such as nickel-cadmium or lead acid); and lighting equipment, such as lamps or lamp ballasts (IFC, 2007).

Wastewater (i.e., water from wash bays) will be recycled where possible, and effluent contained and allowed to evaporate after use. Solid and hazardous waste will be disposed of at the Grootfontein municipal waste disposal site. The proponent shall ensure waste transport certificates are provided. No toxic waste will be discharged into the environment. On site waste management guidance according to IFC standards are contained in the EMP.

4.17 HAZARDOUS WASTE

Hazardous waste (hydrocarbon contaminated soil, etc.) generated on the project site will be handled and disposed of at the Grootfontein municipal landfill site. Hazardous waste shares the properties of a hazardous material (i.e., ignitability, corrosivity, reactivity, or toxicity), or other physical, chemical, or biological characteristics that may pose a potential risk to human health or the environment if improperly managed (IFC, 2007).

5 BASELINE / CURRENT BIOPHYSICAL ENVIRONMENT

This section provides an overview of the existing biophysical environment through the analysis of the baseline data regarding the existing natural and socio-economic environment. Desktop studies on the national database are undertaken to get information of the current status of the receiving environment. This provides a baseline where changes that occur as a result of the proposed project can be measured.

5.1 CLIMATE

Namibia is located within the zone where high-pressure systems are prevalent. Over the interior of Namibia, the Kalahari High dominates, especially during winter when the subsiding air causes cloudless days with stable sinking air. During summer the positions of the high-pressure cells fluctuate more, allowing low pressure cells to develop over the heated interior, which in turn pull moist air from the inter-tropical convergence zone. As the moist air from the north and the east moves south and west, the northeast parts of Namibia receive the most rain – diminishing in a direction to the south and west.

Farm Gai//Khaisa no. 159 is located in a part of Namibia which receives between 500 and 550 mm of rain per year, with a variation coefficient of <30%. Rainfall events are limited to the summer months, starting in November and ending in April, but mainly between December and March, in the form of thunderstorms often associated with heavy downpours. Potential evaporation is between 1,960 and 2,100 mm per year, meaning an average water deficit of between 1,500 and 1,700 mm per year. Relative humidity is low, rarely more than 20% in winter but may reach 85% in summer before or after thunderstorm build-up. Maximum temperatures average around 32 - 34°C, mainly recorded during the afternoons between November and January, while minimum temperatures are around 4 - 6°C and are normally recorded during nights in June and July. Deviations from these averages are common, with the highest temperatures reaching 38 - 40°C and the lowest temperatures below 0°C. Frost during the winter months may occur but is not common (Mendelsohn et al., 2002).

Due to the rhythm of the air pressure systems, the wind patterns over the interior remain fairly predictable. Prevailing wind over the study area is expected to be from the east and northeast, with occasional airflow from the southeast and southwest. Wind speed is expected to range between 5-12km/hr. The stronger air movements during the afternoons and evenings are the result of the ground being heated more in some places than others. During the winter months wind speed is slightly higher (Mendelsohn, et al., 2002).

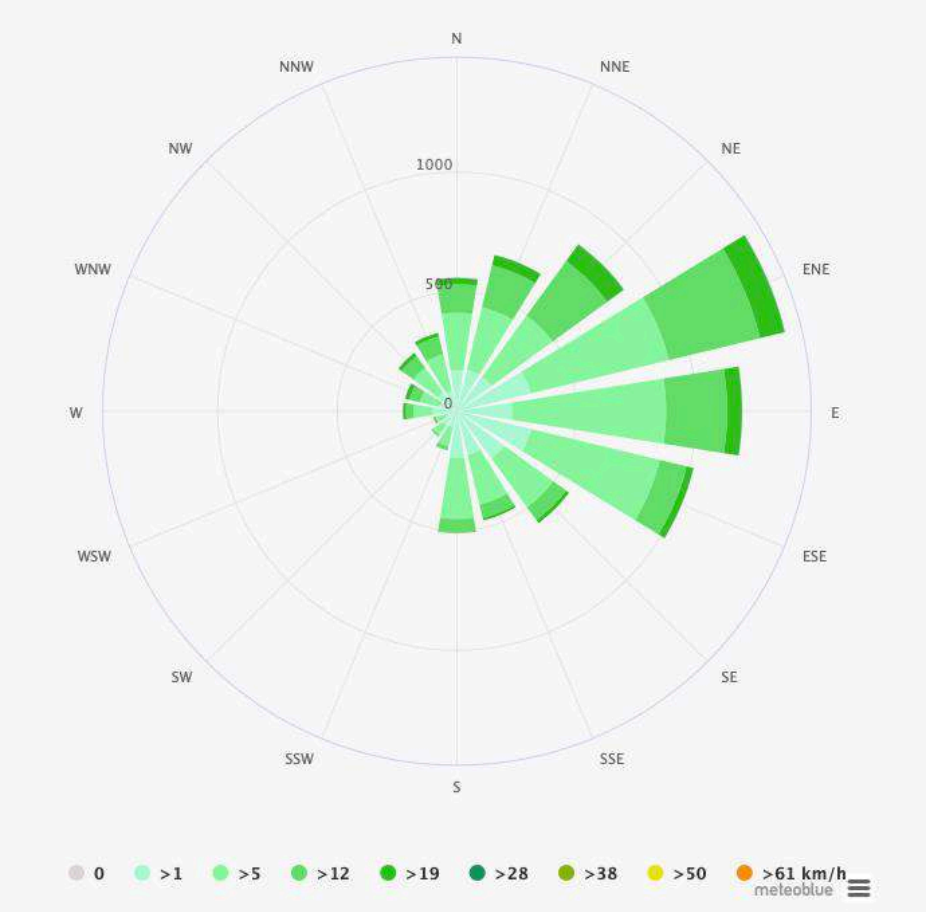

FIGURE 11: WIND ROSE OF THE GENERAL KOMBAT AREA. SOURCE: METEOBLUE.COM 2020

5.2 GEOLOGY

The study area is located where formations of the Swakop Group, which form part of the Damara Supergroup (600 – 850 million years old), show a surficial transition to the Waterberg Basin of the Karoo Supergroup (180 – 300 million years old). See Figure 12. Like the dolomites of the Otavi Group, which also form part of the Damara Supergroup, the schists of the Swakop Group are oriented in a predominantly SW-NE direction with a northern extension into what is known as the Otavi Mountains (Mendelsohn et al., 2002).

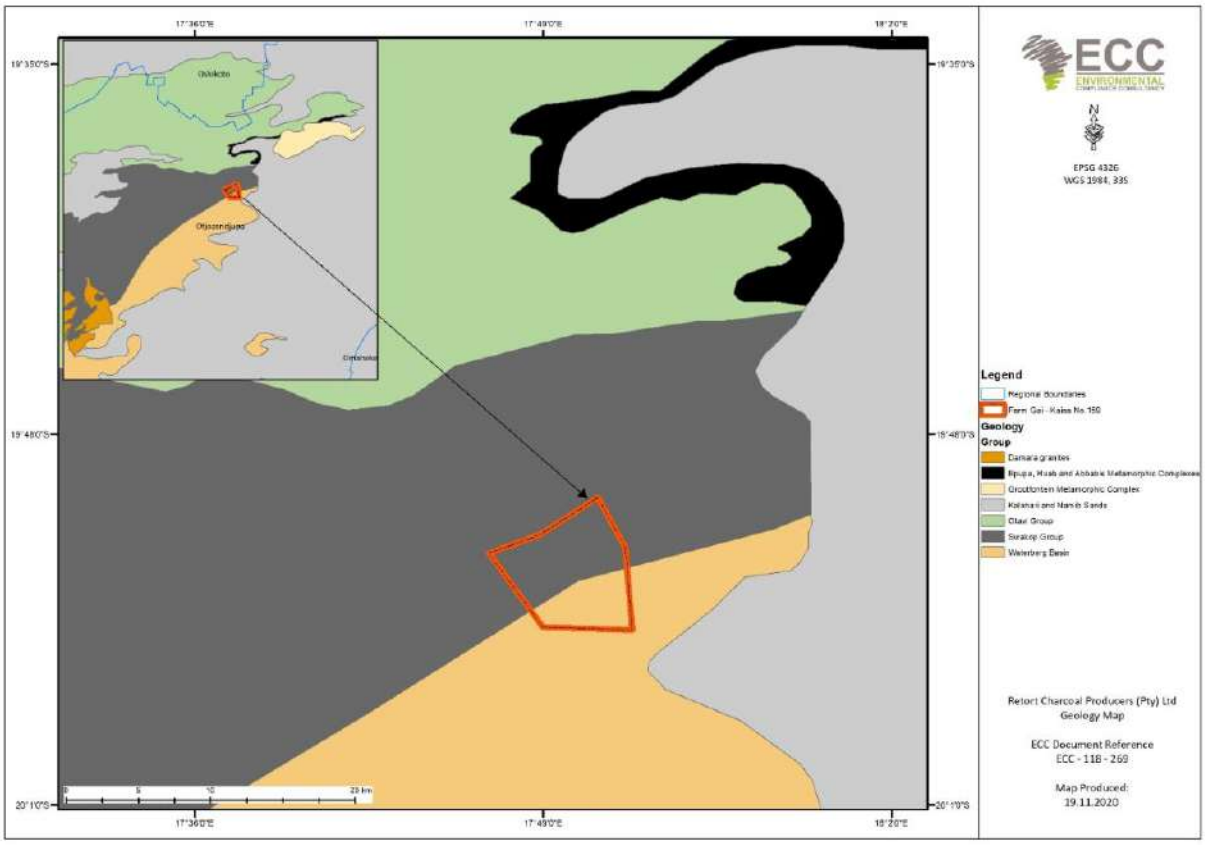

FIGURE 12 – REGIONAL GEOLOGICAL SETTING OF THE STUDY AREA

The origin of the Otavi Mountains is associated with the ancient sea between the Congo and Kalahari Cratons. Over millions of years a lime and dolomite rock mass of up to 5,000 m thick was formed, which was pressed upwards and folded intensely as the result of a gigantic collision between the two mainlands approximately 650 million years ago. Later the landscape was subject to a prolonged period of erosion, and only some of its higher parts preserved a mountainous character. Erosion effected the water-soluble limestones, creating a karst landscape marked by several synclinal and anticlinal axes, and underlain by carbonate rocks (mainly silicified dolomites). At the southern foothills of the Otavi Mountains the schists of the Swakop Group are the remains of the sediments on the ancient sea floor. The project area is situated in this zone – on a relatively flat landscape south of the Otavi Mountains.

During the wet periods of the Karoo age big rivers deposited sediments that became the sandstones and conglomerates of what is known today as the Waterberg Basin. The climate became increasingly drier and when the wetlands finally dried up about 180 million years ago, the former landscape was covered with sand, which solidified as the Etjo sandstones.

To the east a transition to the more recent Kalahari deposits (<70 million years old) becomes increasing apparent. This flat-lying landscape cover most of the older formations and show vary little geological variation on the surface (Mendelsohn et al., 2002).

5.3 TOPOGRAPHY AND SOILS

The topography of the study area is influenced by the increasing elevation towards the Otavi Mountains in the northwest, reaching an elevation of almost 1,600 m above mean sea level. Towards the southeast the landscape flattens gradually to an elevation of 1,350 – 1,300 m above mean sea level (Figure 13).

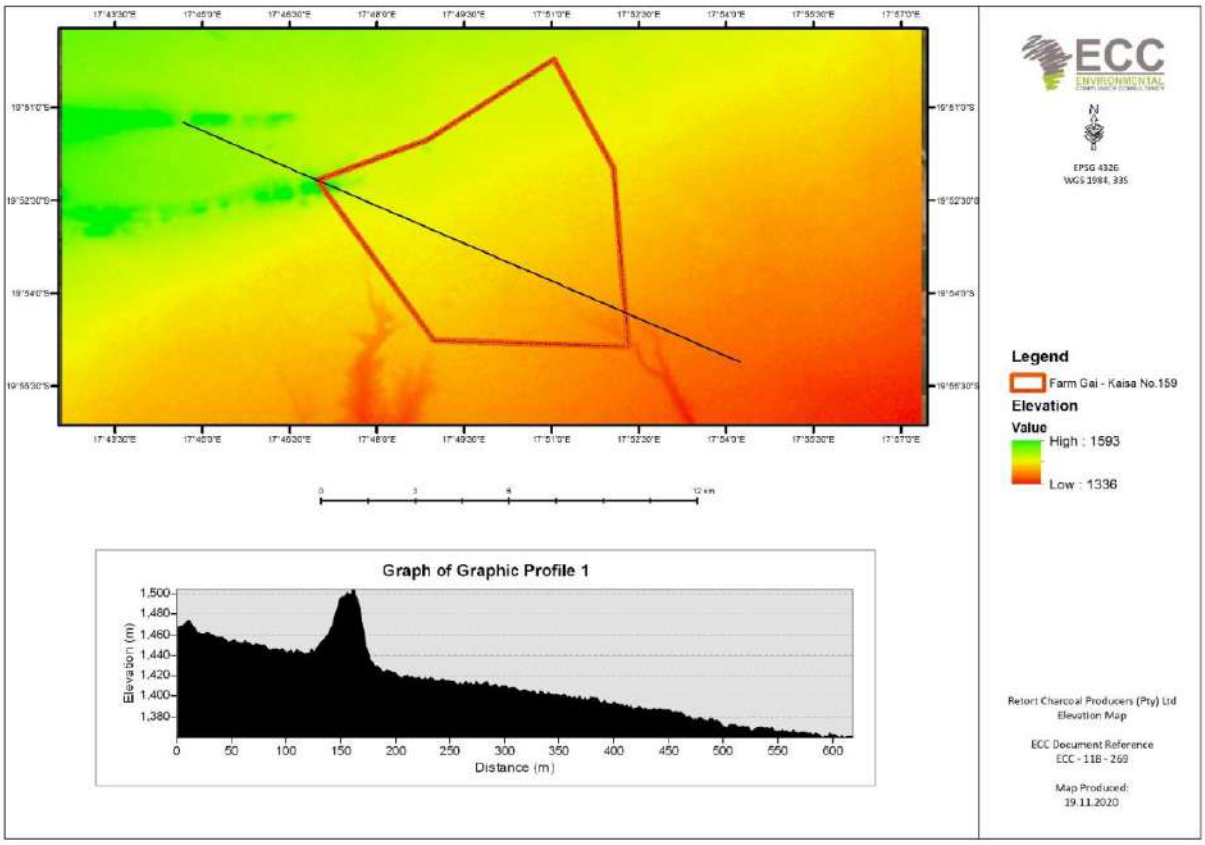

FIGURE 13 - ELEVATION PROFILE OF THE STUDY AREA

The entire study area is located where mollic leptosols dominate the landscape. This soil type is typically associated with a landscape prone to denudation. Leptosols are marked by a shallow soil profile (indicating little influence of soil-forming processes) and contain large amounts of gravel. Leptosols are coarse-textured, underlain by solid rock within 30 cm from the surface. The soil is thus poorly developed and thin, lacks appreciable quantities of accumulated clay and organic material and is susceptible to erosion during the rainy season, especially in the beginning of the rainy season when vegetation cover is sparse. As the topsoil is loose and thin, it is also susceptible to wind erosion, especially when the vegetation cover is sparse (Mendelsohn et al., 2002).

Eutric fluvisols (in the south of the study area) are associated with the ephemeral drainage lines of the Kalahari. These soils were intensely reworked during its formation, as a result of flooding. As the Kalahari landscape became more desiccated, the fluvisols became more stagnant and lost much of the original organic material and nutrients, meaning that it has lost a substantial degree of its original fertility. Fluvisols occur in proximity of the few tributaries of the ephemeral Omatako River which flow south of the study area.

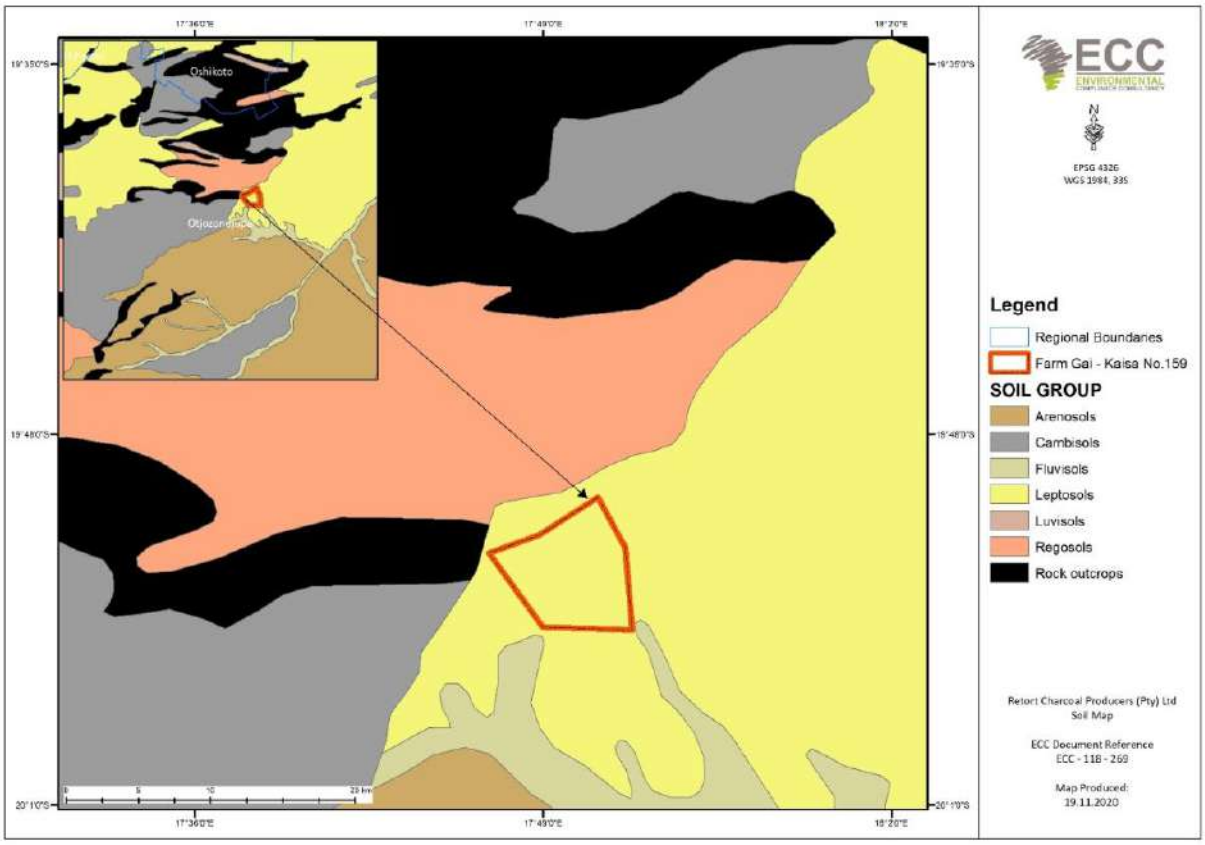

FIGURE 14 - REGIONAL SOIL MAP OF THE STUDY AREA

5.4 HYDROLOGY

The study area is located southeast of the Otavi Mountains. Being a karst landscape, the Otavi Mountains are without any surface drainage channels. Tributaries of the Omatako River originate on or near the study area (Figure 15). All of these drainage lines are ephemeral, i.e., it only contains surficial water for brief periods shortly after sufficient run-off is received in the headwaters as a result of downpours.

The Omatako River is one of the longest in Namibia and ends in the Okavango River on Namibia's border with Angola. The river has an exceptional flat longitudinal gradient - about 800 m over a distance of more than 600 km, mirroring the flatness of the Kalahari landscape it transcends.

The study area is located in the Omatako Groundwater Basin (Figure 15). The general direction of the groundwater flow is east and southeast along a through towards the Omatako River. In the west the groundwater potential is less favourable, but it improves towards the east and southeast, and then following the same direction as the Omatako River (Christelis and Struckmeier, 2001).

In the study area freshwater is obtained from borehole abstraction. Four recorded boreholes occur on the farm (figure 15).

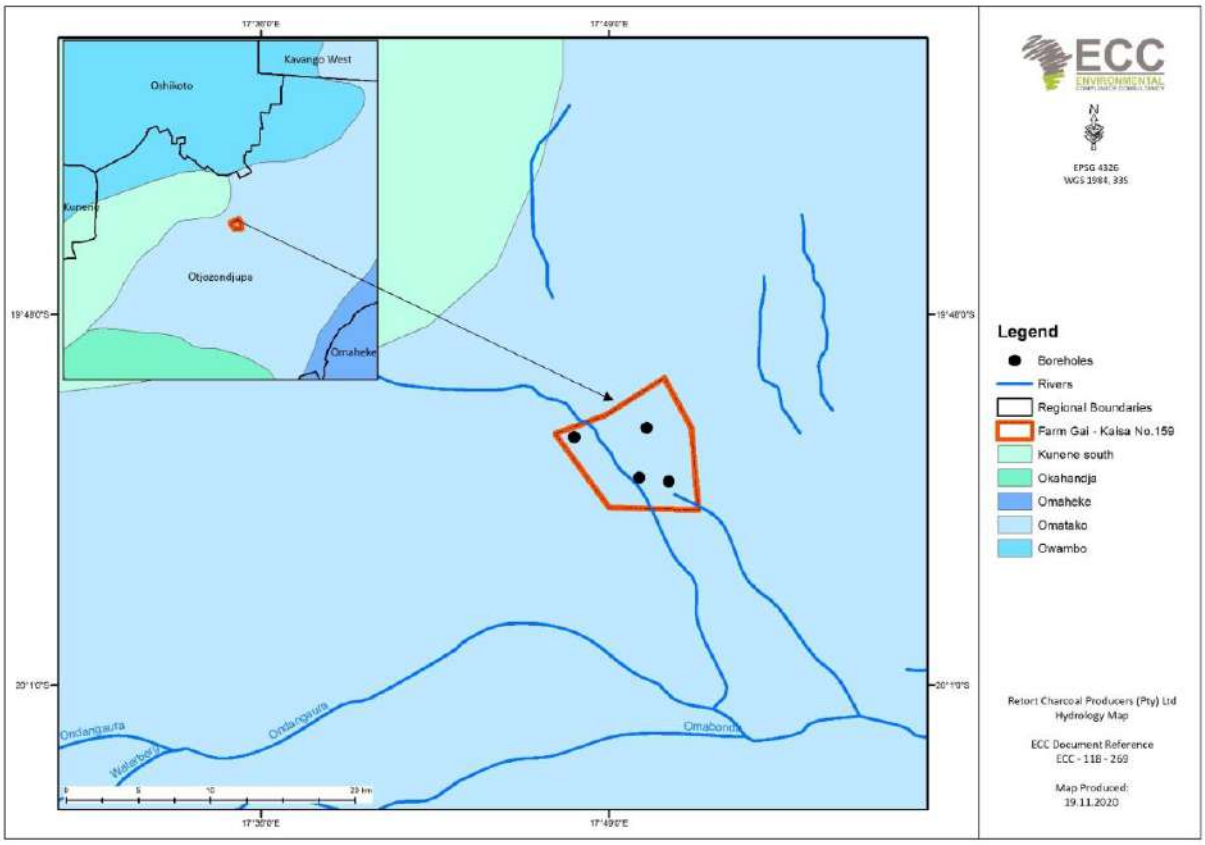

FIGURE 15 - REGIONAL HYDROLOGICAL MAP OF THE STUDY AREA

5.5 VEGETATION

The study area is covered with the Northern Kalahari vegetation type of the Broad-leaved Tree-and-shrub Savanna sub-biome, showing a transition towards the Thornbush Shrubland vegetation type of the Acacia Tree-and-shrub Savanna to the northeast (Figure 16). Where the soils are shallower and the landscape hillier, plant growth tends to be shrubby. To the southeast, where the soils become deeper and the landscape flattens, vegetation is characterized by a dense tree and bush savanna, dominated by Acacia species and annual and perennial grasses. Thornbush thickets dominate on the sandy parts. Most of the woody vegetation vary between 1 and 5m in height. Plant diversity is estimated to be more than 500 species in the general Kombat area, although local differentiation as a result of topography, shelter and the availability of water is possible. Endemism in this area is viewed as “average” with 6-15 species and known for its local endemics (Cunningham, 2020). Biophysical baseline information does not accentuate the uniqueness of mountain vegetation and the diversity of plants species may converge on relatively small, elevated areas in which there are several habitats and niches offered by micro-climate, elevation, water and sheltered spaces. Most of the endemic, near endemic and protected floral species may occur (even on farm Gai//Khaisa no.159, although most of these are common and widespread. Plant endemism is estimated between five and fifteen species (Mendelsohn et al., 2002).

The most important environmental variable affecting vegetation in this part of the country is rain and to a lesser extent frost, but micro-habitat conditions and rangeland management practices determine bush density and grass composition. Grazing resources are made up of a wide variety of grass species, which vary widely in palatability and abundance. Bush thickening (encroachment) problems are experienced in the

general area with densities of between 4,000-12,000 plants/ha for *Dichrostachys cinerea* being the most contentious species (Cunningham, 2020).

It is estimated that at least 145 larger trees and shrubs (>1m in height) and 111 grasses are known to or expected to occur in the general area of which a low proportion are endemics (Cunningham, 2020).

Thirty-six (24.8% of total specie occurrence) species of larger trees and shrubs have some kind of protected status in the general area (this includes endemic and near endemic species) of which 25 species are protected by the Forest Act No. 12 of 2001(17.2%), 4 species are protected by the Nature Conservation Ordinance No. 4 of 1975 (2.8%) and 3 species are listed as CITES Appendix 2 species (2.1%). The IUCN (2020) classifies 19 species as least concern (13.1%) although not all the species have been assessed by the IUCN Red List.

The most important larger tree and shrub species are viewed as *Cyphostemma juttae* (endemic, protected by Forest Act and Nature Conservation Ordinance) and *Erythrina decora* (endemic, protected by Forest Act) from the general area. The Farm Gai//Khaisa no. 159 is located to the south of the most important parts of the Mountain and Karstveld although there are limestone outcrops (See Figure 5) which potentially have some of the important species mentioned in Table 5 within the specialist study conducted by Peter Cunningham.

However, none of the larger trees and shrubs is expected to be exclusively associated with the Farm Gai //Khaisa no. 159 development site (Cunningham, 2020).

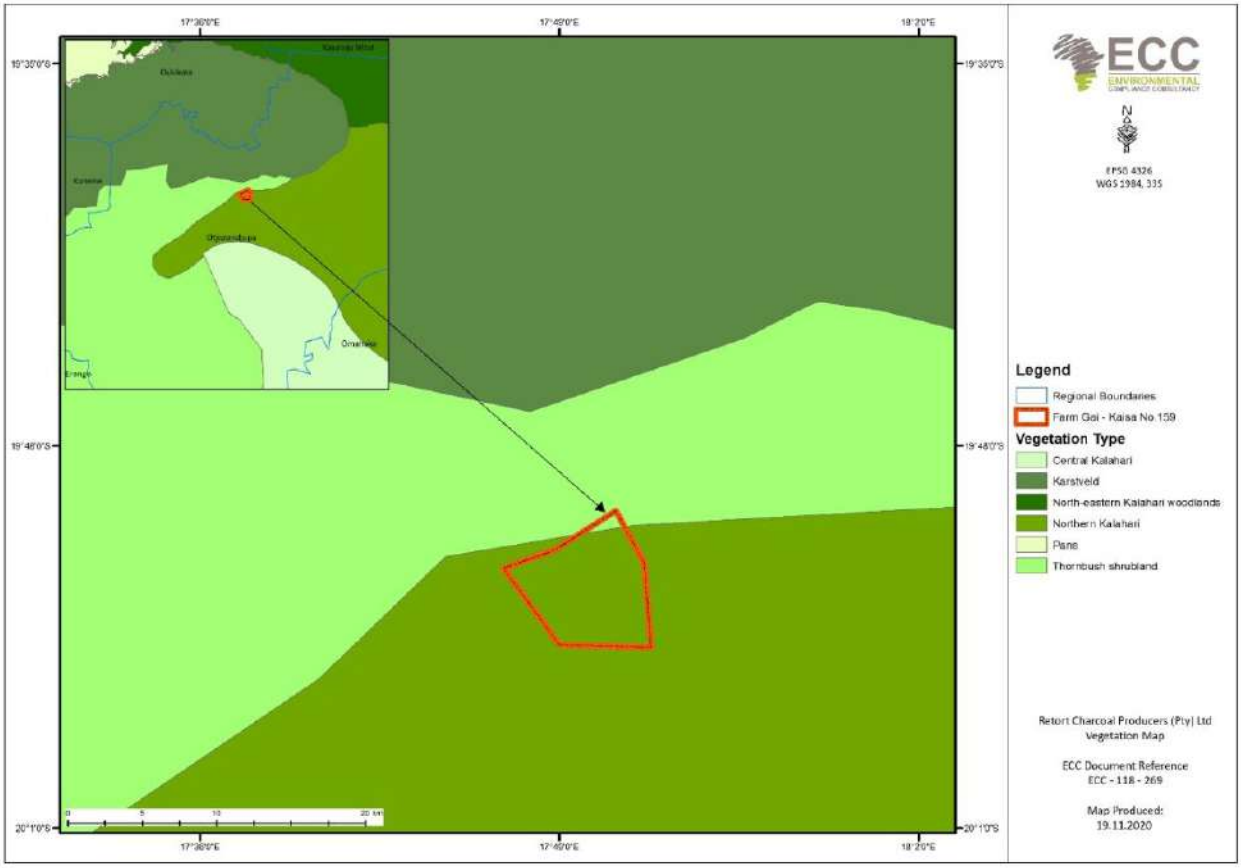

FIGURE 16 - REGIONAL VEGETATION MAP OF THE STUDY AREA

5.5.1 ENCROACHER BUSH SPECIES THAT MAY POTENTIALLY OCCUR ON FARM GAI//KHAISA NO.159

Some potential encroacher species that may likely occur on the project site is illustrated below. These species are useful as biomass for charcoal production.

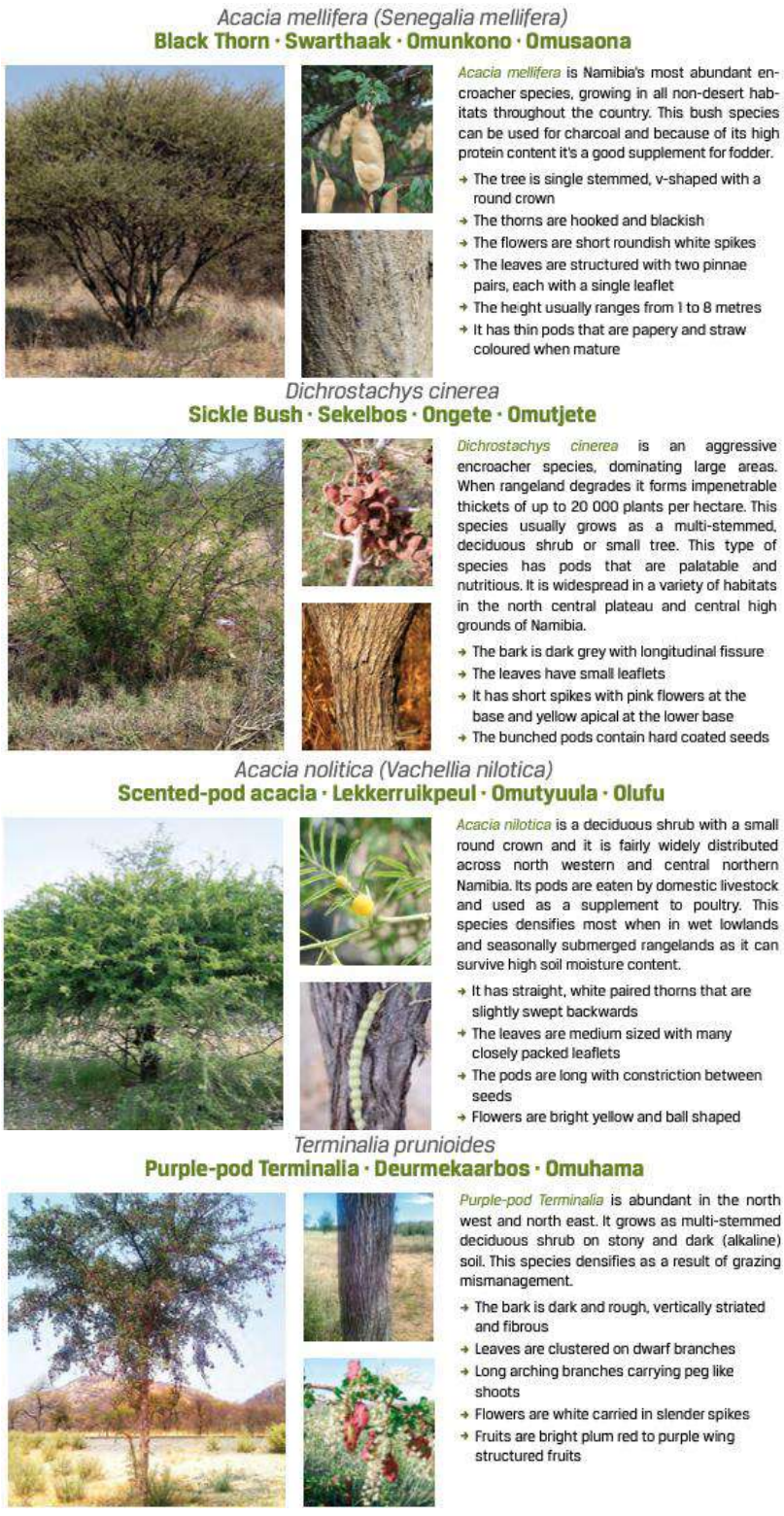

FIGURE 17: ENCROACHER BUSH SPECIES WITH LIKELY OCCURRENCE POTENTIAL ON FARM GAI//KHAISA NO.159 (DAS,2017)

5.6 FAUNA SPECIES

Namibia supports approximately 30% of the continent's species diversity of which at least 22% or 55 species of Namibian lizards are classified as endemics. Sixty-seven (67%) of Namibian reptiles are classified as species of "conservation concern" (Cunningham, 2020).

As endemism trends in Namibia show a clear decline to the east, the number of endemic fauna species possible is expected to be low, although the overall terrestrial biodiversity in the study area ranges from medium to high, showing a clear increase towards the higher elevations associated with the Otavi Mountains. The number of mammal species ranges between 76 and 90, the number of bird species is between 201 and 230, with 71 – 80 reptile species, 12 – 15 frog species and 10 – 11 scorpion species that could be expected (Mendelsohn et al., 2002). On a local scale it is expected that diversity increases with the increase in habitats, which is closely coupled to shelter, food and water availability and migration routes. Elevation and water availability play a prominent role in this regard and is directly related to the increase in terrestrial diversity towards the Otavi Mountains.

Ephemeral drainage lines are viewed as important for flora as most of the larger specimens, protected and otherwise, are often associated with such areas and serve as habitat for various vertebrate fauna – to amphibians it is a suitable habitat and breeding site, to reptiles it is a foraging site, and to birds and mammals it provides drinking water, shade and shelter. Birds often use the higher vegetation near pans and drainage lines for roosting, nesting and perching.

The dominant land use of the surroundings is extensive agriculture, in particular large livestock farming. To protect their livestock, farmers are required to manage predators such as cheetahs, leopards and caracals.

None of the reptiles, amphibians, mammals and birds that may occur within the general Kombat study area are expected to be exclusively associated with the farm Gai//Khaisa no. 159 development site (Cunningham, 2020). See specialist vertebrate fauna and flora associated with farm Gai//Khaisa no.159 study conducted by Peter Cunningham in Appendix E. The specialist study also lists all species with a conservation status that is expected to occur within the general Kombat area.

5.7 SOCIO-ECONOMIC ENVIRONMENT

The study area is located within the Otjozondjupa Region. Otjozondjupa is one of the bigger regions of Namibia and is located in the northern half of the country, bordering the Khomas and Omaheke Regions in the south, the Erongo and Kunene Regions in the west and the Oshikoto, Kavango-West and Kavango-East Regions in the north. In the east the region stretches along the international border with Botswana.

5.7.1 DEMOGRAPHY

Namibia is one of the least densely populated countries in the world (2.8 persons per km^2). Vast areas of Namibia are without people, in contrast to some fairly dense concentrations, such as the central-north and along the Kavango River. The population density of the Otjozondjupa Region, where the project is located, is low (1.5 persons per km^2) when compared to the national average, and the total population of the region was estimated at 154,342 in 2016. In 2011 54% of the total population in the region lived in urban settlements – this figure has increased to 66% in 2016 (NSA, 2017), confirming the current growth of urban areas like Otjiwarongo.

Otjiherero and Oshiwambo are the most spoken languages in the region (both 29% of all households) and the average household size in the Otjozondjupa Region comprises 3.9 persons. The literacy rate for the

region is 83% for people older than 15 years. Ninety-eight (98%) percent of all households have access to safe water, 39% have no toilet facility, 63% have electricity for lighting and 48% of the population depend on open fires to prepare food (NSA, 2017).

5.7.2 GOVERNANCE

Namibia is divided into 14 regions, subdivided by 121 constituencies. The Otjozondjupa Region is divided into seven constituencies. Each region has a regional council, per constituency. Towns are governed through local authorities, in the form of municipalities, town councils and village authorities.

Otjiwarongo is the capital and also the largest town of the Otjozondjupa Region. Many of the region's head offices are located in the town. Other towns of the region are Grootfontein, Otavi, Okahandja and Okakarara.

5.7.3 EMPLOYMENT

Low education levels affect employability and prevents many households to earn a decent income. Of all people employed in Namibia, 63.5% are not higher qualified than junior secondary level (Grade 10 and lower). In total 11.8% of all people employed had no formal education. In total 29.1% of all people employed fall in the category "elementary occupation" and 15.2% in the category "skilled agriculture" (NSA, 2019).

The rate of unemployment is estimated at 33.4% for Namibia, using the broad definition of unemployment. More than 60% of the population is over 15 years of age and about one-third of the total population can be regarded as part of the labour force. The unemployment rate in rural and urban areas is almost the same – 33.4% in urban areas and 33.5% in rural areas. The highest unemployment rates are found amongst persons with education levels lower that junior secondary. The unemployment rate of persons with no formal education is 28.6%, with primary education 34.6% and with junior secondary education 32.7% (NSA, 2019).

5.7.4 ECONOMY

The economy of the Otjozondjupa Region is predominantly agriculture-based. Extensive livestock farming forms the livelihood of many people and is one of the reasons for the low intensity land use over much of the 105,460 km^2 the region covers, the low total population as well as the low population density. Large parts of the region are covered by commercial and communal farms, mainly for cattle ranching. Guest farms and hunting farms are also common. On both commercial and communal land, bush encroachment decreased the carrying capacity of the farms markedly over the last four decades. The invader bush is managed in several ways, one of which is the production of charcoal for export. In recent times the charcoal industry became a significant source of income and employment in the rural parts of Namibia, including the Otjozondjupa Region.

Several mining activities emerged in the Otjozondjupa Region during the last decade and had a strong influence on the regional demography and economy – not only as a result of the establishment of the Otjikoto Gold Mine of B2Gold between Otavi and Otjiwarongo, but also as a result of other mining projects such as Okuruso and Okanjande and the Whale Rock cement factory of Cheetah Cement near Otjiwarongo and Ohorongo Cement near Otavi.

Several new government offices have been established in Otjiwarongo as part of an effort to accentuate the town as the regional capital. Other factors that influenced the socio-economy of the region, is the

continuous growth of the tourism industry as well as the growing importance of the charcoal industry. Combined, all these factors had a cumulative role in the changing land-use patterns and socio-economic landscape of the region (and the towns), which can only be quantified when comparisons from the next national census with the 2011 census are possible.

Since 2016, Namibia recorded slow economic growth, registering an estimated growth of only 1.1% in 2016. The primary and secondary industries contracted by 2.0 and 7.8% respectively. During 2017 the economy contracted by 1.7, 0.7 and 1.9% in the first, second and third quarters respectively (NSA, 2019). Despite the more positive expectations, the economy retracted to an average growth of not more than 1% annually since 2017.

5.7.5 HEALTH

Since independence in 1990, the health status of Namibia has increased steadily with a remarkable improvement in access to primary health facilities and medical infrastructure. In 2015 the World Health Organization (WHO) recommended strategic priorities of the health system in Namibia which entail improved governance, an improved health information system, emergency preparedness, risk reduction and response, preventative health care and the combating of HIV/AIDS and TB (WHO, 2016).

According to the website of the Ministry of Health and Social Services (MoHSS) the Otjozondjupa Region has a total of 20 primary health care facilities, including three health centres, 18 clinics and four district hospitals – in Grootfontein, Okahandja, Okakarara and Otjiwarongo. There are also private hospitals in Otjiwarongo and Grootfontein.

Like elsewhere in Namibia, HIV/AIDS remains a major reason for low life expectancy and is one of the leading causes of death in the Otjozondjupa Region. HIV/AIDS remains the leading cause of death and premature mortality for all ages, killing up to half of all males and females aged 40 - 44 years in 2013 (IHME, 2016). Tuberculosis (TB) is a leading killer of people infected by HIV/AIDS, and Namibia had a high burden in 2018, 35% of people notified with TB were infected with HIV. The country is included among the top 30 high-burden TB countries in the world, with an estimated incidence rate of 423 per 100,000 people and 60 fatalities per 100,000 people in 2018 (retrieved from www.mhss.gov.na).

In 2016 it was estimated that 15% of all people in the Otjozondjupa Region are younger than five years of age and 22% between five and fourteen years of age. Only 18.3% of children younger than five years of age in the region attended programs of early childhood development in 2016 (NSA, 2017), implying that access to these facilities and access to infant health care facilities is limited.

The largest percentage of people in the Otjozondjupa Region utilize hospitals for medical care (45.9%) and only 25% have to rely on a clinic. Less than 10% of the total population of the Otjozondjupa Region receive their medical treatment from a doctor (NSA, 2017). The death rate of 13.1 deaths per 1000 people for the region was higher than the national average of 10.8% in 2016 (NSA, 2017).

As of the beginning of 2020 the coronavirus disease (COVID-19), caused illness in humans at a pandemic scale and has resulted in an increasing number of deaths worldwide. The viral outbreak is adversely affecting various socio-economic activities globally, and with reports of the increasing number of people testing positive, it is anticipated that this may have significant impacts on the operations of various economic sectors in Namibia too. The disease caused many countries to enter a state of emergency and a controlled lockdown mode, with dire economic consequences. In addition, these measures have a detrimental effect on tourism – and Namibia is in both cases no exception.

5.7.6 HERITAGE

In Namibia several mountains are closely coupled to heritage sites, in particular sites with cultural, historical or archaeological importance, and it is possible that this applies to some of the higher elevations on farm Gai//Khaisa no.159 as well. Drainage lines were also important routes for early inhabitants, and it could be expected that some heritage assets along the tributaries of the Omatako River could be found. The Etjo Mountains are also known for its paleontological importance, mainly due to the dinosaur tracks at Otjihaenamaparero, which is a proclaimed national monument. It is to be expected that more paleontological sites of the same kind may exist in the wider landscape associated with the Etjo Mountains including farm Gai//Khaisa no.159.

The archaeological assessment conducted by Dr. John Kinahan (Appendix F) reported that the area is not archaeologically sensitive based on the indicative value of potential surface finds and existing survey data to which the assessment was limited. Dr. Kinahan cautions that hidden or buried archaeological or palaeontological remains might be exposed as the project proceeds (2020). In cases where heritage sites are discovered the chance-find procedure will be used.

The survey identified two recently dated graves and a possible graveyard in close vicinity of the farmhouse on the farm Gai//Khaisa no.159. Figures 18 and 19 are sourced from Dr. Kinahan's specialist report (2020).

FIGURE 19: GRAVE OF THEODOR, FARMWORKER (1966), WITH HEADSTONE CIRCLED. LOCATED 200M SE OF THE FARMHOUSE (-19.89653S 17.83071E)

FIGURE 18: GRAVE OF ROSEMARIE (1948) AND ERNST ADALBERT (1963) VON GOLDFUS. LOCATED 240M NE OF FARMHOUSE (-19.89643S 17.83109E)

The graves are not classified as archaeologically sensitive and no further investigation is necessary). However, these graves are protected under the Burial Place Ordinance (27 of 1966) to prohibit the desecration or disturbance of graves in burial places and to regulate matters relating to the removal or disposal of dead bodies (Kinahan, 2020). The locality of the grave sites is shown in Figure 20

FIGURE 20 - LOCATION OF THE GRAVE SITES FROM AN AERIAL VIEWPOINT

6 IDENTIFICATION AND EVALUATION OF IMPACTS

This chapter outlines ECCs method to identify and evaluate impacts arising from the proposed project. The findings of the assessment are presented in chapter 7.

The evaluation and identification of the environmental and social impacts require the assessment of the project characteristics against the baseline characteristics, ensuring all potentially significant impacts are identified and assessed. The significance of an impact is determined by taking into consideration the combination of the sensitivity and importance/value of environmental and social receptors that may be affected by the proposed project, the nature and characteristics of the impact, and the magnitude of potential change. The magnitude of change (the impact) is the identifiable changes to the existing environment which may be negligible, low, minor, moderate, high, or very high; temporary/short term, long-term or permanent; and either beneficial or adverse.

This chapter provides the following:

- Details on the assessment guidance used to assess impacts;
- Lists the limitations, uncertainties and assumptions with regards to the assessment methodology;
- Details how impacts were identified and evaluated, and how the level of significance was derived; and
- Details how mitigation was applied in the assessment and how additional mitigation was identified.

6.1 ASSESSMENT GUIDANCE

The principal documents used to inform the assessment method are:

- International Finance Corporation standards and models, in particular Performance Standard 1, ‘Assessment and management of environmental and social risks and impacts’ (International Finance Corporation, 2017) (International Finance Corporation, 2012);
- International Finance Corporation CIA and Management Good Practice Handbook (International Finance Corporation, 2013); and
- Namibian Draft Procedures and Guidance for EIA and EMP (Republic of Namibia, 2008).

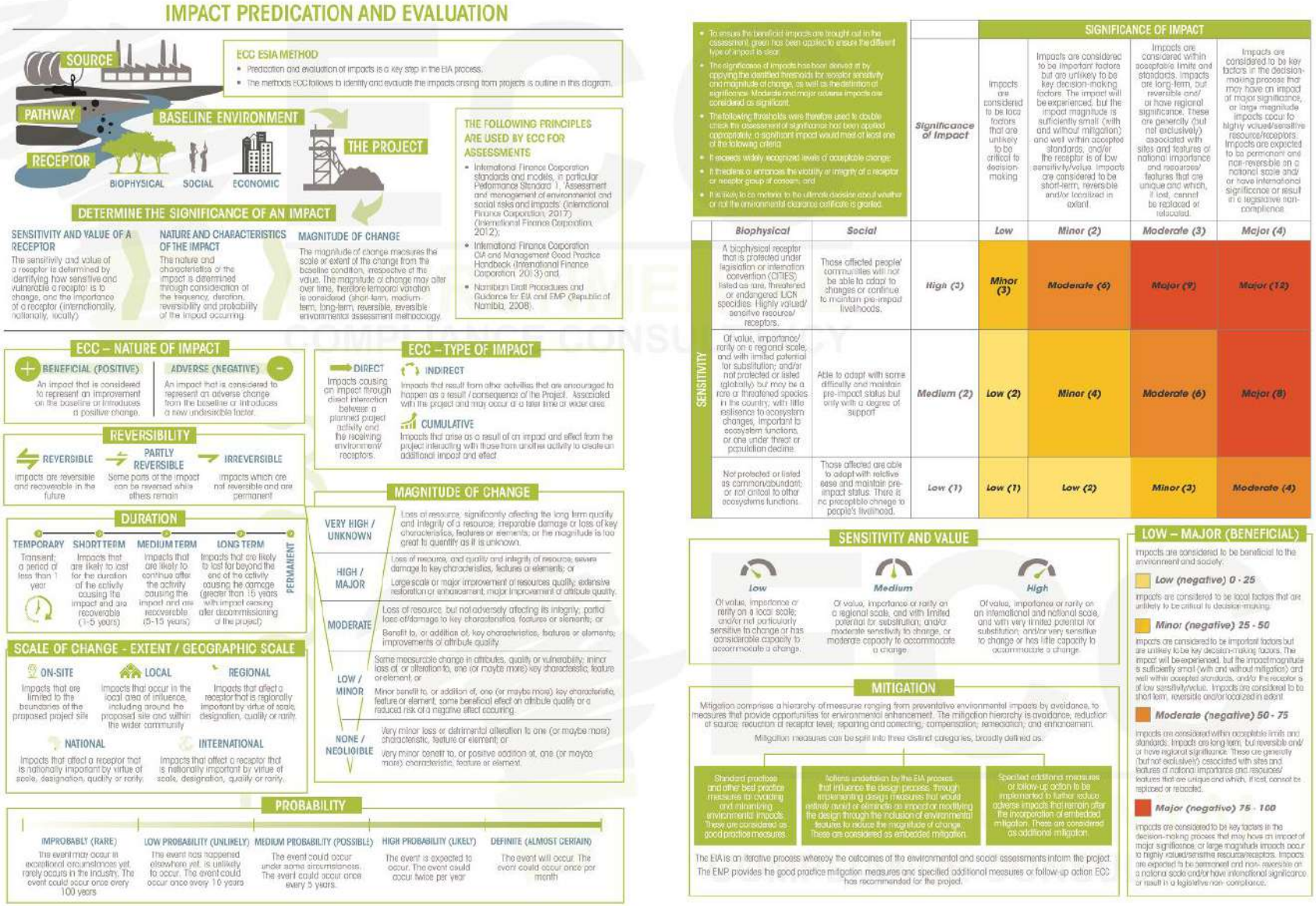

FIGURE 21: ECC'S IMPACT ASSESSMENT METHODOLOGY

6.2 LIMITATIONS, UNCERTAINTIES AND ASSUMPTIONS

The following limitations and uncertainties associated with the assessment methodology were observed:

- Topic specific assessment guidance has not been developed in Namibia. A generic assessment methodology was applied to all topics using IFC guidance and professional judgement.

A number of limitations and uncertainties were acknowledged during the EIA process. In line with EIA best practice, assumptions have been made based on realistic worst-case scenarios, thereby ensuring that the worst-case potential environmental impacts are identified and assessed. Table 5 contains the assumptions and uncertainties identified during the assessment process.

Where uncertainties exist, a cautious approach has been applied, allowing the worst-case scenario for potential impacts to be identified. Where limitation and uncertainties exist, assumptions have been made and applied during the assessment process. These have been clearly described in the baseline section.

TABLE 6 – SUMMARY OF LIMITATION, UNCERTAINTIES AND ASSUMPTION OF THE EIA PROCESS

LIMITATION / UNCERTAINTY	ASSUMPTION
Program of activities	A detailed timeline of the construction and operation activities is not available at this point in time.
Number of workers and area they will come from	It is planned that a full-time team may comprise up to 50 staff members and contract workers. The numbers of contractors are expected to include the following teams: the construction team (temporary); the bush thinning team (permanent) and the charcoal production team (permanent). Moreover, staff will be sourced from the nearby local authority areas such as Kombat and Grootfontein. It is unclear at this stage if all 50 workers may be deployed on site at any given time or only seasonally and phase specific.
Access route and creation of new tracks	The creation of new tracks or access roads will be avoided, and existing tracks and routes will be used as far as possible. While every effort will be made to minimize environmental damage, in some cases it may be necessary to clear some areas to create small roads to access clumps of vegetation identified for thinning. In areas overgrown by sickle bush mechanical methods are not advised for thinning.

7 IMPACT ASSESSMENT FINDINGS AND PROPOSED MITIGATION MANAGEMENT MEASURES

This chapter presents the findings of the EIA for the proposed project as per the EIA process, scope and methodology set out in Chapter 2 and Chapter 6. A range of potential impacts have been identified that may arise as a result of the proposed project. The aim of this EIA report is to focus on the significant impacts that may arise as a result of the proposed project. This chapter therefore only considers the significant impacts and or those that may have specific interest to the community and stakeholders. A summary of impacts that are considered significant is discussed in this section.

When undertaking the assessment exercise, the design of the proposed project and best practice measures were considered to ensure the likely significant effects and any required additional mitigation measures were identified. A summary of the potential impacts and mitigation or control measures are discussed below.

The following topics were considered during the scoping phase:

- Surface water and groundwater;
- Soils and topography;
- Landscape (visual impacts, sense of place);
- Socioeconomics (employment, demographics, and land-use);
- Noise;
- Ecology (fauna and flora);
- Air quality (emissions, pollutants and dust); and
- Cultural heritage.

For each potential significant or sensitive impact, a summary is provided which includes the activity that would cause an impact; the potential impacts; embedded or best practice mitigation (stated where required or available); the sensitivity of receptor that would be impacted; the severity, duration and probability of impacts; the significance of impacts before mitigation and after mitigation measures are applied.

7.1 IMPACTS NOT CONSIDERED SIGNIFICANT

As a result of an iterative development process, mitigation has been incorporated and embedded into the project, thereby designing out potential environmental and social impacts or reducing the potential impact so that it is not significant. Best practice has also played a role in avoiding or reducing potential impacts. The EMP provides best practice measures, management and monitoring for all impacts.

Impacts that have been assessed as not being significant are summarised in Table 6 below and not discussed further.

The listed impacts below are of a non-significant nature and do not render any threat to the environment in a way that adversely challenges the resilience of it to continue in its modified form.

TABLE 7: SUMMARY OF IMPACTS DEEMED NOT SIGNIFICANT

ENVIRONMENT OR SOCIAL TOPIC	POTENTIAL IMPACT	SUMMARY OF ASSESSMENT FINDINGS
Groundwater	The project may store diesel fuel on site (14 000 liters at any given moment). Hydrocarbon leaks and spills could enter the aquifer causing contamination.	Findings are that with the mitigation measures outlined in the EMP, it is unlikely that groundwater may be impacted upon. Even though the site is on a fractured aquifer, infiltration will be unlikely with the establishment of well bunded storage, which should have the capacity of not less than a 110 percent of the volume to be stored.
Impacts on soil	Vegetation clearing to support project activities, increased exposure due to vegetation clearance can cause soil erosion and compaction from heavy machinery.	The proposed project area is located on an already disturbed land. Erosion control and prevention measures are to be in place when vegetation clearance is required.
Visual impacts	Operational activities may increase visible smoke fumes and dust emissions on site.	Mitigation measures through the installation of dust extractors at the industrial sieving, bagging, and conveying operations are outlined in the EMP. The proposed industrial grade retort machinery reduces smoke emissions by 95%. Dust suppression, collection and handling mechanisms shall be applied on the project site. Specific activities that may generate dust and impact road users on the D2512 that run through farm Gai//Khaisa no.159 shall be minimized during high wind events.
Public health impacts	Health nuisances impacts due to ambient air quality and dust pollution.	All employees are to be provided with the appropriate Personnel Protective Equipment (PPE), which should be utilised at all times. Safety inductions will be conducted with the workers before duties commence.
Fire risks and occurrences	Bush thinning activities may increase the risk occurrence of veld fires through anthropogenic means (human error). Fire risks may result in	With the mitigation measures such as a fire protection and prevention plan (to be developed by the proponent), with inclusion of emergency response and firefighting procedures, fire risk can be managed.

ENVIRONMENT OR SOCIAL TOPIC	POTENTIAL IMPACT	SUMMARY OF ASSESSMENT FINDINGS
	property damage and possible injury to personnel.	
Terrestrial ecology and biodiversity	Increased movement of transportation trucks and vehicles for construction and operation activities may results into residing, nesting and slow-moving organisms to be disturbed, injured or killed.	As outlined in the EMP they shall make use of existing tracks and routes only and movements are to be restricted to daytime operating hours. No driving off designated access routes (into the bush) is allowed. However, Where new tracks need to be created the potential path should be surveyed and marked on foot first to observe, identify and relocate any nesting material and possible slow-moving organisms or plants with a conservation status to another portion on the farm.

7.2 Scoping Assessment Findings

When undertaking the scoping exercise, the design of the project and best practice measures were considered to ensure the likely significant effects and any required additional mitigation measures were identified. A summary of the potential impacts and mitigation or control measures were discussed.

Table 7 sets out the findings of the scoping assessment phase. Activities that could be the source of an impact have been listed, followed by receptors that could be affected. The pathway between the source and the receptor has been identified where both are present. Where an activity or receptor has not been identified, an impact is unlikely, thus no further assessment or justification is provided. Where the activity, receptor and pathway have been identified, a justification has been provided documenting if further assessment is required or not required.

Due to the nature and localised scale of the construction and operational activities, and the environmental context of the site, the potential environmental and social effects are limited and unlikely to be significant. The only area where uncertainty remained during the scoping phase was the potential effects on human receptors from the increase movement in the area and dust pollution and visual impacts, namely residents in the nearby houses. Further consideration of the potential effects on humans was therefore undertaken and results are presented in the next section.

TABLE 8- SIGNIFICANT IMPACTS AND PROPOSED MITIGATION MEASURES

DESCRIPTION OF ACTIVITY	RECEPTOR	DESCRIPTION OF IMPACT	EFFECT/DESCRIPTION OF MAGNITUDE	VALUE OF SENSITIVITY	MAGNITUDE OF CHANGE	SIGNIFICANCE OF IMPACT	IMPACT MANAGEMENT/CONTROL MEASURES	RESIDUAL IMPACT AFTER MITIGATION
Construction and operation of the processing plant	**Community**	Triggers job creation, skills development and downstream spending opportunities within the local and regional economy	Beneficial Direct Reversible Minor Short term Local Possible	Low	Minor	Low (2)	- Maximize local employment; - As far as possible promote local procurement of goods and services; and - Enhance development of local skills where possible.	Low beneficial
Mobile and static equipment In use	**Workforce (health and safety on site)**	Equipment used during construction and plant operations may cause injury to personnel	Adverse Direct Partly Reversible Negligible Permanent On-site Possible	Major	Medium	Moderate (6)	- Safety induction training sessions should be given to all technicians and field staff prior to commencement of their shifts; - Risk identification and suitable prevention measures should be employed within the plant area to eliminate potential impacts; - Routine medical checks	Low (2)

DESCRIPTION OF ACTIVITY	RECEPTOR	DESCRIPTION OF IMPACT	EFFECT/DESCRIPTION OF MAGNITUDE	VALUE OF SENSITIVITY	MAGNITUDE OF CHANGE	SIGNIFICANCE OF IMPACT	IMPACT MANAGEMENT/CONTROL MEASURES	RESIDUAL IMPACT AFTER MITIGATION
							to be conducted on personnel to ascertain fitness for work levels; - Frequent maintenance of all equipment and daily inspections done; and - No unauthorized use of equipment is allowed.	
Ground control: Safety of neighbouring farm residents and their livestock.	**Community and livestock**	Presence of workers (during construction and operation phases) may pose personal safety and poaching risks to neighbours surrounding the project site.	Adverse Direct Reversible Moderate Short-term Local Possible	Medium	Minor	Minor (4)	- Develop and implement an operation manual or procedures to work on private farms and implement monitoring programs thereafter to control ground movements; - Maintain continuous engagement with residents to identify any concerns or issues, and appropriate mitigation and management measures agreed upon; - Ensure appropriate supervision of all activities; - Raise awareness and	Low (2)

DESCRIPTION OF ACTIVITY	RECEPTOR	DESCRIPTION OF IMPACT	EFFECT/DESCRIPTION OF MAGNITUDE	VALUE OF SENSITIVITY	MAGNITUDE OF CHANGE	SIGNIFICANCE OF IMPACT	IMPACT MANAGEMENT/CONTROL MEASURES	RESIDUAL IMPACT AFTER MITIGATION
							sensitize employees about contentious issues such as stock theft and poaching; and - Accidents and incidents need to be reported to project manager and recorded in incident register.	
Site establishment of laydown area and plant on a previously disturbed area	**Terrestrial ecology and biodiversity**	Impacts to soil during construction of laydown area and plant site	Adverse Direct Reversible None/ negligible Short-term On-site Unlikely	Low	Low	Low (1)	- Ensure erosion control and prevention measures are in place when levelling the ground for site establishment; - Install and ensure that stormwater diversions are in place if the construction site of the plant is in a water flow path. - Ensure the site's spill prevention procedures and spill kits are on site.	Low (1)
Fuel and other hydrocarbons	**Groundwater quality**	Contamination due to site	Adverse Direct	Medium	Minor	Minor (4)	- Good house keeping - Training through toolbox talks and induction	Low (2)

DESCRIPTION OF ACTIVITY	RECEPTOR	DESCRIPTION OF IMPACT	EFFECT/DESCRIPTION OF MAGNITUDE	VALUE OF SENSITIVITY	MAGNITUDE OF CHANGE	SIGNIFICANCE OF IMPACT	IMPACT MANAGEMENT/CONTROL MEASURES	RESIDUAL IMPACT AFTER MITIGATION
stored on site		operations such as maintenance activities, loss of containment, accidental fuel / hydraulic fluid leaks and spills, or similar sources.	Partly reversible Minor Short-term Regional Unlikely				- All stationary vehicles and machinery must have drip trays to collect leakages of lubricants and oil - Spill kits and absorption material available during fuel delivery, storage or use - Accidental spills and leaks (including absorption material) to be cleaned as soon as possible - Major spills to be reported, also to the authorities - Maintenance and service schedules on equipment is in place - Store bulk fuel in adequate containment areas (non-porous surface, bunded) - No damaged containers in use - Preventative measures	

DESCRIPTION OF ACTIVITY	RECEPTOR	DESCRIPTION OF IMPACT	EFFECT/DESCRIPTION OF MAGNITUDE	VALUE OF SENSITIVITY	MAGNITUDE OF CHANGE	SIGNIFICANCE OF IMPACT	IMPACT MANAGEMENT/CONTROL MEASURES	RESIDUAL IMPACT AFTER MITIGATION
							will be in place when service and maintenance activities are done (drip trays, non-porous surfaces, funnels, non-damaged containers); - Refueling will be done in areas with adequate preventative measures in place.	
Waste generation on site	**Surface water**	Inadequate management of waste on site can litter and pollute surface drainage channels	Adverse Direct Reversible Minor Temporary On-site Unlikely	Low	Low	Low (1)	- Good housekeeping - Training and awareness through toolbox talks and induction - Implement a Standard Operational Procedure on waste management, from cradle to grave for all kinds of waste possible on-site (i.e. domestic, mineral, hydrocarbons, hazardous, etc.) - Raise awareness about the importance of responsible waste management - Implement a culture of	

DESCRIPTION OF ACTIVITY	RECEPTOR	DESCRIPTION OF IMPACT	EFFECT/DESCRIPTION OF MAGNITUDE	VALUE OF SENSITIVITY	MAGNITUDE OF CHANGE	SIGNIFICANCE OF IMPACT	IMPACT MANAGEMENT/CONTROL MEASURES	RESIDUAL IMPACT AFTER MITIGATION
							correct waste collection, waste segregation and waste disposal - Avoid hazardous waste on site - Wastewater discharges will be contained – no disposal of waste water	
Operation activities i.e., (offloading, crushing, sieving and general handling of charcoal products)	**Air quality**	Reduction of the ambient air quality in the area; Charcoal dust emission impacts	Adverse Direct Reversible Moderate Short term On-site Almost certain	Low	Moderate	Minor (3)	- An effective charcoal dust extractor and handling unit to be installed at the industrial sieving, bagging and conveying operations; - Any charcoal dust related issues and complaints shall be registered, and mitigation steps taken to address complaints where necessary i.e., dust suppression; and - Monitor air quality to detect areas of concern by implementing dust monitoring stations around the plant	Low (2)

DESCRIPTION OF ACTIVITY	RECEPTOR	DESCRIPTION OF IMPACT	EFFECT/DESCRIPTION OF MAGNITUDE	VALUE OF SENSITIVITY	MAGNITUDE OF CHANGE	SIGNIFICANCE OF IMPACT	IMPACT MANAGEMENT/CONTROL MEASURES	RESIDUAL IMPACT AFTER MITIGATION
							proportional to the direction of potential sensitive receptors.	
Continuous processing of biomass to produce charcoal	**Ambient noise**	Production noise emissions from biomass production plant; the operation of mechanised bush thinning machinery on farm Gai//Khaisa no.159.	Adverse Direct Reversible Moderate Short term On-site Possible	Low	Low	Low (2)	- Develop a noise management standard operating procedure for the plant and the bush thinning operations which shall include, but not limited to: - Fitting sound mufflers on all machinery where applicable; - Maintain up to date and complete service levels of all moving and stationery machinery; - Throttle back or turn off machinery that is not in use; and - Avoid creating and propagating unnecessary sound emitting noise on site on and after hours.	Low (2)
Progressive	**Heritage**	Two identified	Adverse	Low	Low	Low (2)	- The possibility of	Low (1)

DESCRIPTION OF ACTIVITY	RECEPTOR	DESCRIPTION OF IMPACT	EFFECT/DESCRIPTION OF MAGNITUDE	VALUE OF SENSITIVITY	MAGNITUDE OF CHANGE	SIGNIFICANCE OF IMPACT	IMPACT MANAGEMENT/CONTROL MEASURES	RESIDUAL IMPACT AFTER MITIGATION
bush thinning activities on farm.		heritage sites (recently dated graves) found close to the farmhouse	Direct Partly Reversible Moderate Temporary On-site				uncovering hidden or buried archaeological or paleontological sites will require the chance-find procedure to be adopted proactively on the project site. - Should the need arise to remove the existing graves then the direction of the Burial Place Ordinance (27 of 1966) should be followed.	

8 ENVIRONMENTAL MANAGEMENT PLAN

The EMP for the proposed project is presented in Appendix A. It provides management options to ensure the impacts of the proposed project are minimised. An EMP is a tool used to take pro-active action by addressing potential problems before they occur. This should limit the corrective measures needed, although additional mitigation measures might be included if necessary.

The management measures should be adhered to during all stages of the exploration activities. All persons involved and partaking in the proposed activities should be made aware of the measures outlined in the EMP to ensure activities are conducted in an environmentally responsible manner.

The objectives of the EMP are:

- To include all components of the development and operations of the project;
- To prescribe the best practicable control methods to lessen the environmental impacts associated with the project;
- To monitor and audit the performance of operational personnel in applying such controls; and
- To ensure that appropriate environmental training is provided to responsible operational personnel.

9 CONCLUSION

ECC's EIA methodology was used to undertake the environmental assessment for the proposed project to identify if there is potential for significant effects to occur as a result of the proposed project. Through the scoping process, the only risk to the environment was the potential for visual impacts and noise levels to increase thereby impacting human receptors in the area. All other social and environmental receptors were scoped out as significant effects were unlikely and therefore no further assessment was deemed necessary.

Through further analysis and identification of mitigation and management methods, the assessment concludes that the likely significance of effects on humans from noise impacts is expected to be minor and prior awareness and communication about the project shall be encouraged. The identified burial sites (graves) found in close vicinity to the farmhouse should not be disturbed even though they are not archeologically sensitive. Should the project need to proceed in this area the direction of the Burial Place Ordinance (27 of 1966) should be followed. The chance-find procedure should always be adhered to whenever new possible sites are suspected.

Various best practice and mitigation measures have been identified to avoid and reduce effects as far as reasonably practical, as well as ensure the environment is protected and unforeseen effect and environmental disturbances are avoided.

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APPENDIX A: ENVIRONMENTAL MANAGEMENT PLAN (CONSTRUCTION AND OPERATION OF A BIOMASS PROCESSING PLANT AND STORAGE AREA)

APPENDIX B: NON- TECHNICAL SUMMARY






ECC-118-269-NTS-6-D

NON-TECHNICAL SUMMARY FOR

PROPOSED MECHANIZED BUSH THINNING OPERATIONS AND CONSTRUCTION OF A BIOMASS PROCESSING (CHARCOAL BURNING RETORT SYSTEM), STORAGE AND PACKAGING PLANT ON FARM GAI KAISA NO. 159

OTJOZONDJUPA REGION, NAMIBIA

PREPARED FOR

RETORT CHARCOAL PRODUCERS (PTY) LTD

NOVEMBER 2020

ENVIRONMENTAL COMPLIANCE CONSULTANCY CC/2013/11404
1 JAN JONKER WAY KLEIN WINDHOEK NAMIBIA|PO BOX 91193 WINDHOEK NAMIBIA
WWW.ECCENVIRONMENTAL.COM

NON-TECHNICAL SUMMARY

PROPOSED MECHANIZED BUSH THINNING OPERATIONS AND CONSTRUCTION OF A BIOMASS PROCESSING (CHARCOAL BURNING RETORT SYSTEM), STORAGE AND PACKAGING PLANT ON FARM GAI KAISA NO. 159 IN THE OTJOZUNDJUPA REGION, NAMIBIA

1 PURPOSE OF THIS DOCUMENT

The purpose of this Non-Technical Summary (NTS) is to provide Interested and Affected Parties (I&APs) background to the project.

The purpose of the project is to apply for an environmental clearance certificate on behalf of the proponent for the proposed mechanized bush thinning operations and biomass processing and manufacturing plant on Farm Gai Kaisa No 159 in the Otjozondjupa Region.

By registering for the project, all I&APs will be kept informed throughout the environmental clearance certificate application process, and a platform for participation will be provided to submit comments/recommendations pertaining to the project.

This NTS includes the following information on:

- The necessity of the project, benefits or adverse impacts anticipated;
- The alternatives to the project have been considered and assessed;
- How the ESIA process works;
- The public participation process and how to become involved; and
- Next steps and the way forward.

2 DESCRIPTION OF PROPOSED PROJECT

2.1 BRIEF INTRODUCTION

Environmental Compliance Consultancy (ECC) has been engaged by the proponent Retort Charcoal Producers (Pty) Ltd to undertake an ESIA and an Environmental Management Plan (EMP) in terms of the Environmental Management Act, No. of 7 of 2007 and its regulations. An environmental clearance application will be submitted to the relevant competent authorities; and the Ministry of Environment, Forestry, and Tourism (MEFT).

2.2 LOCATION

The project is located approximately 30 km south east of the Kombat settlement and 130 north-east of Otjiwarongo in the Otjozondjupa region, Namibia. The site location is shown in Figure 1.

2.3 WHY IS THE PROJECT NEEDED

Charcoal production in Namibia presents strategies to combat bush encroachment, supplement farming income, and contribute to employment creation. Retort Charcoal Producers (Pty) Ltd, will be thinning out invader bush for the reclamation of rangeland and selling the biomass, generating income.

The biomass process and manufacturing plant will include retort kilns carbonising the biomass to charcoal, a product in high demand throughout the world. The project will generate long term employment opportunities while promoting sustainable rangeland management to the surrounding area.

2.4 WHAT ARE THE PROJECT ACTVITIES

The following activities and infrastructure are associated with the project:

- Bush thinning of encroacher species on farm Gai Kaisa No. 159 using mechanized techniques,
- The construction of 4 retort kilns and associated infrastructure (3000 square meter shed and offices)
- The carbonization of biomass
- The manufacturing of briquettes
- The storage and processing of biomass, briquettes and charcoal
- The transporting biomass, briquettes and charcoal
- Water is abstracted from boreholes for domestic and industrial use;

- Renovation of existing infrastructure and houses on-site;
- Power will be supplied from silenced diesel power generation sets linked up to a central DB between the plant and the retorts. A solar power supply is planned for the furture.
- The installation of an onsite weighbridge
- The installation of dust collector and jet cleaning machine to minimise dust emissions.

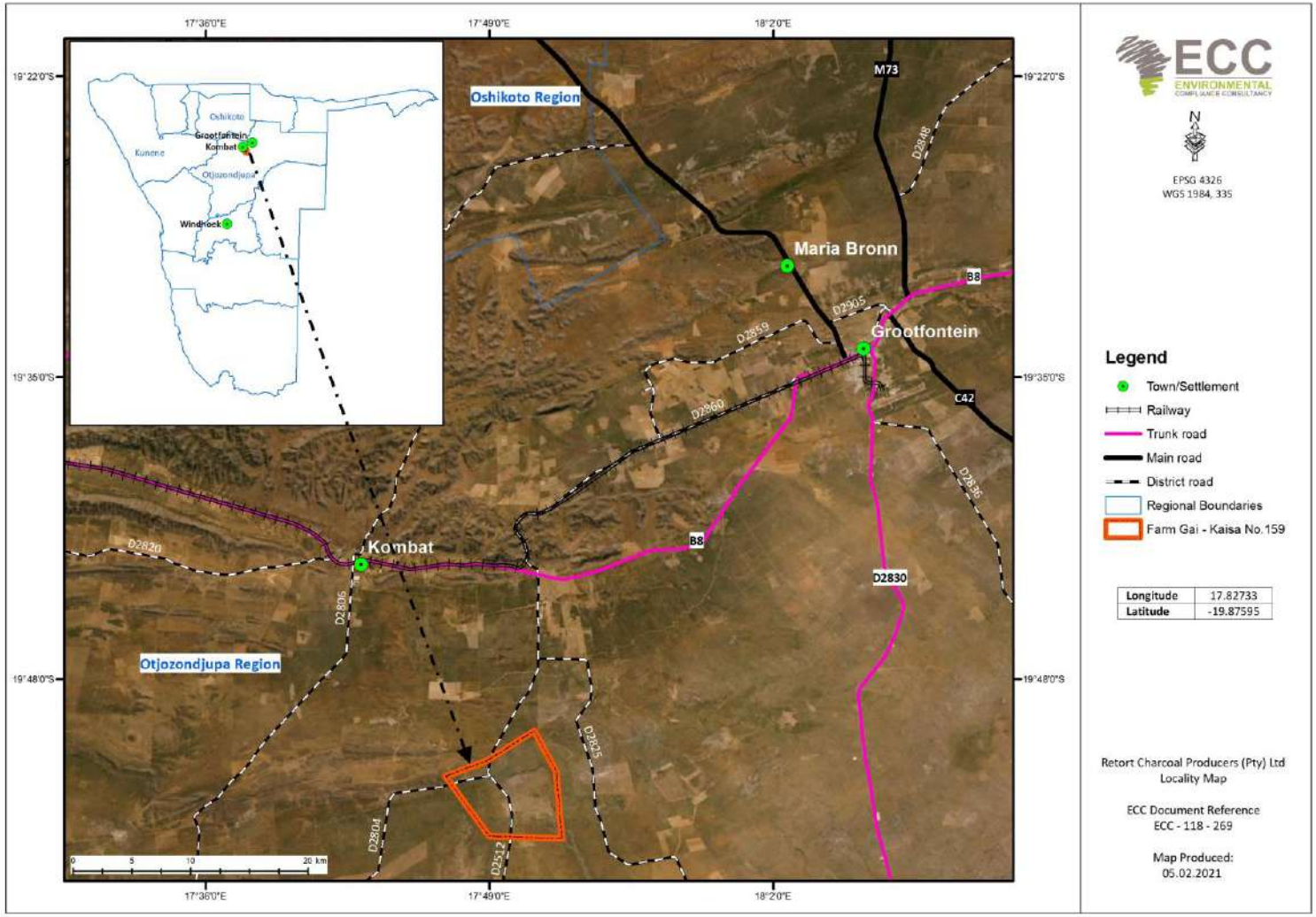


FIGURE 1 – LOCATION OF FARM GAI – KAISA No.159

2.5 POTENTIAL IMPACTS OF THE PROJECT

2.5.1 SOCIO-ECONOMIC

The potential social impacts are anticipated to be of low significance, and those that may transpire shall be confined within the project site: these potential impacts may include the following:

- Potential economic benefits due to increased foreign currency flow, and
- Approximately 50 new jobs will be created as a result of the project.

2.5.2 ENVIRONMENTAL

The potential environmental impacts are anticipated to be of minor significance, and those that may occur shall be contained within the site, these potential impacts may include the following:

- Potential loss of protected and or endangered vegetation during project activities, and
- Generation of noise nuisances from mechanized bush thinning operations such as during transportation.

3 CONSIDERATION OF ALTERNATIVES

Best practice environmental assessment methodology calls for consideration and assessment of alternatives to the project. The project is operating on private farmland.

During the assessment, alternatives will take the form of consideration of optimisation and efficiency to reduce potential effects.

4 THE ENVIRONMENTAL ASSESSMENT PROCESS

This EIA, conducted by ECC, is undertaken in terms of the Environmental Management Act, 2007, and its regulations. The process followed in this EIA is set out in the flowchart in figure 2.

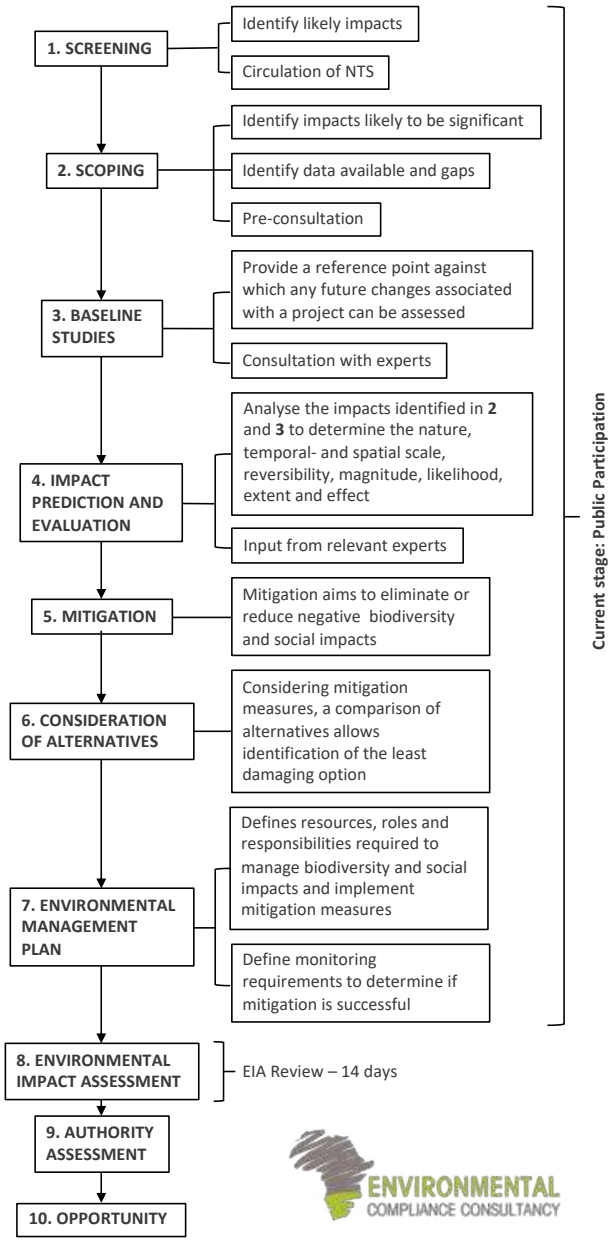


FIGURE 2 - FLOWCHART OF THE ENVIRONMENTAL ASSESSMENT PROCESS

4.1 SCREENING

A review of the project screening findings against the listed activities was conducted; the findings of which are summarised below:

ENERGY GENERATION, TRANSMISSION AND STORAGE ACTIVITIES

1 The construction of facilities for –

(a) The generation of electricity

- The project will generate of electricity through silenced generators.

WASTE MANAGEMENT, TREATMENT, HANDLING AND DISPOSAL ACTIVITIES

2.2 Any activity entailing a scheduled process referred to in the Atmospheric Pollution Prevention Ordinance, 1976.

- The project will generate dust due to the operation of machinery for bush thinning, transporting of biomass and sieving of charcoal. The installation of dust collector and jet cleaning machine to minimise dust emissions.
- Minimum smoke pollution it is envisaged into the atmosphere, due to all gases released during the carbonisation process which will be fed into the system as fuel (advantaged of retort kilns).
- Waste generated during construction, which shall be collected and removed from the site for re-use, recycling, or final disposal at permitted landfill facility. Waste disposal and handling shall comply with waste management specifications as detailed in the Environmental Management Plan.

FORESTRY ACTIVITIES

4 The clearance of forest area, deforestation, afforestation, timber harvesting or any other related activity that requires authorisation in terms of the Forest Act, 2001 (Act No.12 of 2001) or any other law

- The potential exists for vegetation clearing to construct the facility.

WATER RESOURCE DEVELOPMENTS

8.1 The abstraction of groundwater or surface water for industrial or commercial purposes.

- Due to the nature of the project, there would be groundwater abstraction from an existing borehole. Approximately 2000 cubic meters of water during construction over a 5-month period and approximately 200 cubic per month during the operation phase.

8.6 Construction of industrial and domestic wastewater treatment plants and related pipeline systems.

- There are existing ablution facilities currently on site (French drain system).

HAZARDOUS SUBSTANCES TREATMENT, HANDLING, AND STORAGE

9.1 The manufacturing, storage, handling, or processing of a hazardous substance defined in the Hazardous Substance Ordinance, 1974.

- It is planned that 14000 liters of diesel will be stored on site.

The potential environmental and social effects are anticipated to be of minor significance, and those that may occur shall be contained on the project site.

4.2 BASELINE STUDIES

For the project, baseline information will be obtained through desk-based studies and possible site verification process by focusing on the environmental receptors that could be affected by the project. ECC will also engage with stakeholders, I&APs and the proponents to seek input into the assessment.

4.3 IMPACT ASSESSMENT

Impacts will be assessed using the ECC EIA methodology. The EIA will be conducted in terms of the Environmental Management Act, No. 7 of 2007 and its regulations. ECC's methodology for impact assessments was developed using IFC standards in particular Performance Standard 1 'Assessment and management of environmental and social risks and impacts' (IFC 2012, 2017) and Namibian Draft Procedures and Guidance for EIA

and EMP (GRN, 2008) including international and national best practice with over 25 years of combined EIA experience.

4.4 Environmental Management Plan

An EMP shall be developed for the project, setting out auditable management actions for the project to ensure careful and sustainable management measures are implemented for their activities in respect to the surrounding environment and community.

4.5 Public Participation and Advertising

Public participation is an important part of the EIA process; it allows the public and other stakeholders to raise concerns or provide valuable local environmental knowledge that can benefit the assessment, in addition it can aid the design process. This project is currently at the scoping phase and the public participation phase.

At this phase ECC will perform the following:

- Identify key stakeholders, authorities, municipalities, environmental groups and interested or affected members of the public, hereafter referred to as I&APs
- Distribute the NTS for the project (this document)
- Advertise the environmental application in two national newspapers over a two-week period
- Place notices on-site at or near the boundary
- If required host a public meeting to encourage stakeholder participation and engagement, and provide details of issues identified by the environmental practitioner, stakeholders and I&APs
- Record all comments of I&APs and present such comments, as well as responses provided by ECC, in the comments and responses report, which will be included in the scoping report that shall be submitted with the application, and
- Circulate I&AP comments to the project team for consideration of project design.

Comments must be submitted in writing and can be emailed using the details in the contact us section below.

CONTACT US

We welcome any enquiries regarding this document and its content. Please contact:

Environmental Compliance Consultancy (ECC)

info@eccenvironmental.com

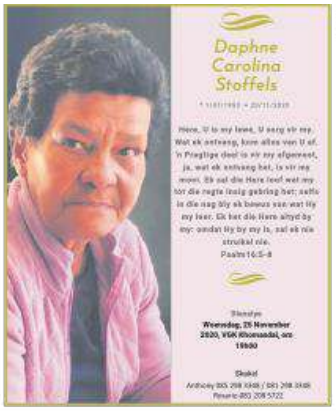
Tel: +264 816 697 608

www.eccenvironmental.com

At ECC we make sure all information is easily accessible to the public.

Follow us online to be kept up to date:

APPENDIX C: PUBLIC CONSULTATION EVIDENCE



NOTICE OF AN ENVIRONMENTAL ASSESSMENT AND PUBLIC PARTICIPATION PROCESS FOR THE PROPOSED MECHANIZED BUSH THINNING OPERATIONS AND CONSTRUCTION OF A BIOMASS PROCESSING, STORAGE, AND PACKAGING PLANT ON FARM GAI – KAISA NO. 159 NEAR KOMBAT, OTJOZONDJUPA REGION, NAMIBIA

Environmental Compliance Consultancy CC (ECC) hereby gives notice to the public that an application for an environmental clearance certificate in terms of the Environmental Management Act, No. 7 of 2007 will be made as per the following:

Applicant: Retort Charcoal Producers (Pty) Ltd
Environmental Assessment Practitioner (EAP): Environmental Compliance Consultancy
Location: Otjozondjupa Region, Namibia

Project: The proposed mechanized bush thinning operations and construction of a biomass processing, storage and packaging plant on farm Gai – Kaisa No. 159 in the Otjozondjupa Region, Namibia.

Proposed activity: : Key infrastructure additions and activities on the site will include: The mechanized bush thinning of encroacher species and establishment of a biomass processing, storage, and packaging plant, which includes carbonization of biomass as well as manufacturing of briquettes.

Application for environmental clearance certificate: In terms of the Environmental Management Act, No. 7 of 2007, ECC on behalf of Retort Charcoal Producers (Pty) Ltd Namibia is required to apply for an environmental certificate from the Ministry of Environment, Forestry and Tourism for the above-mentioned project.

Purpose of the review and registration period: The purpose of the registration and review period is to introduce the proposed project by way of a Non-Technical Summary (NTS) to all who register as Interested and Affected Parties (I&APs). The same will be afforded an opportunity to comment on the NTS and to ensure that potential issues and concerns are brought forward, captured by ECC and considered further in the assessment process.

Registration period: Effective from 17th November to 1st December 2020.

The team at ECC will be in contact with all registered I&APs to review any other documents after the registration period referred to above.

How you can participate: ECC is undertaking the required environmental assessment and public participation process in terms of the Environmental Management Act. I&APs and stakeholders are required to register for the project at: https://eccenvironmental.com/projects/

Environmental Compliance Consultancy Close Corporation
Registration Number: CC/2013/11404
Members: Mr JS Bezuidenhout and Mrs J Mooney
PO Box 91193, Klein Windhoek
Tel: +264 816 697 608
E-mail: info@eccenvironmental.com
Website: https://eccenvironmental.com/projects/
Project ID: : ECC-118-269-ADV-12-A

NOTICE OF AN ENVIRONMENTAL ASSESSMENT AND PUBLIC PARTICIPATION PROCESS EXPLORATION ACTIVITIES ON EPL 7729 AND EPL 7935 IN THE OTJOZONDJUPA REGION, NAMIBIA

Environmental Compliance Consultancy CC (ECC) hereby gives notice to the public that an application for an environmental clearance certificate in terms of the Environmental Management Act, No. 7 of 2007 will be made as per the following:

Applicant: Cheetah Minerals Exploration (Pty) Ltd
Environmental Assessment Practitioner (EAP): Environmental Compliance Consultancy
Location: Otjozondjupa Region, Namibia

Project: Exploration activities on EPL 7729 and EPL 7935 for base and rare metals, and precious metals in the Otjozondjupa Region.

Proposed activity: The proponent intends to carry out exploration activities for base and rare metals, and precious metals on EPL 7729 and EPL 7935. Both EPLs are located within the Otjozondjupa Region, west of the B1 and east of Erindi Private Game Reserve. Exploration methods may include ground geophysical surveys (non-invasive), soil and stream sediment sampling and geological mapping. Exploration drilling is also planned.

Application for environmental clearance certificate: In terms of the Environmental Management Act, No. 7 of 2007, ECC on behalf of Cheetah Minerals Exploration (Pty) Ltd is required to apply for an environmental certificate from the competent authority, the Ministry of Environment, Forestry and Tourism, for the mentioned project.

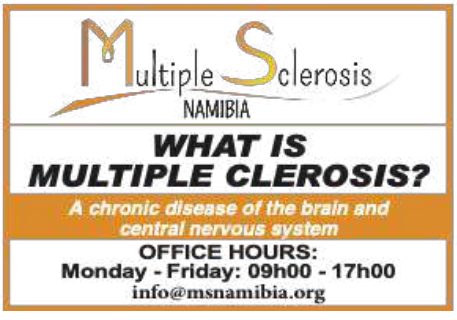
Purpose of the review and registration period: The purpose of the review and registration period is to introduce the proposed project and to afford Interested and Affected Parties (I&APs) an opportunity to register and comment on the Non-Technical Summary (NTS) and to ensure that potential issues and concerns are brought forward, captured and considered further in the assessment process.

Registration period: Effective from 17th November to 1st December 2020.

The team at ECC will be in contact with all registered I&APs to review any other documents after the registration period referred to above.

How you can participate: ECC is undertaking the required environmental assessment and public participation process in terms of the Act. I&APs and stakeholders are required to register for the project at: https://eccenvironmental.com/projects/

Environmental Compliance Consultancy Close Corporation
Registration Number: CC/2013/11404
Members: Mr JS Bezuidenhout and Mrs J Mooney
PO Box 91193, Klein Windhoek
Tel: +264 816 697 608
E-mail: info@eccenvironmental.com
Website: https://eccenvironmental.com/projects/
Project ID: ECC-117-323-ADT-04-B



NOTICE OF AN ENVIRONMENTAL ASSESSMENT AND PUBLIC PARTICIPATION PROCESS FOR THE PROPOSED MECHANIZED BUSH THINNING OPERATIONS AND CONSTRUCTION OF A BIOMASS PROCESSING, STORAGE, AND PACKAGING PLANT ON FARM GAI – KAISA NO. 159 NEAR KOMBAT, OTJOZONDJUPA REGION, NAMIBIA

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Applicant: Retort Charcoal Producers (Pty) Ltd
Environmental Assessment Practitioner (EAP): Environmental Compliance Consultancy
Location: Otjozondjupa Region, Namibia

Project: The proposed mechanized bush thinning operations and construction of a biomass processing, storage and packaging plant on farm Gai – Kaisa No. 159 in the Otjozondjupa Region, Namibia.

Proposed activity: Key infrastructure additions and activities on the site will include: The mechanized bush thinning of encroacher species and establishment of a biomass processing, storage, and packaging plant, which includes carbonization of biomass as well as manufacturing of briquettes.

Application for environmental clearance certificate: In terms of the Environmental Management Act, No. 7 of 2007, ECC on behalf of Retort Charcoal Producers (Pty) Ltd Namibia is required to apply for an environmental certificate from the Ministry of Environment, Forestry and Tourism for the above-mentioned project.

Purpose of the review and registration period: The purpose of the registration and review period is to introduce the proposed project by way of a Non-Technical Summary (NTS) to all who register as Interested and Affected Parties (I&APs). The same will be afforded an opportunity to comment on the NTS and to ensure that potential issues and concerns are brought forward, captured by ECC and considered further in the assessment process.

Registration period: Effective from **17th November to 1st December 2020**.

The team at ECC will be in contact with all registered I&APs to review any other documents after the registration period referred to above.

How you can participate: ECC is undertaking the required environmental assessment and publicipartic-patio process in terms of the Environmental Management Act. I&APs and stakeholders are required to register for the project at: https://eccenvironmental.com/projects/

Environmental Compliance Consultancy Close Corporatio
Registration Number: CC/2013/11404
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Website: https://eccenvironmental.com/projects/
Project ID: : ECC-118-269-ADV-12-A

REPUBLIC OF NAMIBIA
MINISTRY OF WORKS AND TRANSPORT

MINISTRY OF WORKS AND TRANSPORT WILL HOLD A PUBLIC AUCTION

GOVERNMENT AUCTION – DAY 4

OSHAKATI – VEHICLES AUCTION

VIEWING DATE: WEDNESDAY 18 NOVEMBER 2020 from 09H00 to 16H00
AUCTION DATE: THURSDAY 19 NOVEMBER 2020 AT 10H00
VENUE: : MINISTRY OF HOME AFFAIRS, IMMIGRATION, SAFETY AND SECURITY – OSHAKA TI POLICE STATION AND HOSPITAL

Items to be sold
3X TOYOTA 2.0, 8X TOYOTA HILUX 2.5 4X4, FORD IKON 1.6, 6X TOYOTA HILUX 2.7, 5X ISUZU 240 LDV, NISSAN NP 300 4X4, TOYOTA COROLLA 1.8, 2X HINI TRUCK 4X4, 2X M BENZ TRUCKS 4X4AND MUCH MORE.....

Registration: N$ 500.00 (CASH ONLY)
Terms and Conditions apply, No VAT Details are subject to change without prior notice
ALL PAYMENTS MUST BE MADE BY 15H00 HOURS ON A UCTION DATE

Contact: MR J NAMPWEYA 081 289 6545 /
E STEENKAMP 081 249 2338 / 061 208 6144

GOVERNMENT AUCTION – DAY 5

OSHAKATI – LOOSE ITEMS AUCTION

VIEWING DATE: MONDAY 23 NOVEMBER 2020 from 09H00 to 16H00
AUCTION DATE: TUESDAY 24 NOVEMBER 2020 AT 10H00
VENUE: MINISTRY OF FINANCE – OSHAKATI CUSTOMS, AGRICULTURE, WORKS

Items to be sold
BALE CLOTHING, SPACTULAS, CUPS, SANDALS, PLASTIC BOWLS, PLATES, WOODEN CUP, CU-CAR BEER AND MUCH MORE.....

Registration: N$ 5000.00 (CASH ONLY)
Terms and Conditions apply, No VAT Details are subject to change without prior notice
ALL PAYMENTS MUST BE MADE BY 15H00 HOURS ON A UCTION DATE

Contact: MR J NAMPWEYA 081 289 6545,
E STEENKAMP 081 249 2338 / 061 208 6144

GOVERNMENT AUCTION – DAY 6

OSHAKATI – VEHICLES AUCTION

VIEWING DATE: THURSDAY 26 NOVEMBER 2020 from 09H00 to 16H00
AUCTION DATE: FRIDAY 27 NOVEMBER 2020 AT 10H00
VENUE: MINISTRY OF ENVIRONMENT, FORESTRY AND TOURISM – ONGWEDIVA DVC

Items to be sold
2X MAZDA BT-50, 4X NISSAN, 4X FORD RANGER, TOYOTA 2.7, 2X FORD COURIER, 3X M/BENZ 1113, 2X HINO TRUCK, GARDEN TOOLS AND MUCH MORE.....

Registration: N$ 5000.00 (CASH ONLY)
Terms and Conditions apply, No VAT Details are subject to change without prior notice
ALL PAYMENTS MUST BE MADE BY 15H00 HOURS ON A UCTION DATE

Contact: : MR J NAMPWEYA 081 289 6545
E STEENKAMP 081 249 2338 / 061 208 6144

ROADS AUTHORITY
SAFE ROADS TO PROSPERITY

EXPRESSION OF INTEREST

EMERGING CONTRACTOR COURSE IN LABOUR-BASED ROAD CONSTRUCTION

In line with the Roads Authority's SME development policy in promoting SMEs in the sector, the RA through the Roads Technical Training Unit (RTTU) intends to offer the EMERGING CONTRACTOR COURSE to experienced Namibian SME Contractors with the aim of advancing SME Contractors to the level of self-supporting Emerging Contractors.

The Emerging Contractor Course will take place over two weeks focusing on contractual issues and the detailed pricing of the all-inclusive costs in the field of concrete works, labour-based construction work and plant-based construction work.

Course Fee: N$ 2,500.00 for the two-week course, including instructional material

Number of participants per session is limited.

For details on the Emerging Contractor Course please contact: R Ochs +264 61 2847031 or +264 81 122 8144
Interested entities/individuals kindly forward your company profile, clearly listing successfully completed construction projects, to: rittmannz@ra.org.na

SME TRAINING – LABOUR-BASED ACTIVITIES

In line with the Roads Authority's SME development policy in promoting SMEs in the sector, the RA through the Roads Technical Training Unit (RTTU) intends to offer SME TRAINING COURSES to Namibian SME Contractors.

The SME Course will take place over one week focusing on contractual issues and the detailed pricing of the all-inclusive costs in the field of concrete and labour-based construction work.

Course Fee: N$ 1,000.00

Number of participants per session is limited.

For details on the possible training courses please contact: R Ochs +264 61 2847031 or +264 81 122 8144
Interested entities/individuals kindly forward your company profile, clearly listing successfully completed construction projects (if any), to: rittmannz@ra.org.na

Roads Authority, Private Bag 12030, Ausspannplatz, Windhoek, Namibia, www.ra.org.na


ECC

APPENDIX D: ECC CVS

CURRICULUM VITAE

STEPHAN BEZUIDENHOUT

Name of Consultant:	Stephan Bezuidenhout
Position / Profession:	Managing Member & Senior Environmental Practitioner
Date of Birth:	11 April 1989
Nationality:	Namibian
Professional Memberships:	EAPAN, FSC Environmental Chamber, NCE, NCA, N-BiG
Email:	stephan@eccenvironmental.com
Website:	www.eccenvironmental.com
Contact:	+264 81 262 7872

QUALIFICATIONS:

University of Pretoria:	**2011 – 2012**	Postgraduate Degree in Environmental Management and Analysis
University of Stellenbosch:	**2007 – 2010**	Bachelor of Applied Science

PROFILE:

ECC's proudly Namibian Principal leads the ECC team as the lead Environmental Practitioner with a strong and dedicated environmental background. Mr Bezuidenhout has leading practical experience in Identifying and applying legislative requirements to proposed projects. Identifying impacts and mitigations for projects within different sectors, including mining, energy, agriculture and construction.

KEY AREAS OF EXPERTISE:

Agriculture and Ecology	-	Aftercare, rehabilitation & restoration methodology & implementation Forest Stewardship Counsil (FSC) implementation and compliance
Environmental (and social) Impact Assessments (EIAs) (ESIAs) & Environmental Management	-	Compiling EIA Reports and EMPs Coordinate and review specialist studies Review EIA reports Environmental Management Systems (EMS) Public Participation & Stakeholder Management
Project Management	-	Management of teams through Southern Africa for various projects

LANGUAGES:

	Read	Write	Speak
English	Excellent	Excellent	Excellent
Afrikaans	Excellent	Excellent	Excellent

SUMMARY OF EXPERIENCE AND CAPABILITY:

Since 2010, Stephan has been working as an environmental assessment practitioner. Stephan has a strong ecological background and has gained more than ten years' experience in the environmental industry. As a lead practitioner, Stephan has successfully driven environmental impact assessments and compliance assessments within Southern Africa. His hands on and practical experience and knowledge of international standards, such as FSC, IFC and World Bank standards allows Stephan to advise his clients and teams constructively and effectively.

PROJECT EXPERIENCE

PROJECT	DATE	ROLE
Best Practice Guide: Environmental Principles for Mining in Namibia	2017 - 2019	Team member
The FSC National Forest Stewardship Standard of Namibia	(2018-2020)	Part of the working group who compiled the National Standard for Forest Stewardship Council (FSC) in Namibia allowing for a higher rate of certification and improved compliance.
Jumbo Charcoal FSC Group Scheme Management	2015 - 2020	Jumbo Charcoal FSC Group Scheme Management
Biophysical Rehabilitation Plan for ML 42, 43, 44 and 45 as well as an overarching 5-year Biophysical Rehabilitation Plan for Namdeb	2018 - 2019	Part of the ECC team who completed the reporting and aided in the implementation of the Biophysical Rehabilitation Plans for Namdeb.
ESIA amendment for B2Gold Namibia Mining Licence (ML 169) to developed underground working for the Otjikoto (gold mine)	2018 - 2019	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).
Kunene Regional Counsel sustainable water supply Pipeline and Ancillary works	2017 - 2018	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).
ESIA application for B2Gold Namibia 10.8 megawatt PV solar upgrade to the B2Gold Power Plant	2017 - 2018	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).
ESIA application for Otjiwarongo Wastewater Treatment and Bulk Water Supply	2019	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).
ESIA for the Wastewater Treatment facilities for Gondwanan Collection	2019	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).
MAWF permit application for Water Abstraction and Discharge for Gondwanan Collection	2019	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).
EIA application for various exploration activities for Votorantim Metals Namibia Pty Ltd	2018 - Present	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).

Abengoa Solar SA, Kaxu Solar One 100MW Concentrating Solar Plants (CSP) Trough	2015 - 2017	Environmental Control Officer during commissioning and rehabilitation phases
Konkoonsies II PV Solar Energy Facility, On-site substation and a 132kV power line Northern Cape, South Africa	2015 - 2017	Environmental Assessment Practitioner during EIA process
Abengoa Solar SA Paulputs CSP (Pty) Ltd. 150 MW CSP Trough Northern Cape, South Africa	2015 - 2017	Environmental Assessment Practitioner during EIA Process
Abengoa Solar SA, Xina Solar One 200 MW CSP Trough Northern Cape, South Africa	2015 - 2017	Environmental Control Officer during construction phase
Soil Remediation and Commissioning report of NGALA Camp for Isondlo Project Support (IPS) (Pty) Ltd Gauteng, South Africa	2015	Lead consultant and project manager.
375 km 26-inch natural gas installation for SASOL & ROMPCO Mozambique representing Worley Parsons (Pty) LTD. South Africa	2013 - 2015	Environmental Coordinator and Manager
Department of Water Engineering (working on a catchment management project for the Municipality of Stellenbosch)	2011 - 2012	Intern at Aurecon South Africa
Other projects	2011-2020	Stephan has successfully completed various other projects in the sectors of Agriculture, Mining, Energy and Tourism where he acted as the Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP, and report review).

PUBLICATIONS

N.S., et al., Some ecological side-effects of chemical and physical bush clearing in a southern African rangeland ecosystem, Southern African Journal of Botany (2015), http://dx.doi.org/10.1016/j.sajb.2015.07.012

The FSC National Forest Stewardship Standard of Namibia (Draft V 4). Co-authored by S Bezuidenhout, P Cunningham, A Ashby, F Detering, W Enslin & D Honsbein

CERTIFICATION:

I, the undersigned, certify that to the best of my knowledge and belief, these data correctly describe me, my qualifications, and experience.

DATE: **21** / **10** / 20**20**

FULL NAME OF CONSULTANT

Jacobus Stephanus Bezuidenhout

Jessica Mooney

Director & Principal Environmental Practitioner

Hello! :)

ABOUT ME

Name
Jessica Mooney

Born
24 October 1984

Phone
+264 81 653 1214

Email
Jessica@eccenvironmental.com

Website
www.eccenvironmental.com

Contact me!

How to reach me!

+264 81 653 1214

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Jessica Mooney

Education & Qualifications

Federation University Australia 2003-2006 — Bachelor of Applied Science -Environmental Management

Additional Qualifications

- Management Systems Leadership
- ICAM - Incident Cause Analysis Method
- Certificate II in Metalliferous Mining core safety and risk management
- Certificate III in Mine Emergency Response & Rescue
- Level 3 – HLTFA402B Apply Advanced first Aid
- Emergency Rope Rescue
- Level 2 - 21593VIC First Aid level 2
- Bonded Asbestos Removal >10m2
- Leading and Managing People – Brisbane North Institute of TAFE

Experience & Work History

Current

Environment Specialist

Environmental Compliance Consultancy
With 13 years international experience, Jessica provides professional consulting services to clients in Namibia with particular focus on approvals, ECCs, reporting and compliance.

- ECC Approvals
- Mine Closure Plans
- Rehabilitation
- Strategic Environmental Impact Assessments
- Social Impact Assessments
- ARD/AMD Assessments and Reporting
- IMS (ISO14001 and 18001)

Nov 2013-Feb 2016

Group HSE Manager

Weatherly Mining Namibia
An exciting role covering the breadth of two operational underground mines (Otjihase and Matchless) and the construction of a new open pit mine (Tschudi) working for Weatherly Mining in Namibia, Africa.

- Managed company's SHEQ portfolio
- Full scale construction of new greenfield mine into operational copper mine
- Reduced LTIFR by 90% from 23.1 to 2.4 in 22 months!
- Implemented integrated management system
- Approvals, ECC renewals and EMPs
- Established the first mining environmental forums in Namibia
- Implemented SAFE COPPER cultural change programme

Jessica Mooney

Environment Specialist

ECC ENVIRONMENTAL COMPLIANCE CONSULTANCY

References

Feel free to ask the boss

MR CRAIG THOMAS
Managing Director
Weatherly Mining

MR COLIN BULLEN
Managing Director
Imerys (client)

Group Manager Lihir Gold
MR NICK CURREY
Director at Sustainable Mining Strategies

Or ask those who have worked for me?

Ms Asteria Salmon
Worked as Control Room Operator WMN

Mr. Hermanus Lamprecht
Paramedic Safety Officer

Professional Associations

- Chamber of Mines Namibia
- Women on Boards
- The Chamber of Minerals and Energy of Western Australia Industry Member – Mining, Minerals and Resources

Fun Facts:

- I can deadlift 135kg
- To keep fit I Olympic weight lift
- I run ultra Marathons & the longest run yet the fish river Canyon 65km
- I am one of 6 children - do you think that means 4 of us suffer middle child syndrome?

Words I live by:

'The journey will bring you happiest, not the destination'

Experience & Work History

Feb 2013- Feb 2014

Environmental Consultant

Ensolve Pty Ltd - Australia

In February 2013 an opportunity came about to launch my own business, Blue Wren Environmental Services.

During this time I have worked alongside Ensolve Pty Ltd to deliver several environmental projects including:

- A mine closure project taking an operating mine site into the rehabilitation and closure phase. This project involved the full development of a mine closure plan, facilitation of the government approvals, stakeholder engagement and technical environmental studies to inform the mine closure plan
- Sustainability reporting in accordance with the Global Reporting Initiative
- Rehabilitation of historic exploration sites and obtaining associated government approvals for relinquishment of bonds.

Jan 2010- Feb 2013

Site Environmental Manager

Panoramic Resources – Australia

- Brought the site into full compliance with the Environmental Licence within 1 year.
- Managed projects relating to the expansions of the current mine tailings dams including obtaining approvals under the Mining Act 1978 and Environmental Protection Act 1986.
- Managed the environmental and community aspects of three operations; Savannah Nickel Mine, Copernicus Nickel Mine (currently in care and maintenance) and the operations at Wyndham Port
- Responsible for the environment, sustainability and social reporting portfolio
- Developed productive working relationships with local government environmental agencies and non-government agencies, which assisted with the approvals process.
- Developed strategies for the recruitment and retention of local Indigenous personnel

Jan 2007- Jan 2010

Environmental Systems Coordinator

Lihir Gold Limited – Australia

Working on site to provide technical environmental and community advice to ensure all regulatory and licence obligations were met or exceeded

- Regulatory Approvals (State and Federal Government)
- Environment and social aspects of the international cyanide management code
- Operational budgeting and bond management for mine closure
- Compliance with the legislative framework
- Community engagement

CURRICULUM VITAE

LESTER HARKER

Name of Consultant:	Lester Harker
Position / Profession:	Environmental Assessment Practitioner
Date of Birth:	26 February 1988
Nationality:	Namibian
Email:	lester@eccenvironmental.com
Website:	www.eccenvironmental.com
Contact:	+264 81 602 2082

QUALIFICATIONS:

University of Stellenbosch:	**2006 – 2010** Bachelor of Arts (Environment and Development)

PROFILE:

Lester works as an Environmental Assessment Practitioner with a diverse environmental background. Mr Harker has leading practice experience in fields of construction, exploration, monitoring and audit compliance and consultancy obtained from leading professionals.

KEY AREAS OF EXPERTISE:

Environmental Management	-	Project Management
Environmental (and social) Impact Assessments (EIAs)	-	Conducting and managing various small to large scale EIAs Compiling EIA Reports and EMPs Coordinate and review specialist studies
Environmental & Social Compliance reporting	-	Environmental and Social compliance audits in the construction industry

LANGUAGES:

	Read	Write	Speak
English	Excellent	Excellent	Excellent
Afrikaans	Excellent	Excellent	Excellent

SUMMARY OF EXPERIENCE AND CAPABILITY:

Has over 8 years of work experience. His first three years were as a junior environmental assessment practitioner, but already became involved with the holistic management of EIA projects. The following 5 years he has worked in the environmental management field with experience in Environmental Impact Assessments (EIAs), compliance monitoring and auditing in Namibia, the DRC and Equatorial Guinea. Has above average experience in successful client relations.

PROJECT EXPERIENCE

PROJECT	DATE	ROLE
Collaborated with the British CRIDF donor organisation to conduct a high level environmental investigation to determine the feasibility of treating and reusing the Rehoboth Wastewater facility for agricultural purposes	2015	Environmental Assessment Practitioner
Environmental scoping and impact assessment for exploration activities for Westrine Mining & Exploration Company (Pty) Ltd	2016	Environmental Assessment Practitioner.
Conducted an Environmental Scoping and Impact Assessment for the construction of a cement mining and processing facility in Equatorial Guinea, North Africa, for N.B.L.E Sa.	2016	Environmental Assessment Practitioner.
Conducted an environmental impact assessment for the Dauremas Mineral Development Company for exploration and proposed mining activities, Kunene Region.	2015-2017	Environmental Assessment Practitioner.
Conducted an Environmental Impact Assessment for a terrestrial diamond exploration project south of Aus, Karas Region for Hallie Investment Number 14.	2017	Environmental Assessment Practitioner.
Conducted an environmental performance audit in collaboration with a British firm for a copper and cobalt processing facility for the Somika Sarl Group of Companies operating in the DRC to fund the expansion of their processing facility.	2018	Environmental Assessment Practitioner
Projects Completed while at ECC		
Environmental impact assessment for a pilot sustainable water supply project by means of desalination, powered by solar to supplement water supply for Walvis Bay Erongo Region, Namibia	2020	Environmental Assessment Practitioner
Amendment application for the Palmwag Lodge, Gondwana Namibia.	2020	Environmental Assessment Practitioner
Environmental Assessment for the proposed development of residential, retail including tourism activities on Erf 4747, Swakopmund Namibia.	2020	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement and PPP.
Environmental scoping and impact assessment for the proposed exploration activities on 19 EPLs	2020	Lead Environmental Assessment Practitioner managing the EIA process

in the Omaheke and Khomas regions for Kuiseb Copper Company (Pty)Ld		(including stakeholder engagement and PPP.
Environmental assessment for proposed exploration activities on EPL 7769 for Jin Peng Investments (Pty) Ltd	2020	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement and PPP.
Environmental assessment for the proposed exploration activities on EPL 7688	2020	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement and PPP.
Environmental and social compliance audit for 21 sites across Namibia under the Education, Training and Quality Improvement Project funded by the African Development Bank	2020	Site audits and development of an audit report and corrective action plan

CURRICULUM VITAE

LOVISA AMWELE

Name of Consultant:	Lovisa Amwele
Position / Profession:	Junior Environmental Practitioner
Date of Birth:	10 September 1993
Nationality:	Namibian
Professional Memberships:	None
Email:	lovisa@eccenvironmental.com
Website:	www.eccenvironmental.com
Contact:	+264 81 435 1689

QUALIFICATIONS:

Cape Peninsula University of Technology:	**2020 – 2021**	Masters of Environmental Management
	2019 – 2019	B-Tech: Environmental Management
	2016 – 2018	ND: Environmental Management

PROFILE:

I am vibrant and energetic. Academically trained in the field of Environmental management and science sphere. I have been hard at work establishing my personal reputation as a mature critical problem solver and effective communicator driven by a strong set of ethical principles founded in social and environmental awareness. My objectives are to secure a challenging position, where I can utilize my abilities when granted the opportunity for additional career growth.

KEY AREAS OF EXPERTISE:

Environmental (and social) Impact Assessments (EIAs)	-	Compiling EIA Reports and EMPs
	-	Reviewing EIA reports
	-	Compiling of bi-annual environmental reports
	-	Environmental monitoring (Air and borehole water level)
	-	Data interpretation and verification
	-	Maps compilation for various projects using Google Earth and ArcMap
Environmental feasibility studies	-	Various activities pertaining to environmental baseline and monitoring

LANGUAGES:

	Read	Write	Speak
English	Excellent	Excellent	Excellent
Oshiwambo	Excellent	Excellent	Excellent

SUMMARY OF EXPERIENCE AND CAPABILITY:

Feb 2020 – Present: Environmental Compliance Consultancy

Position: Junior Environmental Practitioner

- Providing professional consulting services to clients
- Assisting in the development of scoping reports
- Assisting in the development Environmental management plans for exploration
- Maps compilation for various projects using Google Earth and ArcMap

References: Jessica Money Bezuidenhout

: +264 81 653 1214

July 18 – Jan 2019: Gecko, Namibia

Environmental Management Specialist

Position: Intern

- Compiling and submitting of bi-annual environmental reports for exploration activities
- Various activities pertaining to environmental baseline and monitoring
- Maps compilation for various projects using Google Earth and ArcMap
- Involvement in the writing and compilation of Environmental Impact Assessment (EIA) reports for exploration activities
- Data entry, data organization with quality control
- Data interpretation and verification
- Site visits and various aspects of fieldwork at mineral exploration project areas (Water levels and air quality monitoring)
- Engaged in clients and stakeholders' meetings.

References: Oliver Krappmann

: +264 61 30 5444

June 2017 and Dec 2017: Oniipa Town Council

Environmental Health Inspector

Position: Intern

- Waste management and health education
- Environmental pollution and monitoring control
- Risk assessment at work and public places
- Business inspection to ensure compliance
- Training on food safety manual

References: Daniel Nicodemus

: +264 65 245 700/11

PROJECT EXPERIENCE

PROJECT	DATE	ROLE
Kunene Resources (Pty) Ltd holds EPL 5885 which is located on communal land South of Swaartboisdrift, Opuwa town, Kunene region. The license is granted for the exploration of base and rare metals, precious metals as well as industrial minerals. As part of the application process, a detail ESIA and EMP process needs to be conducted.	2019	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report compilation and review).
The Swakopmund Salt Company (Pty) Ltd (hereafter referred to as Salt Co) would like to start up solar salt operations at Cape Cross area which is approximately 120km north of Swakopmund. The Mining License 66D (ML66D) covers the industrial minerals commodity, salt. As part of the application process, a detail ESIA and EMP process needs to be conducted.	2018	Assistant Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report compilation and review).
Kunene Resources (Pty) Ltd holds EPLs 6561 & 5992 which are located on communal land south and east of Grootfontein town. The licenses are granted for the exploration of precious metals, base and rare metals, dimensions stones as well as industrial minerals. This Environmental Impact Assessment Report should be submitted for an application for Environmental Clearance to conduct mineral exploration work.	2018	Assistant Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report compilation and review).

APPENDIX E: VERTEBRATE FAUNA AND FLORA SPECIALIST STUDY

VERTEBRATE FAUNA AND FLORA ASSOCIATED WITH FARM GAI KAISA No. 159, KOMBAT AREA [Desktop Study – Baseline/Scoping]

SPECIALIST CONTRIBUTION:

Prepared by:

Peter L Cunningham

Environment and Wildlife Consulting Namibia

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CONTENTS

Vertebrate fauna and flora known/expected in the general Kombat area

Vertebrate fauna and flora known/expected in the general Kombat area

1 Introduction

A desktop study (i.e. literature review) was conducted between 3 and 6 November 2020 on the vertebrate fauna (e.g. reptiles, amphibians, mammals and birds) and flora (trees, shrubs and grasses) expected to occur in the general Kombat area. This study was conducted to determine the effect that the proposed mechanized bush thinning operations and charcoal burning (central retort system) for Farm Gai Kaisa No. 159, approximately 30 km south of Kombat, may have on the bio-physical environment (vertebrate fauna and flora) and immediate surroundings.

This literature review was to determine the actual as well as potential vertebrate fauna and flora associated with the general area commonly referred to as the Karstveld (Giess 1971; Mendelsohn *et al.* 2002). The Savannah Biome has 7.5% protected and makes up 37% of the land area while the Karsveld is wholly unprotected (Barnard 1998). Karst caves/sinkholes/springs and Otavi Mountains are sites of special ecological importance in the general Karstveld vegetation type (Curtis and Barnard 1998). The Otavi Highlands are ranked as an area with high biodiversity importance, but due to its relatively low relief and accessability, endemism is low (Irish 2002).

This part of north-central Namibia in general is regarded as “average to high” in overall (all terrestrial species) diversity and “high” in endemism (Mendelsohn *et al.* 2002). The overall diversity and abundance of large herbivorous mammals (big game) is viewed as “high” with with 5-6 species expected of which kudu, oryx and red hartebeest having average densities while the overall diversity and density of large carnivorous mammals (large predators) is “high” with 5 species expected of which leopard and cheetah have average densities (Mendelsohn *et al.* 2002).

According to Maggs (1998) there are approximately 4344 higher plant species with the most species being within the grasses (422), composites (Asteraceae) (385), legumes (Fabaceae) (377) and fygies (Mesembryanthemaceae) (177), recorded from Namibia. Total species richness depends on further collecting and taxonomic revisions. High species richness is found in the Okavango, Otavi/Karsveld, Kaokoveld, southern Namib and Central Highland (Windhoek Mountains) areas. Endemic species – approximately 687 species in total – are manly associated with the Kaokoveld (northwestern) and the succulent Karoo (southwestern) Namibia. The major threats to the floral diversity in Namibia are:
1). Conversion of the land to agriculture (with associated problems) and,
2). poorly considered development (Maggs 1998, Mendelsohn *et al.* 2002).

Mountain Savannah and Karstveld
The mountainous areas are characterised by *Kirkia acuminata*, *Berchemia discolor*, *Croton* spp. and many others, while the depressions are characterised by *Acacia ataxacantha*, several *Ficus* sp., *Peltophorum africanum*, *Sclerocarya birrea* and *Spirostachys africana*. The higher regions are characterised by grasses such as *Brachiaria serrata*, *Digitaria seriata* and *Panicum maximum* while the lower slopes are dominated by *Eragrostis* sp. Lower lying areas are dominated by *Digitaria seriata* and *Urochloa bolbodes* climax grasses and annuals such as *Brachiaria schoenfelderi*. The true Karsveld areas with limestone deposits on shallow soils support stands of *Combretum imberbe*, *Dichrostachys cinerea* and *Terminalia prunioides* with last mentioned two species often responsible for bush thickening (encroachment) in Namibia (Giess 1971).

The generally Kombat area has a “high” plant diversity with the Karst Mountains >500 species while endemism is viewed as “average” with 6-15 species and the area known for its

local endemics (Mendelsohn *et al.* 2002). These estimates are limited to "higher" plants as information regarding "lower" plants is sparse. The greatest variants affecting the diversity of plants are habitat and climate with the highest plant diversity generally associated with high rainfall areas. Pockets of high diversity are found throughout Namibia in "unique" habitat – often transition zones – e.g. mountains, inselbergs, etc. Furthermore, Mendelsohn *et al.* (2002) views the overall plant production as "extremely high" and the overall variation in plant production as "low" (5-10%) in the general area.

The availability of hardwoods and grazing is "average" while the browsing is "good" in the general area (Mendelsohn *et al.* 2002). Bush thickening (encroachment) problems are experienced in the general area with densities of between 4,000-12,000 plants/ha for *Dichrostachys cinerea* being the most contentious species (Bester 1996, Cunningham 1998). Land cleared for cultivation is "low" (<10%) and the risk of farming is viewed as "low" while the tourism potential is viewed as "high" in the general area (Mendelsohn *et al.* 2002).

No communal conservancies occur within the area with the closest being the Otjituuo Conservancy located to the east in the Grootfontein area with the major wildlife resource listed as wild dog, kudu, gemsbok, leopard, eland, warthog, steenbok, klipspringer and spotted hyena (NACSO 2009, 2011). The closest Government protected areas are the Etosha National Park and the Waterberg Plateau Park to the northwest and south, respectively. A number of farms are part of the Ongarangombe Freehold (commercial) Conservancy in the general Kombat area (Mendelsohn *et al.* 2002, See: www.canam.iway.na).

It is estimated that at least 73 species of reptile, 15 amphibian, 107 mammal, 261 bird species (breeding residents), 145 larger trees and shrubs (>1m in height) and 111 grasses are known to or expected to occur in the general area of which a low proportion are endemics (e.g. 16.4% for reptiles being the highest).

2 Methods

2.1 Literature review

A comprehensive and intensive literature review (i.e. desktop study) regarding the vertebrate fauna – e.g. reptiles, amphibians, mammals and birds – and flora (e.g. trees/shrubs >1m in height, grasses and herbs, etc.) that could potentially occur in the general Kombat (Farm Gai Kaisa) area was conducted using as many references as manageable. A list of the references consulted can be viewed in the Reference section (Page 41).

3 Results

3.1 Reptile Diversity

The reptile diversity known, and/or expected to occur in the general Kombat area, is presented in Table 1 below.

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).

Table 1. Reptile diversity known and/or expected to occur in the general Kombat area – i.e. north-central Namibia.

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International status		
			IUCN	SARDB	CITES
TURTLES AND TERRAPINS					
Stigmochelys pardalis	Leopard Tortoise	Vulnerable; Peripheral; Protected Game	LC		C2
Psammobates oculiferus	Kalahari Tent Tortoise	Vulnerable; Protected Game			C2
Pelomedusa subrufa	Marsh/Helmeted Terrapin	Secure			
SNAKES					
Blind Snakes					
Rhinotyphlops schinzi	Schinz's Beaked Blind Snake	Endemic; Secure		P	
Rhinotyphlops schlegelii	Schlegel's Beaked Blind Snake	Secure			
Thread Snakes					
Leptotyphlops merkeri (scutifrons)	Peters' Thread Snake	Secure	LC		
Leptotyphlops labialis	Damara Thread Snake	Endemic; Secure			
Pythons					
Python anchietae	Anchietae's Dwarf Python	Endemic; Incufficiently known; Protected Game	LC		C2
Python natalensis	Southern African Python	Vulnerable; Peripheral; Protected Game		V	C2
Burrowing Asps					
Atractraspis bibronii	Bibron's Burrowing Asp	Secure			
Atractaspis duerdeni	Duerden's or Beaked Burrowing Asp	Insufficiently known			
Purple-Glossed Snakes					
Amblyodipsas ventrimaculata	Kalahari Purple-glossed Snake	Secure	LC		
Quill Snouted Snakes					
Xenocalamus bicolor bicolor	Bicoloured Quill-snouted Snake	Secure			
Xenocalamus mechowii	Elongate Quill-snouted Snake	Secure			
Typical Snakes					
Lamprophis fuliginosus	Brown House Snake	Secure			
Lycophidion ornatum (capense)	Cape Wolf Snake	Secure	LC		
Mehelya capensis	Cape File Snake	Secure			
Mehelya vernayi	Angola File Snake	Insufficiently known; Rare?			
Pseudaspis cana	Mole Snake	Secure			
Prosymna bivittata	Two-striped Shovel-snout	Secure			
Psammophylax tritaeniatus	Striped Skaapsteker	Secure			
Psammophis trigrammus	Western Sand Snake	Endemic; Secure			
Psammophis leightoni	Namib Sand Snake	Secure			

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International status		
			IUCN	SARDB	CITES
Psammophis subtaeniatus	Stripe-bellied Sand Snake	Secure			
Psammophis brevirostris leopardinus	Leopard Grass Snake	Secure			
Psammophis massambicus	Olive Grass Snake	Secure			
Philothamnus semivariegatus	Spotted Bush Snake	Secure			
Dasypeltis scabra	Common/Rhombic Egg Eater	Secure			
Telescopus semiannulatus polystrictus	Eastern Tiger Snake	Secure			
Dispholidus typus	Boomslang	Secure			
Thelotornis capensis oatesii	Twig or Vine Snake	Secure			
Aspidelaps lubricus	Coral Snake	Secure			
Aspidelaps scutatus scutatus	Shield-nose Snake	Secure			
Elapsoidea semiannulata	Angolan Garter Snake	Secure			
Elapsoidea sunderwallii fitzsimonsi	Sundevall's Garter Snake	Endemic; Secure			
Naja anchietae	Snouted Cobra	Secure			
Naja mossambica	Mozambique Spitting Cobra	Secure			
Naja nigricincta	Black-necked Spitting Cobra	Endemic?; Secure			
Dendroaspis polylepis	Black Mamba	Secure	LC		
Bitis arietans	Puff Adder	Secure			
Bitis caudalis	Horned Adder	Secure			
Worm Lizard					
Zygaspis quadrifrons	Kalahari Round-headed Worm Lizard	Secure			
Monopeltis anchietae	Anchieta's Spade-snouted Worm Lizard	Secure	LC		
Monopeltis mauricei	Slender Spade-snouted Worm Lizard	Secure			
LIZARDS					
Skinks					
Acontias occidentalis	Percival's Legless Skink	Secure			
Mochlus (Lygosoma) sundevallii	Sundevall's Writhing Skink	Secure	LC		
Trachylepis occidentalis	Western Three-striped Skink	Secure			
Trachylepis spilogaster	Kalahari Tree Skink	Secure			
Trachylepis striata wahlbergi	Striped Skink	Secure			
Trachylepis varia	Variable Skink	Secure			
Trachylepis variegata punctulata	Variegated Skink	Secure			
Panaspis wahlbergii	Wahlberg's Snake-eyed Skink	Secure			
Old World Lizards					
Heliobolus lugubris	Bushveld Lizard	Secure			

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International status		
			IUCN	SARDB	CITES
Ichnotropis capensis	Cape Rough-scaled Lizard	Secure			
Ichnotropis squamulosa	Common Rough-scaled Lizard	Secure			
Nucras intertexta	Spotted Sandveld Lizard	Secure			
Nucras holubi	Holub's Sandveld Lizard	Secure			
Pedioplanis lineoocellata	Spotted Sand Lizard	Secure			
Pedioplanis namaquensis	Namaqua Sand Lizard	Secure			
Pedioplanis undata	Western Sand Lizard	Endemic; Secure			
Plated Lizards					
Cordylosaurus subtessellatus	Dwarf Plated Lizard	Endemic; Secure	LC		
Zonosaurus (Gerrhosaurus) multilineatus	Kalahari Plated Lizard	Secure			
Zonosaurus (Gerrhosaurus) nigrolineatus	Black-lined Plated Lizard	Secure			
Zonosaurus (Gerrhosaurus) validus maltzahni	Giant Plated Lizard	Secure			
Girdled Lizards					
Karusasaurus (Cordylus) jordani	Jordan's Girdled Lizard	Endemic; Secure			C2
Monitors					
Varanus albigularis	Rock or White-throated Monitor	Vulnerable; Peripheral; Protected Game		V	C2
Agamas					
Agama aculeata	Ground Agama	Secure			
Chameleons					
Chamaeleo dilepis	Flap-neck Chameleon	Secure	LC		C2
Geckos					
Lygodactylus bradfieldi	Bradfield's Dwarf Gecko	Endemic; Secure			
Pachydactylus capensis	Cape Thick-toed Gecko	Secure			
Pachydactylus turneri laevigatus	Turner's Thick-toed Gecko	Endemic; Secure			
Pachydactylus punctatus	Speckled Thick-toed Gecko	Secure			
Pachydactylus rugosus rugosus	Rough Thick-toed Gecko	Endemic; Secure			
Pachydactylus weberi	Weber's Thick-toed Gecko	Secure	LC		
Ptenopus garrulous maculatus	Common Barking Gecko	Secure			

IUCN (2020): LC – Least Concern
SARDB (2004): V – Vulnerable, P – Peripheral
CITES: CITES Appendix 2 or 3 species

Source for literature review: Alexander and Marais (2007), Bzauer (2010), Bauer *et al.* (2006), Branch (1998), Branch (2008), Bonin *et al.* (2006), Boycott and Bourquin 2000, Broadley (1983), Buys and Buys (1983), Clauss and Clauss (2002), Cunningham (2006), Griffin (1998a), Griffin (2003), IUCN (2020), Marais (1992), SARDB (2004), Tolley and Burger (2007)

The overall reptile diversity and endemism in the general area is estimated at between 71-80 species and 5-8 species, respectively (Mendelsohn *et al.* 2002). Griffin (1998a) presents figures of between 21-30 and 31-40 for lizard and snake diversity, respectively, from the general area in north-central Namibia. According to Griffin (1998a) 1-10 endemic lizards and 3-4 endemic snakes are expected from this area. The closest protected areas – Etosha National Park and the Waterberg Plateau Park – have an estimated 109 and 83 species of reptiles, respectively (Griffin 1998a).

At least 73 species of reptiles are expected to occur in the general area with 12 species being endemic (16.4%). These consist of at least 2 tortoise, 1 terrapin, 38 snakes (2 blind snake, 2 thread snake, 2 python, 2 burrowing asps, 1 purple-glossed, 2 quill snouted and 27 typical snakes) and 34 lizards (3 worm lizard, 8 skinks, 8 Old World lizards, 4 plated lizards, 1 girdled lizard, 1 monitor lizard, 1 chameleon, 1 agama and 7 geckos). Typical snakes (27 species – 3 species being endemic (11.1%) and 1 species insufficiently known and rare (3.7%), Old World lizards (8 species – 1 species being endemic (12.5%) and geckos (7 species – 3 species being endemic (42.9%) are the most numerous reptiles expected from the general area. The burrowing worm lizards are more numerous in the sandier north eastern parts of Namibia. Namibia with approximately 129 species of lizards (Lacertilia) has one of the continents richest lizard fauna (Griffin 1998a). Due to the fact that reptiles are an understudied group of animals, especially in Namibia, it is expected that more species may be located in the general area than presented above.

Eighteen species (24.7%) have some form of Namibian conservation status (endemics included and some species have more than 1 status) with 12 species endemic, 1 species rare, 4 species vulnerable, 5 species protected game, 3 species insufficiently known and 3 species peripheral.

Sixteen species (21.9%) have some form of international conservation status (some species have more than 1 status) with 11 species classified as Least Concern by the IUCN (2020) while all the other species have not yet been assessed by the IUCN Red List. The SARDB (2004) classifies 3 species as vulnerable (2 species) and peripheral (1 species) while 7 species are listed under CITES as Appendix 2 species.

Not all the species indicated as potentially occurring in the general area are expected to occur in the proposed development area as reptiles often have very specific habitat requirements – e.g. rupicolous species associated with Karst formations, etc.

The most important species are viewed as those with some form of conservation status (Namibian and International – See Table 1) with the tortoises, leopard tortoise (*Stigmochelys pardalis*) and Kalahari tent tortoise (*Psammobates oculiferus*) the pythons, Anchietae's dwarf python (*Python anchieta*) and Southern African python (*P. natalensis*), monitor lizard (*Varanus albigularis*) and the 1 species listed as "rare" – Angola file snake (*Mehelya vernayi*) – probably the most important in the general area. Two relatively recent discoveries of 2 new species of *Pachydactylus* spp. from the Karst Mountains include *Pachydactylus boehmei* (Bauer 2010) and *P. otaviensis* (Bauer *et al.* 2006). These 2 species fall within the *Pachydactylus serval/weberi* group and not included in Table 1 as individual species although viewed as important as they are restricted range species from the general Kombat area.

However, none of the reptiles are expected to be exclusively associated with the Farm Gai Kaisa No. 159 development site.

Mechanical harvesting – Impact

Mechanical harvesting is expected to impact on slow moving reptile species as these are usually cryptic (i.e. difficult to see) and sedentary (i.e. small home ranges) and will not be able and/or willing to flee oncoming heavy vehicles. This is especially true for the two

tortoise species known/expected to occur in the area. Tortoises are the reptile family of greatest national concern and most under threat in Namibia (Griffin 1998a).

Furthermore, unsustainable exploitation (i.e. poaching) and alteration of habitat are two main categories of threat to most reptiles in Namibia (Griffin 1998a).

Many arboreal species are also expected to be negatively affected, especially if larger tree specimens and dead trees are targeted which serve as refuge to a variety of unique species (e.g. cavity and bark dwelling species such as agama, gecko, monitor lizard, etc.).

These negative impacts would depend on the scale and intensity of the harvesting operation.

3.2 Amphibian Diversity

The amphibian diversity known, and/or expected to occur in the general Kombat area, is presented in Table 2 below.

Table 2. Amphibian diversity known and/or expected to occur in the general Kombat area – i.e. north-central Namibia.

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International Status: IUCN
Rain Frogs			
Breviceps adspersus	Bushveld Rain Frog		LC
Toads			
Amietophrynus gutturalis	Guttaral Toad		LC
Amietophrynus maculatus	Flat-backed Toad		LC
Amietophrynus poweri	Western Olive Toad		LC
Kassinas			
Kassina senegalensis	Bubbling Kassina		LC
Rubber Frog			
Phrynomantis affinis	Spotted Rubber Frog		LC
Phrynomantis bifasciatus	Banded Rubber Frog		LC
Puddle Frog			
Phrynobatrachus mababiensis	Dwarf Puddle Frog		LC
Phrynobatrachus natalensis	Snoring Puddle Frog		
Ornate Frogs			
Hildebrandtia ornata	Ornate Frog		LC
Cacos			
Cacosternum boettgeri	Boettger's Caco		LC
Bullfrogs			
Pyxicephalus adspersus	Giant Bullfrog*		LC
Sand Frogs			
Tomopterna krugerensis	Knocking Sand Frog		LC
Tomopterna tandyi	Tandy's Sand Frog		LC
Platannas			
Xenopus laevis	Common Platanna		LC

Namibian conservation and legal status according to the Nature Conservation Ordinance No 4 of 1975 (Griffin 2003)
IUCN (2020): LC = Least Concern
*The giant bullfrog is classified as "near threatened" by Du Preez and Carruthers (2009)
Source for literature review: Carruthers (2001), Channing (2001), Channing and Griffin (1993), Du Preez and Carruthers (2009), Passmore and Carruthers (1995)

Amphibians are declining throughout the world due to various factors of which much has been ascribed to habitat destruction. Basic species lists for various habitats are not always

available with Namibia being no exception in this regard while the basic ecology of most species is also unknown. Approximately 4,000 species of amphibians are known worldwide with just over 200 species known from southern Africa and at least 57 species expected to occur in Namibia. Griffin (1998b) puts this figure at 50 recorded species and a final species richness of approximately 65 species, 6 of which are endemic to Namibia. This "low" number of amphibians from Namibia is not only as a result of the generally marginal desert habitat, but also due to Namibia being under studied and under collected. Most amphibians require water to breed and are therefore associated with the permanent water bodies, mainly in northeast Namibia.

According to Mendelsohn *et al.* (2002), the overall frog diversity in the general area is estimated at between 12-15 species. Griffin (1998b) puts the species richness in the general area at between 15-16 species. The closest protected areas – Etosha National Park and the Waterberg Plateau Park – have an estimated 18 and 13 species of amphibians, respectively (Griffin 1998b).

At least 15 species of amphibians can occur in suitable habitat in the general area. The area is under represented, with 1 rain frog, 3 toads, 1 kassina, 2 rubber frogs, 2 puddle frogs, 1 ornate frog, 1 caco, 1 bullfrog, 2 sand frogs and 1 platanna known and/or expected (i.e. potentially could be found in the area) to occur in the area. None of the amphibians are endemic (Griffin 1998b) while 1 species is classified as "near threatened" due to habitat loss and development (*Pyxicephalus adspersus*) (Du Preez and Carruthers 2009) – i.e. 6.7% of amphibians of conservation value from the general area. *Pyxicephalus adspersus* is more common in northern Namibia where their numbers are also declining due to overutilization as food by humans (Griffin pers. com.). The IUCN (2020) lists all the species as Least Concern.

The most important species is *Pyxicephalus adspersus* although they are widespread in Namibia and not exclusively associated with the Kombat area in particular. Permanent water bodies viewed as amphibian habitat in the area include the various fountains known to occur in the Karst formations in the surrounding hills. Other potential habitats in the area include ephemeral pans, farm reservoirs and earth dams although the latter are also dependant on localised showers and temporary of nature.

Due to the fact that amphibians are an understudied group of animals, especially in Namibia, it is expected that more species may be located in the general area than presented in Table 2 above. Furthermore, as Namibia is an arid country with increasing human population and intensified agriculture, all the amphibians which depend on perennial water sources are viewed as vulnerable in the long term (Griffin 1998b).

However, none of the amphibians are expected to be exclusively associated with the Farm Gai Kaisa No. 159 development site.

Mechanical harvesting – Impact
Mechanical harvesting is expected to impact on amphibian habitat if ephemeral water features, especially pans and ground dams are disturbed and/or radically altered. On the other hand, bush thinning may increase groundwater levels and consequently result in more water for fountains and pans and thus improve amphibian habitat or result in more runoff and erosion and thus less water penetration into the groundwater system. This would depend on the scale and intensity of the harvesting operation.

3.3 Mammal Diversity

The mammal diversity known, and/or expected to occur in the general Kombat area, is presented in Table 3 below.

Table 3. Mammal diversity known and/or expected to occur in the general Kombat area – i.e. north-central Namibia.

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International Status		
			IUCN	SARDB	CITES
Elephant Shrews					
Elephantulus intufi	Bushveld Elephant-shrew	Secure		DD	
Aardvark					
Orycteropus afer	Aardvark	Secure; Protected Game			
Shrews					
Crocidura fuscomurina	Tiny Musk Shrew	Secure		DD	
Crocidura hirta	Lesser Red Musk Shrew	Secure		DD	
Hyrax					
Procavia capensis	Rock Hyrax	Secure; Problem animal			
Bats					
Eidolon helvum	African Straw-coloured Bat	Secure; Migrant	NT		
Epomophorus crypturus	Peter's Epauletted Fruit Bat	Not listed			
Rousettus aegyptiacus	Egyptian Rousette	Not listed			
Cloeotis percivali	Percival's Short-eared Trident Bat	Not listed			
Macronycteris (Hipposideros) caffer	Sundevall's Leaf-nosed Bat	Secure		DD	
Macronycteris (Hipposideros) gigas	Giant Leaf-nosed Bat	Not listed	[1]NT		
Macronycteris (Hipposideros) vittatus	Striped Leaf-nosed Bat	Not listed	NT		
Rhinolophus blasii	Blasius's Horseshoe Bat	Not listed			
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	Secure		NT	
Rhinolophus darlingi	Darling's Horseshoe Bat	Secure; Peripheral		NT	
Rhinolophus denti	Dent's Horseshoe Bat	Secure		NT	
Rhinolophus fumigatus	Rüppell's Horseshoe Bat	Secure		NT	
Rhinolophus hildebrandtii	Hildebrandt's Horseshoe Bat	Not listed			
Rhinolophus swinnyi	Swinny's Horseshoe Bat	Not listed			
Taphozous mauritianus	Mauritian Tomb Bat	Secure			
Nycteris thebaica	Egyptian Slit-faced Bat	Secure			
Chaerephon ansorgei	Ansorge's Free-tailed Bat	Not listed			
Chaerephon nigeriae	Nigerian Free-tailed Bat	Secure			
Mops midas	Midas Free-tailed Bat	Secure			
Sauromys petrophilus	Roberts's Flat-headed Bat	Secure			
Tadarida aegyptiaca	Egyptian Free-tailed Bat	Secure			
Miniopterus inflatus	Greater Long-fingered Bat	Insufficiently known; Rare?			

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International Status		
			IUCN	SARDB	CITES
Miniopterus natalensis	Natal Long-fingered Bat	Secure		NT	
Eptesticus hottentotus	Long-tailed Serotine Bat	Secure			
Glauconycteris variegata	Variegated Butterfly Bat	Secure		NT	
Hypsugo anchietae	Anchieta's Pipistrelle	Not listed			
Kerivoula lanosa	Lesser Wooly Bat	Indeterminate; Rare?; Peripheral		NT	
Laephotis botswanae	Botswana Long-eared Bat	Secure		V	
Mimetillus thomasi	Thomas's Flat-headed Bat	Not listed			
Neoromicia capensis	Cape Serotine Bat	Secure			
Neoromicia nana	Banana Bat	Secure			
Neoromicia zuluensis	Zulu Serotine Bat	Secure			
Nycticeinops schlieffeni	Schlieffen's Twilight Bat	Secure			
Pipistrellus hesperidus	Dusky Pipistrelle	Not listed			
Pipistrellus rueppellii	Rüppell's Pipistrelle	Insufficiently known; Peripheral			
Pipistrellus rusticus	Rusty Pipistrelle	Secure		NT	
Scotophilus dinganii	Yellow-bellied House Bat	Secure			
Scotophilus leucogaster	White-bellied House Bat	Not listed			
Hares and Rabbits					
Lepus saxatilis	Scrub Hare	Secure			
Pronolagus randensis	Jameson's Red Rock Rabbit	Secure			
Rodents					
Molerat					
Cryptomys damarensis	Damaraland Mole-Rat	Secure			
Porcupine					
Hystrix africaeaustralis	Cape Porcupine	Secure			
Rats and Mice					
Petromys typicus	Dassie Rat	Endemic; Secure		NT	
Pedetes capensis	Springhare	Secure			
Xerus inaurus	South African Ground Squirrel	Secure			
Funisciurus congicus	Striped Tree Squirrel	Secure			
Paraxerus cepapi	Tree Squirrel	Secure			
Graphiurus murinus	Woodland Dormouse	Secure			
Lemniscomys rosalia	Single-striped Grass Mouse	Secure		DD	
Rhabdomys pumilio	Four-striped Grass Mouse	Secure			
Mus indutus	Desert Pygmy Mouse	Secure			

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International Status		
			IUCN	SARDB	CITES
Mastomys natalensis	Natal Multimammate Mouse	Secure			
Mastomys coucha	Southern Multimammate Mouse	Secure			
Thallomys paedulcus	Acacia Rat	Secure			
Thallomys nigricauda	Black-tailed Tree Rat	Secure			
Aethomys chrysophilus	Red Veld Rat	Secure			
Aethomys namaquensis	Namaqua Rock Mouse	Secure			
Desmodillus auricularis	Cape Short-tailed Gerbil	Secure			
Gerbillurus paeba	Hairy-footed Gerbil	Secure			
Tatera leucogaster	Bushveld Gerbil	Secure		DD	
Tatera brantsii	Highveld Gerbil	Secure			
Saccostomus campestris	Pouched Mouse	Secure			
Malacothrix typica	Gerbil Mouse	Secure			
Steatomys pratensis	Fat Mouse	Secure			
Petromyscus collinus	Pygmy Rock Mouse	Endemic; Secure			
Petromyscus shortridei	Shortridge's Rock Mouse	Secure			
Mus musculus	House Mouse	Invasive alien			
Primates					
Galago moholi	South African Galago	Vulnerable; Protected Game			C2
Papio ursinus	Chacma Baboon	Secure; Problem animal			C2
Cercopihecus pygerythrus	Vervet Monkey	Secure			C2
Hedgehog					
Atelerix frontalis angolae	Southern African Hedgehog	Insufficiently known; Rare; Protected Game		R; NT	
Pangolin					
Smutsia (Manis) temminckii	Ground Pangolin	Vulnerable; Peripheral; Protected Game	V	V	C2
Carnivores					
Proteles cristatus	Aardwolf	Insufficiently known; (Vulnerable?); Peripheral			
Parahyaena (Hyaena) brunnea	Brown Hyena	Insufficiently known; (Vulnerable?); Peripheral	NT	NT	
Crocuta crocuta	Spotted Hyena	Secure?; Peripheral		NT	
Acinonyx jubatus	Cheetah	Vulnerable; Protected Game	V	V	C1
Panthera pardus	Leopard	Secure?; Peripheral; Protected Game	V		C1
Caracal caracal	Caracal	Secure; Problem Animal			C2
Felis silvestris	African Wild Cat	Vulnerable			C2
Felis nigripes	Black-footed Cat	Indeterminate; Rare	V		C1
Genetta genetta	Small Spotted Genet	Secure			

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International Status		
			IUCN	SARDB	CITES
Suricata suricatta	Suricate	Secure			
Cynictis penicillata	Yellow Mongoose	Secure			
Galerella sanguinea	Slender Mongoose	Secure			
Mungos mungo	Banded Mongoose	Secure			
Helogale parvula	Dwarf Mongoose	Secure			
Otocyon megalotis	Bat-eared Fox	Vulnerable?; Peripheral			
Vulpes chama	Cape Fox	Vulnerable?			
Canis mesomelas	Black-backed Jackal	Secure; Problem animal			
Mellivora capensis	Honey Badger/Ratel	Secure; Protected Game		NT	
Ictonyx striatus	Striped Polecat	Secure			
Pigs					
Phacochoerus africanus	Common Warthog	Secure; Huntable Game			
Antelopes					
Giraffa camelopardalis	Giraffe	Vulnerable?; Peripheral; Specially Protected Game	V		
Tragelaphus strepsiceros	Greater Kudu	Secure; Huntable Game			
Tragelaphus oryx	Eland	Insufficiently known; Vulnerable?; Protected Game			
Alcelaphus buselaphus	Red Hartebeest	Secure; Protected Game			
Oryx gazella	Gemsbok	Secure; Huntable game			
Sylvicapra grimmia	Common Duiker	Secure			
Antidorcas marsupialis	Springbok	Secure; Huntable game			
Madoqua damarensis	Damara Dik-Dik	Insufficiently known; Protected Game			
Raphicerus campestris	Steenbok	Secure; Protected Game			
Oreotragus oreotragus	Klipspringer	Secure; Specially Protected Game			

SARDB (2004): R = Rare; E = Endangered; NT = Near Threatened; DD = Data Deficient
IUCN (2020): V = Vulnerable; NT = Near Threatened
[1]Monadjem *et al.* (2010)
CITES: Appendix 1 or 2 species
Other species not listed are viewed as “Least Concern” by IUCN (2020) or not yet been assessed bt the IUCN Red List.
Source for literature review: De Graaff (1981), Griffin and Coetzee (2005), Estes (1995), Frost (2014), IUCN (2020), Joubert and Mostert (1975), Monadjem *et al.* (2010), Skinner and Smithers (1990), SARDB (2004), Skinner and Chimimba (2005), Stander and Hanssen (2003) and Taylor (2000)

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 "average to high" in overall (all terrestrial species) diversity and "high" in endemism in the north-central part of Namibia (Mendelsohn *et al.* 2002). The overall diversity and abundance of large herbivorous mammals (big game) is viewed as "high" with 5-6 species expected of which kudu, oryx and red hartebeest having average densities while the overall diversity and density of large carnivorous mammals (large predators) is "high" with 5 species expected of which leopard and cheetah have average densities (Mendelsohn *et al.* 2002). The overall mammal diversity in the general area is estimated at between 61-75 species with 1-2 species being endemic to the area (Mendelsohn *et al.* 2002). Griffin (1998c) puts the species richness distribution of endemics also between 9-11 species. The closest protected areas – Etosha National Park and the Waterberg Plateau Park – have an estimated 102 and 82 species of mammals, respectively (Griffin 1998c).

At least 107 species of mammals are known and/or expected to occur in the general area of which 2 species (1.9%) are classified as endemic. The Namibian legislation classifies 4 species as rare (greater long-fingered bat, lesser woolly bat, Southern African hedgehog, black-footed cat), 10 species as vulnerable (South African galago, ground pangolin, aardwolf, brown hyena, cheetah, African wildcat, bat-eared fox, Cape fox, giraffe, eland), 2 species as specially protected game, 10 species as protected game, 7 species as insufficiently known, 2 species as indeterminate, 9 species as peripheral, 1 species as migrant, 4 species as huntable game, 3 species as problem animals and 13 species not listed. At least 35.5% (38 species) of the mammalian fauna that occur or are expected to occur in general Kombat area are represented by bats of which 2 species are classified as rare (5.3%). This is followed by rodents with 27.1% (29 species) of which 2 species are classified as endemic (6.9%) and carnivores with 17.8% (19 species) of which 1 species is classified as rare (5.3%) and 6 species as vulnerable (31.6%). Species probably underrepresented in the above mentioned table for the general area are bats and rodents, as these groups have not been well documented from Namibia.

Thirty three species (30.8%) have some form of international conservation status (some species have more than one status) of which the IUCN (2020) classifies 5 species as vulnerable (ground pangolin, cheetah, leopard, black-footed cat, giraffe) and 3 species as near threatened (African straw-coloured bat, striped leaf-nosed bat, brown hyena); SARDB (2004) classifies 1 species as rare, 3 as vulnerable, 13 as near threatened and 6 as data deficient while CITES lists 3 species as Appendix 1 species and 6 species as Appendix 2 species. Furthermore Monadjem *et al.* (2010) classifies 1 species as near threatened although this is probably using old IUCN status revised in IUCN (2020). 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 vulnerable (ground pangolin, cheetah, leopard, black-footed cat, giraffe) and near threatened (African straw-coloured bat, striped leaf-nosed bat, brown hyena) by the IUCN (2020) and those species classified as rare (greater long-fingered bat, lesser woolly bat, Southern African hedgehog, black-footed cat), and vulnerable (South African galago, ground pangolin, aardwolf, brown hyena, cheetah, African wildcat, bat-eared fox, Cape fox, giraffe, eland),

under the Namibian legislation. However, not all the species occur permanently in the proposed development area, but may move through the area sporadically – e.g. cheetah, eland, etc.

However, none of the mammals are expected to be exclusively associated with the Farm Gai Kaisa No. 159 development site.

Mechanical harvesting – Impact
Mechanical harvesting is expected to impact on slow moving mammal species as these are usually cryptic (i.e. difficult to see) and sedentary (i.e. small home ranges) and will not be able and/or willing to flee oncoming heavy vehicles. This is especially true for the ground pangolin and South African hedgehog known/expected to occur in the area. However, they are nocturnal and usually utilise aardvark and other burrows during daylight hours. Most other larger mammals – e.g. carnivores and ungulates – would typically move out of an area experiencing human disturbances and mechanical activities.

Many arboreal species are also expected to be negatively affected, especially if larger tree specimens and dead trees are targeted which serve as refuge to a variety of unique species (e.g. cavity and bark dwelling species such as bats, galago, etc.).

Furthermore, habitat alteration and overutilization are the two primary processes threatening most mammals in Namibia (Griffin 1998c). On the other hand, habitat alteration during responsible bush thinning operations (i.e. scientifically managed), could create habitat for certain species which favour more open landscape or a mosaic of landscapes (i.e. varying patches of bush densities) – e.g. cheetah, oryx, springbok, etc.

These negative impacts would depend on the scale and intensity of the harvesting operation.

3.4 Avian Diversity

The avian diversity known, and/or expected to occur in the general Kombat area, is presented in Table 4 below.

Although Namibia's avifauna is comparatively sparse compared to the high rainfall equatorial areas elsewhere in Africa, approximately 658 species have already been recorded with a diverse and unique group of arid endemics (Brown *et al.* 1998, Maclean 1985). Fourteen species of birds are endemic or near endemic to Namibia with the majority of Namibian endemics occurring in the savannas (30%) of which ten species occur in a north-south belt of dry savannah in central Namibia (Brown *et al.* 1998).

Bird diversity is viewed as "high" in the general area with an estimated 171-230 species and 1-3 species being endemic (Mendelsohn *et al.* 2000). Simmons (1998a) suggests 4-6 endemic species and "average" rankings for southern African endemics and red data birds expected from the general area. Although the Kombat area is not classified as an Important Birding Area (IBA) in Namibia (Simmons 1998a) the closest such sites are located at the Etosha National Park to the northwest and the Waterberg to the south.

At least 261 species of terrestrial ["breeding residents"] birds occur and/or could occur in the general Kombat area at any time (Hockey *et al.* 2006, Maclean 1985, Tarboton 2001). All the migrant and aquatic species and those breeding extralimital, have been excluded. Eight of the 14 Namibian endemics are expected to occur in the general area (57.1% of all Namibian endemic species or 3.1% of all the species expected to occur in the area). Seven species are viewed as endangered (violet wood-hoopoe, Ludwig's bustard, white-backed vulture, bateleur, tawny eagle, booted eagle, martial eagle), 3 species as vulnerable (lappet-faced vulture, white-headed vulture, secretarybird) and 5 species as near threatened (Rüppell's parrot, kori bustard, Verreaux's eagle, peregrine falcon, marabou stork) (Simmons

Table 4. Avian diversity known and/or expected to occur in the general Kombat area – i.e. north-central Namibia.

Species: Scientific name	Species: Common name	Status: Namibia	International Status	
			Southern Africa	IUCN
Struthio camelus	Common Ostrich			
Peliperdix coqui	Coqui Francolin			
Dendroperdix sephaena	Crested Francolin			
Scleroptila levaillantoides	Orange River Francolin		N-end	
Pternistis hartlaubi	Hartlaub's Spurfowl	End	N-end	
Pternistis adspersus	Red-billed Spurfowl		N-end	
Pternistis swainsonii	Swainson's Spurfowl			
Coturnix coturnix	Common Quail			
Coturnix delegorguei	Harlequin Quail			
Numida meleagris	Helmeted Guineafowl			
Turnix sylvaticus	Kurrichane Buttonquail			
Indicator indicator	Greater Honeyguide			
Indicator minor	Lesser Honeyguide			
Campethera bennettii	Bennett's Woodpecker			
Campethera abingoni	Golden-tailed Woodpecker			
Dendropicos fuscescens	Cardinal Woodpecker			
Dendropicos namaquus	Bearded Woodpecker			
Pogoniulus chrysoconus	Yellow-fronted Tinkerbird			
Tricholaema leucomelas	Acacia Pied Barbet		N-end	
Tockus monteiri	Monteiro's Hornbill	End		
Tockus erythrorhynchus	Red-billed Hornbill			
Tockus damarensis	Damara Hornbill	End	N-end	
Tockus leucomelas	Southern Yellow-billed Hornbill		N-end	
Tockus bradfieldi	Bradfield's Hornbill		N-end	
Tockus nasutus	African Grey Hornbill			
Upupa africana	African Hoopoe			
Phoeniculus purpureus	Green Wood-Hoopoe			
Phoeniculus damarensis	Violet Wood-Hoopoe	E, N-end		
Rhinopomastus cyanomelas	Common Scimitarbill			
Coracias caudatus	Lilac-breasted Roller			
Coracias naevius	Purple Roller			
Halcyon leucocephala	Grey-headed Kingfisher			

Species: Scientific name	Species: Common name	Status: Namibia	International Status	
			Southern Africa	IUCN
Halcyon senegalensis	Woodland Kingfisher			
Halcyon albiventris	Brown-hooded Kingfisher			
Halcyon chelicuti	Striped Kingfisher			
Ceryle rudis	Pied Kingfisher			
Merops hirundineus	Swallow-tailed Bee-eater			
Merops apiaster	European Bee-eater			
Colius colius	White-backed Mousebird		End	
Urocolius indicus	Red-faced Mousebird			
Clamator jacobinus	Jacobin Cuckoo			
Clamator levaillantii	Levaillant's Cuckoo			
Clamator glandarius	Great Spotted Cuckoo			
Cuculus solitarius	Red-chested Cuckoo			
Cuculus clamosus	Black Cuckoo			
Cuculus gularis	African Cuckoo			
Chrysococcyx klaas	Klaas's Cuckoo			
Chrysococyx caprius	Diederick Cuckoo			
Centropus senegalensis	Senegal Coucal			
Poicephalus meyeri	Meyer's Parrot			
Poicephalus rueppellii	Rüppell's Parrot	NT, N-end	N-end	
Agapornis roseicollis	Rosy-faced Lovebird	End	N-end	
Cypsiurus parvus	African Palm Swift			
Tachymarptis melba	Alpine Swift			
Apus bradfieldi	Bradfield's Swift		N-end	
Apus affinis	Little Swift			
Apus horus	Horus Swift			
Apus caffer	White-rumped Swift			
Corythaixoides concolor	Grey Go-away Bird			
Tyto alba	Barn Owl			
Otus senegalensis	African Scops-Owl			
Ptilopsis granti	Southern White-faced Scops-Owl			
Bubo africanus	Spotted Eagle Owl			
Bubo lacteus	Verreaux's Eagle-Owl			
Glaucidium perlatum	Pearl-spotted Owlet			
Glaucidium capense	African Barred Owlet			

Species: Scientific name	Species: Common name	Status: Namibia	International Status	
			Southern Africa	IUCN
Asio capensis	Marsh Owl			
Caprimulgus pectoralis	Fiery-necked Nightjar			
Caprimulgus tristigma	Freckled Nightjar			
Caprimulgus fossii	Square-tailed Nightjar			
Caprimulgus rufigena	Rufous-cheeked Nightjar			
Columba livia	Rock Dove			
Columba guinea	Speckled Pigeon			
Streptopelia capicola	Cape Turtle Dove			
Streptopelia senegalensis	Laughing Dove			
Turtur chalcospilos	Emerald-spotted Wood-dove			
Oena capensis	Namaqua Dove			
Treron calvus	African Green-Pigeon			
Neotis ludwigii	Ludwig's Bustard	E	N-end	E
Ardeotis kori	Kori Bustard	NT		NT
Lophotis ruficrista	Red-crested Korhaan		N-end	
Afrotis afraoides	Northern Black Korhaan		End	
Lissotis melanogaster	Black-bellied Bustard			
Pterocles namaqua	Namaqua Sandgrouse		N-end	
Pterocles bicinctus	Double-banded Sandgrouse		N-end	
Pterocles burchelli	Burchell's Sandgrouse		N-end	
Burhinus vermiculatus	Water Thick-knee			
Burhinus capensis	Spotted Thick-knee			
Vanellus armatus	Blacksmith Lapwing			
Vanellus senegallus	African Wattled Lapwing			
Vanellus coronatus	Crowned Lapwing			
Rhinoptilus africanus	Double-banded Courser			
Rhinoptilus chalcopterus	Bronze-winged Courser			
Cursorius rufus	Burchell's Courser		N-end	
Cursorius temminckii	Temminck's Courser			
Macheiramphus alcinus	Bat Hawk			
Elanus caeruleus	Black-shouldered Kite			
Gyps africanus	White-backed Vulture	E		CE
Torgos tracheliotos	Lappet-faced Vulture	V		E
Trigonoceps occipitalis	White-headed Vulture	V		CE

Species: Scientific name	Species: Common name	Status: Namibia	International Status	
			Southern Africa	IUCN
Circaetus pectoralis	Black-chested Snake-Eagle			
Circaetus cinereus	Brown Snake-Eagle			
Terathopius ecaudatus	Bateleur	E		NT
Polyboroides typus	African Harrier-Hawk			
Kaupifalco monogrammicus	Lizard Buzzard			
Melierax metabates	Dark Chanting Goshawk			
Melierax canorus	Southern Pale Chanting Goshawk		N-end	
Melierax gabar	Gabar Goshawk			
Accipiter badius	Shikra			
Accipiter minullus	Little Sparrowhawk			
Accipiter ovampensis	Ovambo Sparrowhawk			
Buteo augur	Augur Buzzard			
Aquila rapax	Tawny Eagle	E		
Aquila verreauxii	Verreaux's Eagle	NT		V
Aquila spilogaster	African Hawk-Eagle			
Hieraaetus pennatus	Booted Eagle	E		
Aquila wahlbergi	Wahlberg's Eagle			
Polemaetus bellicosus	Martial Eagle	E		V
Sagittarius serpentarius	Secretarybird	V		V
Polihierax semitorquatus	Pygmy Falcon			
Falco rupicolus	Rock Kestrel			
Falco rupicoloides	Greater Kestrel			
Falco chicquera	Red-necked Falcon			
Falco cuvierii	African Hobby			
Falco biarmicus	Lanner Falcon			
Falco peregrinus	Peregrine Falcon	NT		
Egretta garzetta	Little Egret			
Ardea cinerea	Grey Heron			
Ardea melanocephala	Black-headed Heron			
Bubulcus ibis	Cattle Egret			
Scopus umbretta	Hamerkop			
Leptoptilos crumeniferus	Marabou Stork	NT		
Oriolus auratus	African Golden Oriole			
Dicrurus adsimilis	Fork-tailed Drongo			

Species: Scientific name	Species: Common name	Status: Namibia	International Status	
			Southern Africa	IUCN
Terpsiphone viridis	African Paradise-Flycatcher			
Nilaus afer	Brubru			
Dryoscopus cubla	Black-backed Puffback			
Tchagra senegalensis	Black-crowned Tchagra			
Tchagra australis	Brown-crowned Tchagra			
Laniarius atrococcineus	Crimson-breasted Shrike		N-end	
Prionops plumatus	White-crested Helmet-Shrike			
Lanioturdus torquatus	White-tailed Shrike	End	N-end	
Batis molitor	Chinspot Batis			
Batis pririt	Pririt Batis		N-end	
Corvus capensis	Cape Crow			
Corvus albus	Pied Crow			
Lanius collaris	Common Fiscal			
Corvinella melanoleuca	Magpie Shrike			
Eurocephalus anguitimens	Southern White-crowned Shrike		N-end	
Campephaga flava	Black Cuckooshrike			
Anthoscopus minutes	Cape Penduline Tit		N-end	
Anthoscopus caroli	Grey Penduline Tit			
Parus niger	Southern Black Tit			
Parus carpi	Carp's Tit	End	N-end	
Parus cinerascens	Ashy Tit		End	
Riparia paludicola	Brown-throated Martin			
Riparia cincta	Banded Martin			
Hirundu albigularis	White-throated Swallow			
Hirundo dimidiata	Pearl-breasted Swallow			
Hirundo cucullata	Greater Striped Swallow			
Hirundo abyssinica	Lesser Striped Swallow			
Hirundo semirufa	Red-breasted Swallow			
Hirundo spilodera	South African Cliff Swallow			
Hirundo fuligula	Rock Martin			
Delichon urbicum	Common House Martin			
Pycnonotus nigricans	African Red-eyed Bulbul		N-end	
Achaetps pycnopygius	Rockrunner	End	N-end	
Sylvietta rufescens	Long-billed Crombec			

Species: Scientific name	Species: Common name	Status: Namibia	International Status	
			Southern Africa	IUCN
Eremomela icteropygialis	Yellow-bellied Eremomela			
Eremomela usticollis	Burnt-necked Eremomela			
Acrocephalus baeticatus	African Reed-Warbler			
Turdoides bicolor	Southern Pied Babbler		End	
Turdoides gymnogenys	Bare-cheeked Babbler	End		
Parisoma subcaeruleum	Chestnut-vented Tit-Babbler		N-end	
Zosterops senegalensis	African Yellow White-eye			
Zosterops pallidus	Orange River White-eye		End	
Cisticola chiniana	Rattling Cisticola			
Cisticola rufilatus	Tinkling Cisticola			
Cisticola subruficapilla	Grey-backed Cisticola		N-end	
Cisticola fulvicapilla	Neddicky			
Cisticola juncidis	Zitting Cisticola			
Cisticola jaridulus	Desert Cisticola			
Prinia flavicans	Black-chested Prinia			
Malcorus pectoralis	Rufous-eared Warbler		End	
Apalis flavida	Yellow-breasted Apalis			
Camaroptera brevicaudata	Grey-backed Camaroptera			
Calamonastes fasciolatus	Barren Wren-Warbler		N-end	
Mirafra passerina	Monotonous Lark			
Mirafra africana	Rufous-naped Lark			
Mirafra fasciolata	Eastern Clapper Lark		N-end	
Mirafra sabota	Sabota Lark			
Calendulauda africanoides	Fawn-coloured Lark		N-end	
Pinarocorys nigricans	Dusky Lark			
Chersomanes albofasciata	Spike-heeled Lark		N-end	
Eremopterix leucotis	Chestnut-backed Sparrowlark			
Eremopterix verticalis	Grey-backed Sparrowlark		N-end	
Calandrella cinerea	Red-capped Lark			
Alauda starki	Stark's Lark		N-end	
Spizocorys conirostris	Pink-billed Lark		N-end	
Monticola brevipes	Short-toed Rock Thrush			
Psophocichla litsitsirupa	Groundscraper Thrush			
Turdus libonyana	Kurrichane Thrush			

Species: Scientific name	Species: Common name	Status: Namibia	International Status	
			Southern Africa	IUCN
Bradornis infuscatus	Chat Flycatcher		N-end	
Melaenornis mariquensis	Marico Flycatcher		N-end	
Muscicapa striata	Spotted Flycatcher			
Cercotrichas leucophrys	White-browed Scrub-Robin			
Cercotrichas paena	Kalahari Scrub-Robin			
Oenanthe monticola	Mountain Wheatear		N-end	
Oenanthe pileata	Capped Wheatear			
Cercomela familiaris	Familiar Chat			
Myrmecocichla formicivora	Ant-eating Chat		End	
Onychognathus nabouroup	Pale-winged Starling		N-end	
Lamprotornis nitens	Cape Glossy Starling			
Lamprotornis chalybaeus	Greater Blue-eared Starling			
Lamprotornis australis	Burchell's Starling			
Cinnyricinclus leucogaster	Violet-backed Starling			
Creatophora cinerea	Wattled Starling			
Chalcomitra amethystina	Amethyst Sunbird			
Chalcomitra senegalensis	Scarlet-chested Sunbird			
Cinnyris talatala	White-bellied Sunbird			
Nectarinia fusca	Dusky Sunbird		N-end	
Cinnyris mariquensis	Marico Sunbird			
Bualornis niger	Red-billed Buffalo-Weaver			
Sporopipes squamifrons	Scaly-feathered Finch		N-end	
Plocepasser mahali	White-browed Sparrow-Weaver			
Philetairus socius	Sociable Weaver		End	
Ploceus intermedius	Lesser Masked-Weaver			
Ploceus velatus	Southern Masked-Weaver			
Ploceus rubiginosus	Chestnut Weaver			
Anaplectes melanotis	Red-headed Weaver			
Quelea quelea	Red-billed Quelea			
Euplectes afer	Yellow-crowned Bishop			
Euplectes orix	Southern Red Bishop			
Ortygospiza atricollis	African Quailfinch			
Amadina erythrocephala	Red-headed Finch		N-end	
Amadina fasciata	Cut-throat Finch			

Species: Scientific name	Species: Common name	Status: Namibia	International Status	
			Southern Africa	IUCN
Estrilda erythronotos	Black-faced Waxbill			
Estrilda astrild	Common Waxbill			
Granatina granatina	Violet-eared Waxbill			
Uraeginthus angolensis	Blue Waxbill			
Pytilia melba	Green-winged Pytilia			
Vidua macroura	Pin-tailed Whydah			
Vidua paradisaea	Long-tailed Paradise-Whydah			
Vidua regia	Shaft-tailed Whydah			
Passer domesticus	House Sparrow			
Passer motitensis	Great Sparrow		N-end	
Passer melanurus	Cape Sparrow		N-end	
Passer griseus	Southern Grey-headed Sparrow			
Petronia superciliaris	Yellow-throated Petronia			
Motacilla aguimp	African Pied Wagtail			
Motacilla capensis	Cape Wagtail			
Anthus cinnamomeus	African Pipit			
Anthus leucophrys	Plain-backed Pipit			
Anthus vaalensis	Buffy Pipit			
Crithagra atrogulariis	Black-throated Canary			
Serinus flaviventris	Yellow Canary		N-end	
Serinus albogularis	White-throated Canary		N-end	
Emberiza impetuani	Lark-like Bunting		N-end	
Emberiza tahapisi	Cinnamon-breasted Bunting			
Emberiza capensis	Cape Bunting		N-end	
Emberiza flaviventris	Golden-breasted Bunting			

Simmons *et al.* (2015): E = Endangered; V = Vulnerable; NT = Near threatened
End = Endemic (Brown *et al.* 1998)
N-end = Near-endemic (Simmons *et al.* 2015)
Endemic and near endemic – southern African status (Hockey *et al.* 2006)
IUCN (2020): CE = Critically Endangered; E = Endangered; V = Vulnerable; NT = Near Threatened
[This table excludes migratory birds (e.g. Petrel, Albatross, Skua, etc.); species breeding extralimital (e.g. stints, sandpipers, etc.) and aquatic birds (e.g. ducks, herons, etc.) and rather focuses on birds that are breeding residents or can be found in the area during any time of the year. This

would imply that many more birds (e.g. Palaearctic migrants and aquatic species) could occur in the area depending on “favourable” environmental conditions]

Source for literature review: Brown *et al.* (1998), Hockey *et al.* (2006), IUCN (2020), Komen (n.d.), Maclean (1985), Simmons *et al.* (2015) and Tarboton (2001)

et al. 2015). Furthermore, Simmons *et al.* (2015) classifies 2 species as near endemic which were previously seen as endemic (i.e. violet wood-hoopoe and Rűppel's parrot). The IUCN (2020) classifies 2 species as critically endangered (white-backed vulture, white-headed vulture), 2 species as endangered (Ludwig's bustard and lappet-faced vulture), 3 species as vulnerable (Verreaux's eagle, martial eagle and secretarybird) and 2 species as near threatened (kori bustard, bateleur).

Fifty five (21.1% of all the birds expected) species have a southern African conservation rating with 8 species classified as endemic (14.5% of southern African endemics or 3.1% of all the birds expected) and 47 species classified as near endemic (85.5% of southern African endemics or 18% of all the birds expected) (Hockey *et al.* 2006).

The most important endemic species known/expected to occur in the general area are viewed as Hartlaub's spurfowl (*Pternistis hartlaubi*), Monteiro's hornbill (*Tockus monteiri*), Damara hornbill (*Tockus damarensis*), Carp's tit (*Parus carpi*), rockrunner (*Achaetops pycnopygius*), bare-cheeked babbler (*Turdoides gymnogenys*) and Rüppell's parrot (*Poicephalus rueppellii* – near-endemic). The most important species are those listed as endangered (violet wood-hoopoe, Ludwig's bustard, white-backed vulture, bateleur, tawny eagle, booted eagle, martial eagle), vulnerable (lappet-faced vulture, white-headed vulture, secretarybird) and near threatened (Rüppell's parrot, kori bustard, Verreaux's eagle, peregrine falcon, marabou stork) by Simmons *et al.* (2015) from Namibia as well as the species classified as critically endangered (white-backed vulture, white-headed vulture), endangered (Ludwig's bustard and lappet-faced vulture), vulnerable (Verreaux's eagle, martial eagle and secretarybird) and near threatened (kori bustard, bateleur) by the IUCN (2020).

However, none of the birds are expected to be exclusively associated with the Farm Gai Kaisa No. 159 development site.

Mechanical harvesting – Impact
Mechanical harvesting is expected to impact on the ground nesting bird species as these are usually cryptic (i.e. difficult to see) and will only flee oncoming heavy vehicles at the last moment. The most important ground nesting birds would include the Hartlaub's spurfowl (endemic), Ludwig's bustard (endangered), kori bustard (near threatened) and rockrunner (endemic). Although the adult birds will disperse when disturbed, eggs and chicks will be destroyed. *Most other birds would typically move out of an area experiencing human disturbances and mechanical activities.*

Many arboreal species are also expected to be negatively affected, especially if larger tree specimens and dead trees are targeted which serve as refuge to a variety of unique species (e.g. cavity nesting and crown nesting species). The most important cavity nesting birds would include the Monteiro's and Damara hornbills (both endemics), violet wood-hoopoe (endangered and near endemic), Rüppell's parrot (near threatened and near endemic), rosy-faced lovebird, Carp's tit and rockrunner (all endemic). The most important crown nesting birds would include the white-backed, white-headed and lappet-faced vultures (the first 2 species are listed as critically endangered by the IUCN (2020), bateleur, booted eagle, martial eagle (all endangered), secretarybird (vulnerable) and Verreaux's eagle, marabou stork (both near threatened). Raptor, especially vulture, numbers are decreasing alarmingly throughout their range and they often abandon their nests (which are often reused) when disturbed.

Habitat alteration during responsible bush thinning operations (i.e. scientifically managed), could create habitat for certain species which favour more open landscape or a mosaic of landscapes (i.e. varying patches of bush densities) – e.g. Ludwig's and kori bustards, etc. On the other hand many species favour bush thickets and a change in habitat could detrimentally affect them – e.g. small birds with ball/cup shaped nests favouring inaccessible

thorny shrubs such as eromomela, finches, sunbirds, white-eyes, etc. (See: Cunningham and Joubert 2011).

These negative impacts would depend on the scale and intensity of the harvesting operation.

3.5 Tree and Shrub Diversity

The tree and shrub diversity known, and/or expected to occur in the general Kombat area, is presented in Table 5 below.

The trees and shrubs known, and/or expected to occur in the general Kombat area (derived from Mannheimer and Curtis 2018) is presented in Table 5 below. Species indicated are know from the quarter-degree square distribution principle used and don't necessarily occur throughout the entire area.

Table 5. Tree and shrub diversity known and/or expected to occur in the general Kombat area – i.e. north-central Namibia.

Species: Scientific name	Status: Namibia	International Status:	
		IUCN	CITES
Acacia ataxacantha			
Acacia erioloba	Protected (F#)		
Acacia erubescens			
Acacia fleckii			
Acacia hebeclada			
Acacia hereroensis			
Acacia karroo			
Acacia kirkii			
Acacia luederitzii			
Acacia mellifera			
Acacia nebrownii			
Acacia nilotica			
Acacia reficiens			
Acacia senegal			
Acacia tortilis			
Adansonia digitata	Protected (F#)		
Adenium boehmianum	Protected (F#)		
Albizia anthelmintica	Protected (F#)		
Aloe litoralis	NC		C2
Bauhinia petersiana			
Berchemia discolor	Protected (F#)		
Boscia albitrunca	Protected (F#)		
Boscia foetida			
Burkea africana	Protected (F#)	LC	
Caesalpinia rubra			
Carissa bispinosa			
Carissa edulis			
Cassia abbreviata			
Catophractes alexandri			
Cissus nymphaeifolia			
Combretum apiculatum			
Combretum collinum			
Combretum engleri			
Combretum hereroense			
Combretum mossambicense			
Combretum imberbe	Protected (F#)	LC	

Species: Scientific name	Status: Namibia	International Status:	
		IUCN	CITES
Combretum psidioides			
Combretum zeyheri			
Commiphora africana		LC	
Commiphora angolensis			
Commiphora glandulosa		LC	
Commiphora glaucescens	N-end	LC	
Commiphora mollis		LC	
Commiphora pyracanthoides		LC	
Commiphora tenuipetiolata		LC	
Cordia sinensis			
Croton gratissimus			
Croton menyharthii			
Cyphostemma juttae	Protected (F#); End; NC		
Dichrostachys cinerea			
Diospyros lycioides			
Dombeya rotundifolia			
Ehretia alba			
Ehretia namibiensis			
Elaeodendron transvaalense			
Elephantorrhiza suffruticosa			
Entada arenaria			
Erythrina decora	Protected (F#); End		
Erythrococca menyharthii			
Euclea divinorum			
Euclea undulata			
Euphorbia avasmontana			C2
Euphorbia guerichiana			C2
Euphorbia transvaalensis			
Faidherbia albida	Protected (F#)	LC	
Ficus burkei/petersii	Protected (F#)		
Ficus cordata	Protected (F#)	LC	
Ficus ilicina			
Ficus sycomorus	Protected (F#)	LC	
Flueggea virosa			
Fockea multiflora			
Grewia avellana			
Grewia bicolor			
Grewia falcistipula			
Grewia flava			
Grewia flavescens			
Grewia olukondae			
Grewia retinervis			
Grewia schinzii			
Grewia subspathulata			
Grewia tenax			
Grewia villosa			
Gossypium triphyllum			
Gymnosporia buxifolia			
Gymnosporia senegalensis			
Gyrocarpus americanus			
Heteromorpha stenophylla			
Hyphaene petersiana	Protected (F#)	LC	
Ipomoea adenioides			
Kirkia acuminata			
Laggera decurrens			
Lannea discolor	Protected (F#)	LC	

Species: Scientific name	Status: Namibia	International Status:	
		IUCN	CITES
Lycium cinereum			
Maerua juncea			
Maerua parvifolia			
Maerua schinzii	Protected (F#)	LC	
Melianthus comosus			
Montinia caryophyllacea			
Moringa ovalifolia	Protected (F#); NC; N-end		
Mundulea sericea			
Obetia carruthersiana	N-end		
Ochna pulchra			
Olea europaea			
Opilia campestris			
Osyris lanceolata			
Ozoroa crassinervia			
Ozoroa insignis			
Ozoroa paniculosa			
Ozoroa schinzii	N-end		
Pachypodium lealii	Protected (F#); NC; N-end		
Pavetta zeyheri			
Peltophorum africanum			
Philenoptera nelsii			
Pouzolzia mixta			
Pseudolachnostylis maprouneifolia			
Psydrax livida			
Rhigozum brevispinosum			
Rhigozum trichotomum			
Rotheca myricoides			
Salsola spp.			
Schinziophyton rautanenii	Protected (F#)	LC	
Sclerocarya birrea	Protected (F#)		
Searsia ciliata			
Searsia lancea	Protected (F#)	LC	
Searsia marlothii			
Searsia pyroides			
Searsia tenuinervis			
Securidaca longependuculata			
Spirostachys africana	Protected (F#)	LC	
Steganotaenia araliacea			
Sterculia africana	Protected (F#)	LC	
Tarchonanthus camphoratus			
Terminalia brachystemma			
Terminalia prunioides			
Terminalia sericea			
Tetradenia riparia			
Tinnea eriocalyx			
Tinnea rhodesiana			
Vangueria cyanescens			
Vangueria infausta			
Vangueria lanciflora			
Vernonia cinerascens			
Ximenia americana			
Ximenia caffra var. *caffra*			
Ziziphus mucronata	Protected (F#)	LC	

Endemic = End and Near-endemic = N-end (Mannheimer and Curtis 2018)
F# = Forest Act No. 12 of 2001

NC = Nature Conservation Ordinance No. 4 of 1975
C2 = CITES Appendix 2 species
LC = Least Concern (IUCN 2020)
Source for literature review: Mannheimer and Curtis (2018), Steyn (2003)

Plant diversity is viewed as "high" in the general area with an estimated 400-499 species and 2-5 species being endemic (Mendelsohn *et al.* 2000). Furthermore, the Karst area (limestone areas of the Otavi-Grootfontein-Tsumeb hills) is known as a hotspot for local endemics (Mendelsohn *et al.* 2000). According to Barnard (1998) the Otavi Mountains are known for their high biodiversity richness and endemism and views the general area as a top priority for conservation protection. Maggs (1998) refers to the Karsveld area as a species-rich "island" which supports relic populations of southern vascular plants and a refuge to mosses and ferns due to the higher altitudes, cooler temperatures and sheltered sites.

At least 145 species of larger trees and shrubs (>1m in height) are known and/or expected to occur in the general area of which 2 species are classified as endemic (1.4%) and 5 species as near endemic (3.5%).

Thirty six (24.8%) species of larger trees and shrubs have some kind of protected status in the general area (this includes endemic and near endemic species) of which 25 species are protected by the Forest Act No. 12 of 2001(17.2%), 4 species are protected by the Nature Conservation Ordinance No. 4 of 1975 (2.8%) and 3 species are listed as CITES Appendix 2 species (2.1%). The IUCN (2020) classifies 19 species as least concern (13.1%) although not all the species have been assessed by the IUCN Red List.

The most important larger tree and shrub species are viewed as *Cyphostemma juttae* (endemic, protected by Forest Act and Nature Conservation Ordinance) and *Erythrina decora* (endemic, protected by Forest Act) from the general area.

The Farm Gai Kaisa No. 159 is located to the south of the most important parts of the Mountain and Karstveld although there are limestone outcrops (See Figure 1) which potentially have some of the important species mentioned in Table 5.

However, none of the larger trees and shrubs is expected to be exclusively associated with the Farm Gai Kaisa No. 159 development site.

Mechanical harvesting – Impact
The impact of mechanical harvesting would depend on the scale and intensity of the harvesting operation and overall vision, planning, execution of the operation and especially the control over the harvesters.

The plants expected to be impacted would be those important species typically associated with the Karst formations (i.e. dolomite outcrops/ridges/hills) such as the endemic *Cyphostemma juttae* and *Erythrina decora* and various *Aloe* species. *However, although the rocky terrain is usually unsuitable for mechanical operations, these important areas should nevertheless be avoided and excluded from harvesting activities.*

Various protected tree species occur in the areas potentially suitable for mechanical harvesting operations. These trees (See Table 5), especially the larger specimens, should be avoided as they potentially serve as habitat to a variety of vertebrate fauna (Further, see the Forest Act for tree harvesting limitations – i.e.18cm diameter, etc.).

Larger tree specimens (including protected species – e.g. Searsia lancea, Ziziphus mucronata, etc.) are usually associated with ephemeral drainage lines and pans in the general area. These areas should be avoided as the trees potentially serve as habitat to a

variety of vertebrate fauna and stabilise soils around these drainage lines (Further, see the Forest Act for harvesting limitations – i.e.100m from streams, etc.).

A mosaic harvesting approach (i.e. patch harvesting which results in a variety of openness, but still includes dense patches) is recommended as this would increase the ecotone area around these patches and consequently associated biodiversity. Bad planning and execution could result in mechanised harvesting "over harvesting" areas with dire consequences to the ecology of the area.

Conectivity of areas is recommended as these corridors serve as thoroughfare for various vertebrate species. The most important habitats should be connected – i.e. rocky areas, pans and drainage lines. Bad planning and execution could result in mechanised harvesting eliminating connectivity with dire consequences to the ecology of the area.

Dichrostachys cinerea (sicklebush) is known to react aggressively when disturbed by mechanical means – i.e. become exceedingly dense. Areas dominated by this species should not be harvested mechanically to avoid the area becoming even more dense and inaccesable than prior to harvesting operations (e.g. De Wet 2015, Smit et al. 2015, Tainton 1999).

Soil disturbances are a common feature of mechanical harvesting depending on the type of vehicles used; soil type; aspect; slope, etc. (De Klerk 2004, SAIEA 2016). Wheel mounted Bell Loggers, as envisaged for this operation, would result in less disturbances than track mounted vehicles. Nevertheless, rocky areas (erosion) and clay soils (compaction and tracks in wet season) should be avoided and harvesting should rather be limited to areas with sandy soils where fewer problems are expected.

Hydrocarbon spills are a risk (e.g. groundwater contamination and detrimental to trees/shrubs at site of spill) when dealing with mechanised harvesters and would have to be planned for.

Fire is a risk (e.g. destruction of browse) when dealing with mechanised harvesters and would have to be planned for (e.g. De Wet 2015).

These negative impacts would depend on the scale and intensity of the harvesting operation.

3.6 Grass Diversity

The grass diversity known, and/or expected to occur in the general Kombat area, is presented in Table 6 below.

The grasses known and/or expected to occur in the general Kombat area ([1]Müller 1984, [2]Van Oudtshoorn 1999, and [3]Müller 2007) is presented in Table 6 below.

Table 6. Grass diversity known and/or expected to occur in the general Kombat area – i.e. north-central Namibia.

Species: Scientific name	Status: Namibia	Ecological Status	Grazing Value
[2,3]*Andropogon chinensis*		Decreaser	High
[1]*Andropogon schinzii*		Decreaser	High
[1,2,3]*Anthephora pubescens*		Decreaser	High
[1,3]*Anthephora schinzii*		?	Low
[1,2,3]*Aristida adscensionis*		Increaser 2	Low
[1,2,3]*Aristida congesta*		Increaser 2	Low
[2,3]*Aristida stipitata*		Increaser 2	Low

Species: Scientific name	Status: Namibia	Ecological Status	Grazing Value
[1,3]*Aristida effusa*		?	Low
[1,2,3]*Aristida meridionalis*		Increaser 3	Low
[1,2,3]*Aristida rhiniochloa*		Increaser 2	Low
[1,3]*Aristida stipitata*		Increaser 2	Low
[3]*Aristida stipoides*		?	Low
[1,2,3]*Brachiaria deflexa*		Increaser 2	Average
[2]*Brachiaria eruciformis*		Increaser 2	Average
[1,2]*Bothriochloa radicans*		Increaser 2	Low
[3]*Brachiaria malacodes*		Increaser 2	Low
[1,2]*Brachiaria marlothii*		Increaser 2	Low
[1,2,3]*Brachiaria nigropedata*		Decreaser	High
[1]*Brachiaria poaeoides*		?	Average
[1,2,3]*Cenchrus ciliaris*		Decreaser	High
[2]*Centropodia glauca*		Decreaser	High
[1,2,3]*Chloris virgata*		Increaser 2	Average
[1,2,3]*Cymbopogon caesius*		Increaser 1	Low
[2]*Cymbopogon plurinodis*		Increaser 1	Low
[1,3]*Cymbopogon pospischilii*		Increaser 1	Low
[1,2,3]*Cynodon dactylon*		Increaser 2	High
[1,2,3]*Dactyloctenium aegyptium*		Increaser 2	Average
[1,3]*Danthoniopsis ramosa*		?	Average
[2,3]*Dichanthium annulatum*		Decreaser	High
[1]*Dichanthium papillosum*		Decreaser	High
[1,2,3]*Digitaria eriantha*		Decreaser	High
[2,3]*Digitaria velutina*		Increaser 2	Low
[2]*Diplachne fusca*		Decreaser	High
[1,2,3]*Echinochloa holubii*		Increaser 2	Average
[2]*Eleusine coracana*		Increaser 2	Low
[1,2,3]*Elionurus muticus*		Increaser 3	Low
[1,2,3]*Enneapogon cenchroides*		Increaser 2	Average
[1,2,3]*Enneapogon desvauxii*		Intermediate	Average
[3]*Enneapogon scaber*		?	Low
[1,2,3]*Enneapogon scoparius*		Increaser 3	Low
[1,3]*Entoplocamia aristulata*		?	Average
[1,3]*Eragrostis annulata*		?	Low
[2,3]*Eragrostis bicolor*		?	Low
[1,2,3]*Eragrostis biflora*		Increaser 2	Low
[2]*Eragrostis cilianensis*		Increaser 2	Low
[2]*Eragrostis curvula*		Increaser 2	High
[1,3]*Eragrostis cylindriflora*		Increaser 2	Low
[3]*Eragrostis dinteri*		Increaser 2	Average
[1,2,3]*Eragrostis echinochloidea*		Increaser 2	Average
[2]*Eragrostis gummiflua*		Increaser 2	Low
[1,2,3]*Eragrostis lehmanniana*		Increaser 2	Average
[1,2,3]*Eragrostis nindensis*		Increaser 2	Average
[1,3]*Eragrostis omahekensis*	End	Increaser 2	Low
[1,3]*Eragrostis porosa*		Increaser 2	Low
[1,2,3]*Eragrostis rigidior*		Increaser 2	Average
[1,2,3]*Eragrostis rotifer*		?	Average
[1,3]*Eragrostis scopelophila*	End	Decreaser	Average
[1,2,3]*Eragrostis superba*		Increaser 2	Average
[1,2,3]*Eragrostis trichophora*		Increaser 2	Average
[1]*Eragrostis truncata*		?	Average
[2,3]*Eragrostis viscosa*		Increaser 2	Low
[1,2,3]*Fingerhuthia africana*		Decreaser	Average
[1,2,3]*Heteropogon contortus*		Increaser 2	Average
[1,2,3]*Hyparrhenia hirta*		Increaser 1	Average

Species: Scientific name	Status: Namibia	Ecological Status	Grazing Value
[2]*Imperata cylindrica*		Increaser 1	Low
[3]*Leptochloa fusca*		?	Average
[1,2,3]*Melinis repens*		Increaser 2	Low
[1,2,3]*Microchloa caffra*		Increaser 2	Low
[1,3]*Monelytrum leuderitzianum*		?	Low
[3]*Odyssea paucinervis*		?	Low
[2,3]*Oropetium capense*		Increaser 2	Low
[1,2,3]*Panicum coloratum*		Decreaser	High
[1,3]*Panicum lanipes*		?	High
[1,2,3]*Panicum maximum*		Decreaser	High
[3]*Panicum novemnerve*		?	Low
[3]*Panicum repens*		Decreaser	High
[1,3]*Panicum stapfianum*		Decreaser	High
[1,3]*Pennisetum foermeranum*	End	?	Low
[1,3]*Pogonarthria fleckii*		Increaser 2	Low
[1,2,3]*Pogonarthria squarrosa*		Increaser 2	Low
[2,3]*Schizachyrium sanguineum*		Increaser 1	Low
[1,2,3]*Schmidtia kalahariensis*		Increaser 2	Low
[1,2,3]*Schmidtia pappophoroides*		Decreaser	High
[1,3]*Setaria finita*	End	?	Low
[2]*Setaria incrassata*		Decreaser	High
[2]*Setaria pallide-fusca*		Increaser 2	Average
[1,2,3]*Setaria verticillata*		Increaser 2	Average
[3]*Sorghum bicolor*		?	High
[2,3]*Sporobolus festivus*		Increaser 2	Low
[1,2,3]*Sporobolus fimbriatus*		Decreaser	High
[1,2,3]*Sporobolus ioclados*		Increaser 2	Average
[2]*Sporobolus pyramidalis*		Increaser 2	Low
[1,2]*Stipagrostis ciliata*		Decreaser	High
[1,2,3]*Stipagrostis hirtigluma*		Increaser 2	Low
[1,3]*Stipagrostis hochstetteriana*		Decreaser	High
[1,2,3]*Stipagrostis namaquensis*		?	Average
[1,2,3]*Stipagrostis obtusa*		Decreaser	High
[1,2,3]*Stipagrostis uniplumis*		Increaser 2	Average
[1,2]*Themeda triandra*		Decreaser	High
[2,3]*Tragus berteronianus*		Increaser 2	Low
[3]*Tragus racemosus*		Increaser 2	Low
[1,2,3]*Tricholaena monachne*		Increaser 2	Average
[2]*Trichoneura grandiglumis*		Increaser 2	Low
[1]*Triraphis purpurea*		Increaser 1	Low
[1,3]*Triraphis ramosissima*		?	High
[1]*Urochloa bolbodes*		Decreaser	High
[3]*Urochloa brachyura*		?	Average
[2,3]*Urochloa oligotricha*		Decreaser	High
[2,3]*Urochloa panicoides*		Increaser 2	High
[3]*Urochloa trichopus*		?	Low
[3]*Willkommia sarmentosa*		?	High

End = Endemic (Müller 2007)
? – not classified in literature, but often similar to other species within the genus
Source for literature review: Müller (1984), Müller (2007), Van Oudtshoorn (1999)

Up to 111 grasses are expected in the general Kombat area of which 4 species are viewed as endemic (*Eragrostis omahekensis*, *Eragrostis scopelophila*, *Pennisetum foermeranum* and *Setaria finite*). *Pennisetum foermeranum* is associated with rocky mountainous terrain and consequently only expected is such suitable habitat. *Eragrostis omahekensis* is virtually

only found on disturbed soils – e.g. close to watering points – while *Eragrostis scopelophila* is associated with mountainous areas under trees and shrubs.

The most important grass is viewed as the endemic *Setaria finite* which is associated with drainage lines in the general area and never very common wherever it occurs.

However, none of the important grasses are expected to be exclusively associated with the Farm Gai Kaisa No. 159 development site.

Mechanical harvesting – Impact
The impact of mechanical harvesting would depend on the scale and intensity of the harvesting operation and overall vision, planning, execution of the operation and especially the control over the harvesters.

Grass biomass is expected and known to increase dramatically after bush thinning although these consist almost entirely of annual grasses which are not as palatable and/or resilient to drought and fire as perennial grass species. Only by controlling the livestock stocking rate; employ rotational grazing and rest, will the overall grass species compositions improve over time – i.e. with active visionary adaptive management and sound farming practices. Understanding the grass-tree interactions (positive and negative) is paramount in the recovery of the grazing sward (e.g. Tainton 1999).

Habitat alteration during responsible bush thinning operations (i.e. scientifically managed), could create habitat for certain species which favour more open landscape or a mosaic of landscapes (i.e. varying patches of bush densities) and increased grass growth – e.g. grazing ungulates, cheetah, domestic stock, etc. On the other hand many species favour bush thickets and a change in habitat could detrimentally affect them – e.g. various browsers (kudu), small elusive ungulates (dik dik), etc. All wildlife require shade and shelter as part of their basic habitat requirements and a drastic change from a bush thickened area to an open grassland area would negatively affect most species. It is therefore imperative to find the correct balance of trees/shrubs/grasses.

Hydrocarbon spills are a risk (e.g. groundwater contamination and detrimental to grass at site of spill) when dealing with mechanised harvesters and would have to be planned for.

Fire is a risk (e.g. destruction of grazing) when dealing with mechanised harvesters and would have to be planned for (e.g. De Wet 2015).

These negative impacts would depend on the scale and intensity of the harvesting operation.

3.7 Other Species

Aloes
Aloe species – all protected (See Nature Conservation Ordinance No. 4 of 1975) – include 3 other species not included in Table 5, but which potentially occur in the general Kombat area, and also viewed as important are *Aloe dinteri*, *A. hereroensis* and *A. zebrina* (Rothmann 2004).

Commiphoras
Many endemic Commiphora species are found throughout Namibia with Steyn (2003) indicating that *Commiphora crenato-serrata* (not included in the Table 5) potentially also occurring in the general area. Furthermore, some species are also known to have an economic potential – i.e. resin properties of *C. wildii* used in the perfume industry (Knott and Curtis 2006) – which makes them an important group of plants.

Ferns
At least 64 species of ferns, of which 13 species being endemic, occur throughout Namibia. Ferns in the general area include at least 31 indigenous species (*Actiniopteris radiata*, *Adiantum capillus-veneris*, *A. incisum*, *A. poiretii*, *Asplenium cordatum*, *Blechnum australe*, *Cheilanthes dinteri*, *C. dura*, *C. eckloniana*, *C. involuta*, *C. marlothii*, *C. multifida*, *C. pentagona*, *C. viridis*, *Christella chaseana*, *Doryopteris concolor*, *Marsilea aegyptiaca*, *M. ephippiocarpa*, *M. farinosa*, *M. marcocarpa*, *M. nubica*, *M. unicornis*, *M. vera*, *Microlepia speluncae*, *Ophioglossum polyphyllum*, *O. reticulatum*, *O. sandieae*, *Pellaea calomelanos*, *P. pectiniformis*, *Pteris vittata*, *Thelypteris confluens*) with no endemics known/expected (Crouch *et al.* 2011).

Although ferns require specific habitat – often rocky substrate – the general area is undercollected with more species probably occurring than presented above.

Lichens
The overall diversity of lichens is poorly known from Namibia, especially the coastal areas and statistics on endemicity is even sparser (Craven 1998). More than 100 species are expected to occur in the Namib Desert with the majority being uniquely related to the coastal fog belt. Lichen diversity is related to air humidity and generally decreases inland form the Namibian coast (Schultz and Rambold 2007). Off road driving is the biggest threat to these lichens which are often rare and unique to Namibia. To indicate how poorly known lichens are from Namibia, the recent publication by Schultz *et al.* (2009) indicating that 37 of the 39 lichen species collected during BIOTA surveys in the early/mid 2000's were new to science (i.e. new species), is a case in point.

Although lichens require specific habitat – often rocky substrate – there are species that live on the bark of trees, usually the cooler southern side of the trees (often *Acacia* spp.) in the general area.

Lithops
Lithops species – all protected (See Nature Conservation Ordinance No. 4 of 1975) – are not known to occur in the Kombat area with the closest species associated with the Otjiwarongo (*Lithops pseudotruncatella* var. *elisabethiae*) area (Cole and Cole 2005).

Other
Other species with commercial potential that could occur in the general area include *Harpagophytum procumbens* (Devil's claw) – harvested for medicinal purposes and often over-exploited – and *Citrullus lanatus* (Tsamma melon) which potentially has a huge economic benefit (Mendelsohn *et al.* 2002).

Although the focus of this survey was on the larger trees, shrubs, grasses and more important other species potentially occurring in the general area, many more species – e.g. especially herbs – occur throughout the area and are viewed as important.

4. Conclusion

The proposed development area – Farm Gai Kaisa – does not fall within the biodiversity important Karst formations located further to the north around Kombat, although there are a few Karst ridges located on the northwest portion of the farm (See Figure 1). Furthermore, the area is not pristine and much harvesting for charcoal production has already altered most of the landscape – i.e. disturbed areas with secondary growth, etc. (See Figure 1).

Reptiles
The most important species are viewed as leopard tortoise (*Stigmochelys pardalis*), Kalahari tent tortoise (*Psammobates oculiferus*), Anchietae's dwarf python (*Python anchieta*), Southern African python (*P. natalensis*), monitor lizard (*Varanus albigularis*), Angola file

snake (*Mehelya vernayi*) and 2 relatively recent discoveries of 2 new species of *Pachydactylus* spp. from the Karst Mountains – i.e. *Pachydactylus boehmei* (Bauer 2010) and *P. otaviensis* (Bauer *et al.* 2006).

However, none of the reptiles are expected to be exclusively associated with the Farm Gai Kaisa No. 159 development site.

Mechanical harvesting – Impact
Mechanical harvesting is expected to impact on slow moving reptile species as these are usually cryptic (i.e. difficult to see) and sedentary (i.e. small home ranges) and will not be able and/or willing to flee oncoming heavy vehicles. This is especially true for the two tortoise species known/expected to occur in the area. Tortoises are the reptile family of greatest national concern and most under threat in Namibia (Griffin 1998a).

Furthermore, unsustainable exploitation (i.e. poaching) and alteration of habitat are two main categories of threat to most reptiles in Namibia (Griffin 1998a).

Many arboreal species are also expected to be negatively affected, especially if larger tree specimens and dead trees are targeted which serve as refuge to a variety of unique species (e.g. cavity and bark dwelling species such as agama, gecko, monitor lizard, etc.).

These negative impacts would depend on the scale and intensity of the harvesting operation.

Amphibians
The most important species is viewed as the giant bullfrog (*Pyxicephalus adspersus*) although they are widespread in Namibia and not exclusively associated with the Kombat area in particular. Permanent water bodies viewed as amphibian habitat in the area include the various fountains known to occur in the Karst formations in the surrounding hills. Other potential habitats in the area include ephemeral pans, farm reservoirs and earth dams although the latter are also dependant on localised showers and temporary of nature.

However, none of the amphibians are expected to be exclusively associated with the Farm Gai Kaisa No. 159 development site.

Mechanical harvesting – Impact
Mechanical harvesting is expected to impact on amphibian habitat if ephemeral water features, especially pans and ground dams are disturbed and/or radically altered. On the other hand, bush thinning may increase groundwater levels and consequently result in more water for fountains and pans and thus improve amphibian habitat or result in more runoff and erosion and thus less water penetration into the groundwater system. This would depend on the scale and intensity of the harvesting operation.

Mammals
The most important species are viewed as those classified as vulnerable (ground pangolin, cheetah, leopard, black-footed cat, giraffe) and near threatened (African straw-coloured bat, striped leaf-nosed bat, brown hyena) by the IUCN (2020) and those species classified as rare (greater long-fingered bat, lesser woolly bat, Southern African hedgehog, black-footed cat), and vulnerable (South African galago, ground pangolin, aardwolf, brown hyena, cheetah, African wildcat, bat-eared fox, Cape fox, giraffe, eland), under the Namibian legislation.

However, none of the mammals are expected to be exclusively associated with the Farm Gai Kaisa No. 159 development site.

Mechanical harvesting – Impact

Mechanical harvesting is expected to impact on slow moving mammal species as these are usually cryptic (i.e. difficult to see) and sedentary (i.e. small home ranges) and will not be able and/or willing to flee oncoming heavy vehicles. This is especially true for the ground pangolin and South African hedgehog known/expected to occur in the area. However, they are nocturnal and usually utilise aardvark and other burrows during daylight hours. Most other larger mammals – e.g. carnivores and ungulates – would typically move out of an area experiencing human disturbances and mechanical activities.

Many arboreal species are also expected to be negatively affected, especially if larger tree specimens and dead trees are targeted which serve as refuge to a variety of unique species (e.g. cavity and bark dwelling species such as bats, galago, etc.).

Furthermore, habitat alteration and overutilization are the two primary processes threatening most mammals in Namibia (Griffin 1998c). On the other hand, habitat alteration during responsible bush thinning operations (i.e. scientifically managed), could create habitat for certain species which favour more open landscape or a mosaic of landscapes (i.e. varying patches of bush densities) – e.g. cheetah, oryx, springbok, etc.

These negative impacts would depend on the scale and intensity of the harvesting operation.

Birds

The most important species are viewed as the endemic species such as Hartlaub's spurfowl (*Pternistis hartlaubi*), Monteiro's hornbill (*Tockus monteiri*), Damara hornbill (*Tockus damarensis*), Carp's tit (*Parus carpi*), rockrunner (*Achaetops pycnopygius*), bare-cheeked babbler (*Turdoides gymnogenys*) and Rüppell's parrot (*Poicephalus rueppellii* – near-endemic). The most important species are those listed as endangered (violet wood-hoopoe, Ludwig's bustard, white-backed vulture, bateleur, tawny eagle, booted eagle, martial eagle), vulnerable (lappet-faced vulture, white-headed vulture, secretarybird) and near threatened (Rüppell's parrot, kori bustard, Verreaux's eagle, peregrine falcon, marabou stork) by Simmons *et al.* (2015) from Namibia as well as the species classified as critically endangered (white-backed vulture, white-headed vulture), endangered (Ludwig's bustard and lappet-faced vulture), vulnerable (Verreaux's eagle, martial eagle and secretarybird) and near threatened (kori bustard, bateleur) by the IUCN (2020).

However, none of the birds are expected to be exclusively associated with the Farm Gai Kaisa No. 159 development site.

Mechanical harvesting – Impact

Mechanical harvesting is expected to impact on the ground nesting bird species as these are usually cryptic (i.e. difficult to see) and will only flee oncoming heavy vehicles at the last moment. The most important ground nesting birds would include the Hartlaub's spurfowl (endemic), Ludwig's bustard (endangered), kori bustard (near threatened) and rockrunner (endemic). Although the adult birds will disperse when disturbed, eggs and chicks will be destroyed. *Most other birds would typically move out of an area experiencing human disturbances and mechanical activities.*

Many arboreal species are also expected to be negatively affected, especially if larger tree specimens and dead trees are targeted which serve as refuge to a variety of unique species (e.g. cavity nesting and crown nesting species). The most important cavity nesting birds would include the Monteiro's and Damara hornbills (both endemics), violet wood-hoopoe (endangered and near endemic), Rüppell's parrot (near threatened and near endemic), rosy-faced lovebird, Carp's tit and rockrunner (all endemic). The most important crown nesting birds would include the white-backed, white-headed and lappet-faced vultures (the first 2 species are listed as critically endangered by the IUCN (2020), bateleur, booted eagle, martial eagle (all endangered), secretarybird (vulnerable) and Verreaux's eagle, marabou stork (both near threatened). Raptors, especially vulture, numbers are decreasing rapidly

throughout their range and often abandon their nests (which are often reused) when disturbed.

Habitat alteration during responsible bush thinning operations (i.e. scientifically managed), could create habitat for certain species which favour more open landscape or a mosaic of landscapes (i.e. varying patches of bush densities) – e.g. Ludwig's and kori bustards, etc. On the other hand many species favour bush thickets and a change in habitat could detrimentally affect them – e.g. small birds with ball/cup shaped nests favouring inaccessible thorny shrubs such as eromomela, finches, sunbirds, white-eyes, etc. (See: Cunningham and Joubert 2011).

These negative impacts would depend on the scale and intensity of the harvesting operation.

Trees/shrubs
The most important larger tree and shrub species are viewed as *Cyphostemma juttae* (endemic, protected by Forest Act and Nature Conservation Ordinance) and *Erythrina decora* (endemic, protected by Forest Act) from the general area.

The Farm Gai Kaisa No. 159 is located to the south of the most important parts of the Mountain and Karstveld although there are limestone outcrops which potentially have some of the important species mentioned in Table 5.

However, none of the larger trees and shrubs is expected to be exclusively associated with the Farm Gai Kaisa No. 159 development site.

Mechanical harvesting – Impact
The impact of mechanical harvesting would depend on the scale and intensity of the harvesting operation and overall vision, planning, execution of the operation and especially the control over the harvesters.

The plants expected to be impacted would be those important species typically associated with the Karst formations (i.e. dolomite outcrops/ridges/hills) such as the endemic *Cyphostemma juttae* and *Erythrina decora* and various *Aloe* species. *However, although the rocky terrain is usually unsuitable for mechanical operations, these important areas should nevertheless be avoided and excluded from harvesting activities.*

Various protected tree species occur in the areas potentially suitable for mechanical harvesting operations. These trees (See Table 5), especially the larger specimens, should be avoided as they potentially serve as habitat to a variety of vertebrate fauna (Further, see the Forest Act for tree size limitations – i.e.18cm diameter, etc.).

Larger tree specimens (including protected species – e.g. Searsia lancea, Ziziphus mucronata, etc.) are usually associated with ephemeral drainage lines and pans in the general area. These areas should be avoided as the trees potentially serve as habitat to a variety of vertebrate fauna and stabilise soils around these drainage lines (Further, see the Forest Act for harvesting limitations – i.e.100m from streams, etc.).

A mosaic harvesting approach (i.e. patch harvesting which results in a variety of openness, but still includes dense patches) is recommended as this would increase the ecotone area around these patches and consequently associated biodiversity. Bad planning and execution could result in mechanised harvesting "over harvesting" areas with dire consequences to the ecology of the area.

Connectivity of areas is recommended as these corridors serve as thoroughfare for various vertebrate species. The most important habitats should be connected – i.e. rocky areas and

drainage lines. Bad planning and execution could result in mechanised harvesting eliminating connectivity with dire consequences to the ecology of the area.

Dichrostachys cinerea (sicklebush) is known to react aggressively when disturbed by mechanical means – i.e. become exceedingly dense. Areas dominated by this species should not be harvested mechanically to avoid the area becoming even more dense and inaccessible than prior to harvesting operations (e.g. Dewet 2015, Smit et al. 2015, Tainton 1999).

Soil disturbances are a common feature of mechanical harvesting depending on the type of vehicles used; soil type; slope, etc. Wheel mounted Bell Loggers, as envisaged for this operation, would result in less disturbances than track mounted vehicles. Nevertheless, rocky areas (erosion) and clay soils (compaction and tracks in wet season) should be avoided and harvesting should rather be limited to areas with sandy soils where fewer problems are expected.

Hydrocarbon spills are a risk (e.g. groundwater contamination and detrimental to trees/shrubs at site of spill) when dealing with mechanised harvesters and would have to be planned for.

Fire is a risk (e.g. destruction of browse) when dealing with mechanised harvesters and would have to be planned for (e.g. De Wet 2015).

These negative impacts would depend on the scale and intensity of the harvesting operation.

Grass
The most important species is viewed as the endemic *Setaria finite* which is associated with drainage lines in the general area and never very common.

However, none of the grasses are expected to be exclusively associated with the Farm Gai Kaisa No. 159 development site.

Mechanical harvesting – Impact
The impact of mechanical harvesting would depend on the scale and intensity of the harvesting operation and overall vision, planning, execution of the operation and especially the control over the harvesters.

Grass biomass is expected and known to increase dramatically after bush thinning although these consist almost entirely of annual grasses which are not as palatable and/or resilient to drought and fire as perennial grass species. Only by controlling the livestock stocking rate; use rotational grazing and rest will the overall grass species compositions improve over time – i.e. with active visionary adaptive management and sound farming practices. Understanding the grass tree interactions (positive and negative) is paramount in the recovery of the grazing sward (e.g. Tainton 1999).

Habitat alteration during responsible bush thinning operations (i.e. scientifically managed), could create habitat for certain species which favour more open landscape or a mosaic of landscapes (i.e. varying patches of bush densities) and increased grass growth – e.g. grazing ungulates, cheetah, domestic stock, etc. On the other hand many species favour bush thickets and a change in habitat could detrimentally affect them – e.g. various browsers (kudu), small elusive ungulates (dik dik), etc. All wildlife require shade and shelter as part of their basic habitat requirements and a drastic change from a bush thickened area to an open grassland area would negatively affect most species. It is therefore imperative to find the correct balance of trees/shrubs/grasses.

Hydrocarbon spills are a risk (e.g. groundwater contamination and detrimental to grass at site of spill) when dealing with mechanised harvesters and would have to be planned for.

Fire is a risk (e.g. destruction of grazing) when dealing with mechanised harvesters and would have to be planned for (e.g. De Wet 2015).

These negative impacts would depend on the scale and intensity of the harvesting operation.

Other spp.
Except for various Aloe species known to occur in the general area, most other species are not expected to be adversely affected by the proposed mechanical harvesting operations. Should Aloe spp. be encountered then they should be removed and relocated to similar habitat on the farm.

Hydrocarbon spills are a risk (e.g. groundwater contamination and detrimental to all flora at site of spill) when dealing with mechanised harvesters and would have to be planned for.

Fire is a risk (e.g. destruction of flora) when dealing with mechanised harvesters and would have to be planned for (e.g. De Wet 2015).

Sensitive areas
The Farm Gai Kaisa No.159 does not have any major unique habitats; is not in a pristine condition and is heavily impacted by current/past charcoal harvesting activities. However, the following areas are viewed as the most unique (sensitive) on the farm:

a) Rocky areas
Any Karst formations – i.e. dolomite hills, ridges, etc. – as located on the northwest portion of the farm, are potentially important for biodiversity and should be avoided and excluded from harvesting activities (Figure 1).

b) Ephemeral pan system
All well vegetated ephemeral pans (northeast portion of farm) with larger and especially protected tree species, are potentially important for biodiversity and should be avoided and excluded from harvesting activities (Figure 1).

c) Ephemeral drainage lines
All well vegetated ephemeral drainage lines (north, west and southeast portions of farm) with larger and especially protected tree species, are potentially important for biodiversity and should be avoided and excluded from harvesting activities (Figure 1).

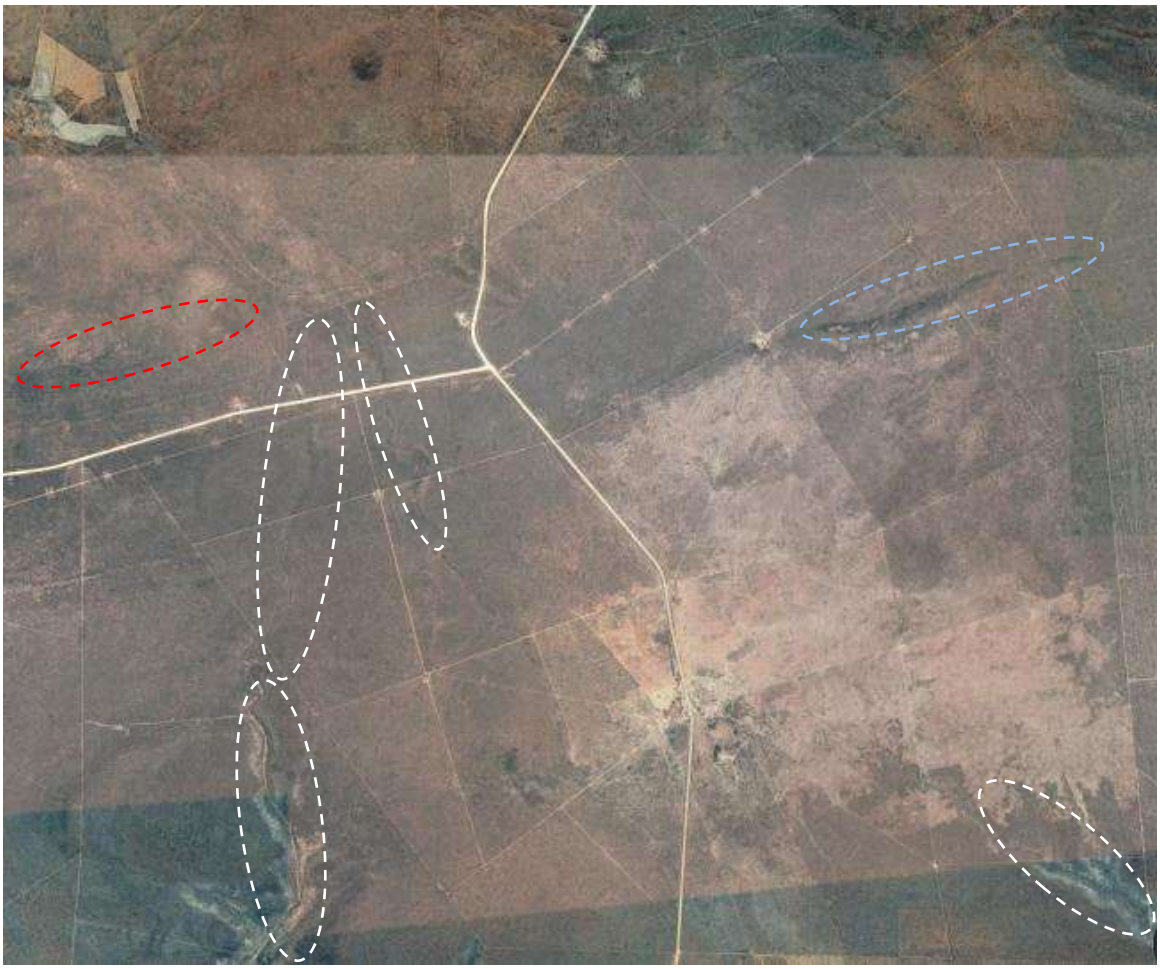

Figure 1. Sensitive areas that should be avoided and excluded from mechanical harvesting operations on Farm Gai Kaisa No.159 include rocky ridges (red dotted oblong); ephemeral pan system (blue dotted oblong) and ephemeral drainage lines (white dotted oblongs). Note the open areas currently/previously impacted by charcoal harvesting operations throughout most of the farm.

5. Recommendations

To show environmental sensitivity and ensure environmental commitment to the proposed mechanical harvesting operations the following general recommendations are made:

Vertebrate fauna

i) Avoid sensitive areas – avoid harvesting in the rocky areas, ephemeral pan system and drainage lines as indicated in Figure 1;

ii) Survey areas on foot prior to harvesting to collect and remove slow moving reptiles, especially tortoise species, and relocate elsewhere to similar habitat on the farm;

iii) Identify vulture and other raptor nesting trees and avoid harvesting in these areas;

iv) Most birds nest in associated with rainfall therefore avoid harvesting trees with birds' nests during the breeding season;

v) Prevent the killing of perceived dangerous species (e.g. snakes); collection of veld foods (e.g. giant bullfrog, tortoise, monitor lizard); any form of poaching (e.g. setting of snares for birds and ungulates, etc.);

vi) Initiate a suitable and appropriate refuse removal policy as littering could result in certain animals becoming accustomed to humans and associated activity and result in typical problem animal scenarios – e.g. baboon, black-backed jackal, crows, etc.;

vii) Obtain the necessary permits from the Ministry of Environment, Forestry and Tourism prior to the collection, removal and relocation of protected species.

Flora

i) Avoid sensitive areas – avoid harvesting in the rocky areas and ephemeral pan system and drainage lines as indicated in Figure 1;

ii) Avoid removing the large protected tree species;

iii) Remove all *Aloe* species (should these be encountered) prior to harvesting and relocate elsewhere to similar habitat on the farm;

iv) Avoid mechanical harvesting in areas dominated by *Dihrostachys cinerea* (sicklebush);

v) Obtain the necessary permits from the Ministry of Environment, Forestry and Tourism prior to the collection, removal and relocation of protected species.

Ecology

i) Avoid sensitive areas – avoid harvesting in the rocky areas and ephemeral pan system and drainage lines as indicated in Figure 1;

ii) Investigate ecologically sound “after care” methods as mechanical disturbances could result in a denser bush scenario than prior to harvesting operations. This would depend on the objective of harvesting – i.e. sustainable bush utilisation versus veld reclamation for grazing, etc.;

iii) Do not clear cut the entire area, but follow a mosaic harvesting approach (include dense patches of bush);

iv) Maintain connectivity of habitats, especially linking the sensitive areas (i.e. rocky areas, ephemeral pans and drainage lines);

v) Avoid harvesting on slopes and soils prone to erosion;

vi) Avoid harvesting during the rainy (wet) season as this may cause deep tracks and result in erosion and compaction of soils;

vii) Implement erosion control measures where applicable – e.g. cross drains on slopes, do not make tracks along drainage lines and cross these at a right angle, etc.;

viii) Remove all invasive alien species on site – e.g. *Prosopis* spp., etc. This would not only indicate environmental commitment, but actively contribute to a better overall landscape;

ix) Ensure that adequate fire fighting equipment (e.g. fire beaters; extinguishers, etc.) is available on Bell Loggers; at camp sites and kitchen areas (at plant) to avoid accidental fires;

x) Ensure that all hydrocarbon spills are avoided and/or dealt with adequately and quickly;

xi) Ensure that the Bell Logger operators can identify protected species and inform all contractors/workers regarding the above mentioned ecological issues prior to harvesting activities and monitor for compliance thereof throughout; and

xii) Investigate FSC certification to ensure compliance and external auditing with international standards.

All human induced activities (including mechanical harvesting activities) change or are destructive to the local fauna, flora and ecology to some or other degree. Assessing potential impacts is occasionally obvious, but more often difficult to predict accurately. Such predictions may change depending on the scope and intensity of the activity – i.e. once initiated, may have a different effect on the fauna and flora as originally predicted. Thus continued monitoring of such impacts during the operational phase(s) is imperative.

The Farm Gai Kaisa No.159 does not have any major unique habitats (including vertebrate fauna and flora); is not in a pristine condition and is heavily impacted by current/past charcoal harvesting activities. Mechanical harvesting activities using Bell Loggers without tracks is not expected to further affect and/or impact negatively on the vertebrate fauna, flora and ecology of the farm, especially if the sensitive areas are avoided and the recommendations (suggested mitigations) are followed and implemented.

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APPENDIX F: HERITAGE SPECIALIST STUDY

2 December 2020

ECC Environmental
Windhoek
Namibia

For attention: Mr Lester Harker, Environmental Assessment Practitioner

ARCHAEOLOGICAL ASSESSMENT FOR PROPOSED BUSH THINNING AND CHARCOAL BURNING PROJECT NEAR KOMBAT, OTJOZONDJUPA REGION

DECLARATION

I hereby declare that I do:

(a) have knowledge of and experience in conducting assessments, including knowledge of Namibian legislation, specifically the National Heritage Act (27 of 2004), as well as regulations and guidelines that have relevance to the proposed activity;

(b) perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;

(c) comply with the aforementioned Act, relevant regulations, guidelines and other applicable laws.

I also declare that I have no interests or involvement in:

(i) the financial or other affairs of either the applicant or his consultant

(ii) the decision-making structures of the National Heritage Council of Namibia.

John Kinahan, Archaeologist

EXECUTIVE SUMMARY

An archaeological/heritage reconnaissance survey was carried out on the farm Gai-Kaisa in the Otjozondjupa Region. The field survey did not locate any archaeological sites, but did record two recent grave sites. It is recommended that the project adopt the attached Chance Finds Procedure in the event of encountering buried archaeological remains in the course of development work. It is pointed out that the grave sites are protected in terms of the Burial Places Ordinance (27 of 1966).

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1. INTRODUCTION

1.1 Background

Environmental Compliance Consultancy (ECC) is carrying out an environmental assessment of the farm Gai-Kaisa (159) of the Otjozondjupa Region for the purposes of a bush-thinning and charcoal production project. Land-use changes are listed in the Environmental Management Act (2007) as activities requiring environmental assessment and the issuance of an Environmental Clearance Certificate.

Archaeological remains in Namibia are protected under the National Heritage Act (2004) and National Heritage Regulations (Government Notice 106 of 2005), and ECC has accordingly appointed the undersigned, J. Kinahan, archaeologist, to carry out an assessment of the project. A field visit to the site was carried out on 19th and 20th November 2020.

1.2 Terms of Reference

The primary task of the archaeological assessment reported here was to identify sensitive archaeological/heritage sites that could be affected by the proposed exploration and mining activities. The archaeological/heritage assessment forms the basis of recommended management actions to avoid or reduce negative impacts, as part of the environmental assessment. The study is intended to satisfy the requirements of the relevant legislation and regulations, in which the process of review and clearance may require further, or different mitigation measures to be adopted.

Specifically, the archaeological/heritage assessment addresses the following primary elements:

1. The identification and assessment of potential impacts on archaeological/heritage resources, including historical sites arising from the proposed exploration and mining activities.
2. The identification and demarcation of highly sensitive archaeological/heritage sites requiring special mitigation measures to eliminate, avoid or compensate for possible destructive impacts.
3. Formulation and motivation of specific mitigation measures for the project to be considered by the authorities for the issuance of clearance certificates.
4. Identify permit requirements as related to the removal and/or destruction of heritage resources.

1.3 Assumptions & Limitations

Archaeological assessment relies on the indicative value of surface finds recorded in the course of field survey. Field survey results are augmented wherever possible by inference from the results of surveys and excavations carried out in the course of previous work in the same general area as the proposed project, as well as other sources such as historical documentation. Based on these data, it is possible to predict the likely occurrence of further archaeological sites with some accuracy, and to present a general statement (see Receiving Environment, below) of the local archaeological site distribution and its sensitivity. However, since the assessment is limited

to surface observations and existing survey data, it is necessary to caution the proponent that hidden, or buried archaeological or palaeontological remains might be exposed as the project proceeds.

2. LEGAL REQUIREMENTS

The principal instrument of legal protection for archaeological/heritage resources in Namibia is the National Heritage Act (27 of 2004). Part V Section 46 of the Act prohibits removal, damage, alteration or excavation of heritage sites or remains. Section 48 *ff* sets out the procedure for application and granting of permits such as might be required in the event of damage to a protected site occurring as an inevitable result of development. Section 51 (3) sets out the requirements for impact assessment. Part VI Section 55 Paragraphs 3 and 4 require that any person who discovers an archaeological site should notify the National Heritage Council. Heritage sites or remains are defined in Part 1, Definitions 1, as "any remains of human habitation or occupation that are 50 or more years old found on or beneath the surface".

It is important to be aware that no specific regulations or operating guidelines have been formulated for the implementation of the National Heritage Act in respect of archaeological assessment. However, archaeological impact assessment of large projects has become accepted practice in Namibia during the last 25 years, especially where project proponents need also to consider international guidelines. In such cases the appropriate international guidelines are those of the World Bank OP/ BP 4.11 in respect of "Physical Cultural Resources" (R2006-0049, revised April 2013). Of these guidelines, those relating to project screening, baseline survey and mitigation are the most relevant.

Archaeological/heritage impact assessment in Namibia may also take place under the rubric of the Environmental Management Act (7 of 2007) which specifically includes anthropogenic elements in its definition of environment. The List of activities that may not be undertaken without Environmental Clearance Certificate: Environmental Management Act, 2007 (Govt Notice 29 of 2012), and the Environmental Impact Assessment Regulations: Environmental Management Act, 2007 (Govt Notice 30 of 2012) both apply to the management of impacts on archaeological sites and remains whether these are considered in detail by the environmental assessment or not.

Graves are protected under the Burial Places Ordinance (27 of 1966) and permission is required in the evnt of development work encroaching on such sites.

3. THE RECEIVING ENVIRONMENT

Farm Gai-Kaisa (159) lies 20km SE of Kombat in the northern Otjozondjupa Region. The farm is characterized by typical tree and shrub savanna with a large component of *Combretum imberbe* woodland on the headwaters of two well developed drainage lines, both northern tributaries of the Omatako omuramba. Between the drainage

lines the terrain is relatively subdued, with outcropping calcretes and dolomites of the Otavi Group overlain by shallow sandy loam soils.

Figure 1 shows the location of Gai-Kaisa in relation to known archaeological sites and proclaimed National Monuments. There has been little recent archaeological field research carried out in this area, other than a corridor survey for a NamPower transmission line (now in place) running close to the northern boundary of the property. The survey did not record any archaeological sites in this vicinity. Figure 1 shows a relatively dense distribution of archaeological sites to the SW of Gai-Kaisa and few if any records from the area to the east of the property. Although this pattern confirms the archaeological significance of the high density distribution, the existence of these records also reflects the fact that more archaeological work has been carried out on commercial farmland rather than communal farmland. In other words, the eastern parts of the Otjozondjupa Region are disproportionately under researched and the available data do not therefore provide a reliable reflection of the local archaeology.

The known archaeological/heritage record of this region spans the entire upper Pliocene to recent historical period. Early hominoid fossil remains were recovered from a limestone breccia at Berg Aukas[1] and there have been numerous investigations of sites yielding important palaeoclimatic evidence in this area[2]. Little is known of the upper Pleistocene and Holocene human occupation of the area, although the accumulated site records shown in Figure 1 demonstrate its likely importance. A systematic survey of rock art on commercial farms in the Otjozondupa Region[3] yielded a number of sites indicating the presence of hunter-gatherer communities in this area during the last 5000 years. Historical and ethnographic research on hunter-gatherer populations in this region points to the existence of widespread social networks which probably formed part of trade routes that were used by recent indigenous and colonial peoples[4]. The 19th century hunter and trader Axel Eriksson (1846

[1] Conroy, G.C., Pickford, M., Senut, B., Van Couvering, J. & Mein, P. 1992. *Otavipithecus namibiensis*, first Miocene hominoid from southern Africa. *Nature* 356: 144–8.

[2] e.g. Sletten, H.R., Railsback, L.B., Liang, F., Brook, G., Marais, E., Hardt, B.F., Cheng, H. & Edwards, L.R. 2013. A petrographic and geochemical record of climate change over the last 4600 years from a northern Namibia stalagmite, with evidence of abruptly wetter climate at the beginning of southern Africa's Iron Age. *Palaeogeography, Palaeoclimatology, Palaeoecology* 376: 149–62. See also Deacon, J. and Lancaster, N. 1988. *Late Quaternary Palaeoenvironments of Southern Africa.* Clarendon, Oxford.

[3] Breunig, P. 1986 (ed.) *Ernst-Rudolf Scherz, Felsbilder in Südwest-Afrika Vol. 3*. Die Malereien. Zusammenfassungen. Köln Wien: Böhlau Verlag.

[4] Kose, E, 2009. New light on iron-working groups along the middle Kavango in northern Namibia. *South African Archaeological Bulletin* 64: 130 – 147; Kose, E. and Richter, J. 2007. The prehistory of the Kavango people. *Sprache und Geschichte in Afrika* 18: 103-129; see also Wiessner, P. 1994. The pathways of the past: !Kung San hxaro exchange and history. In: Bollig, M. & Klees, F. eds *Uberlebensstrategien in Afrika. Colloquium Africanum* 1: 101 – 124. Cologne, Heinrich Barth Institute, and Wilmsen, E. 1989. *Land filled with flies: a political economy of the Kalahari.* University of Chicago Press. 402pp.

– 1901) is buried at Rietfontein north of Gai-Kaisa[5], and the *omiramba* drainage lines which also bisect the Gai-Kaisa property were central to Ovaherero settlement and landuse in the 18th and 19th centuries[6].

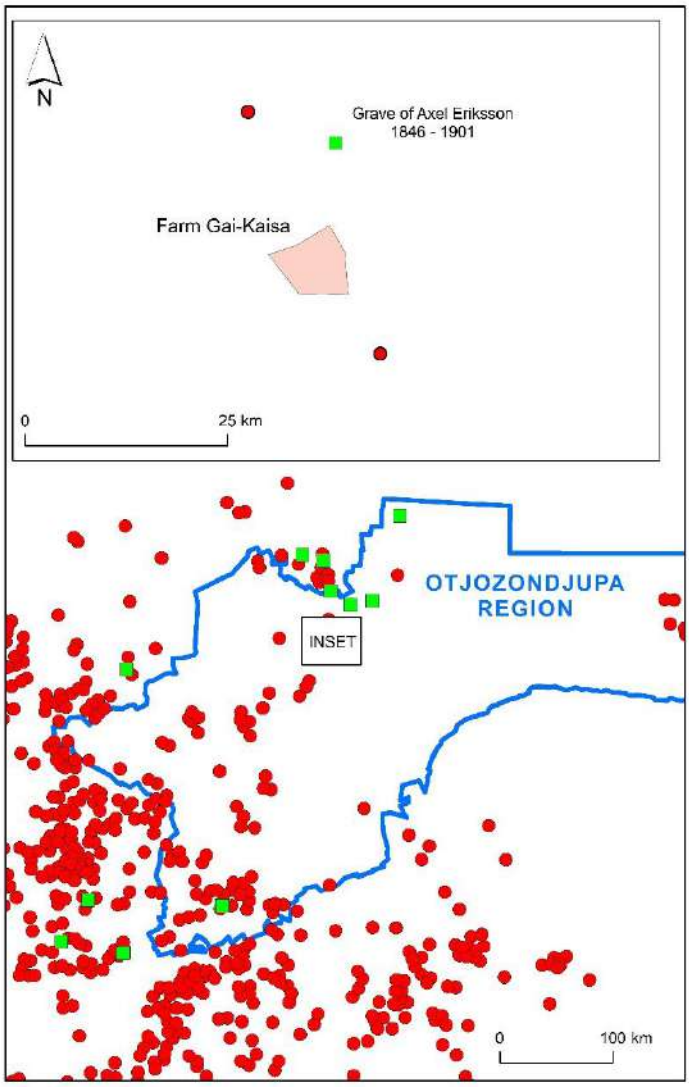


Figure 1: The location of Farm Gai-Kaisa in the Otjozondjupa Region shown in relation to known archaeological sites (red circles) and proclaimed National Monuments (green squares).

[5] Vogt, A. 2004. *National Monuments in Namibia: An inventory of proclaimed national monuments in the Republic of Namibia.* Windhoek: Macmillan.

[6] Lindholm,K.-J. 2006. *Wells of Experience: A pastoral land-use history of Omaheke, Namibia.* Studies in Global Archaeology 9, University of Uppsala.

Earlier surveys provide an indication of the archaeological importance of this general area, although the intensity of survey varies considerably and large parts of the area are archaeologically unknown, including that of Gai-Kaisa itself. The general sequence and archaeological characteristics of the area under consideration, based on current knowledge, are as follows:

a. **Pliocene and early Pleistocene (ca. 10my to 0.128my; including OIS 6, 7, 19 &c):** represented by limestone breccia material as well as surface scatters of stone tools and artefact debris, usually transported from original context by fluvial action, and seldom occurring in sealed stratigraphic context.
b. **Mid- to upper Pleistocene (ca. 0.128my to 0.040my; OIS 3, 4 & 5a-e):** represented by dense surface scatters and rare occupation evidence in sealed stratigraphic context, with occasional associated evidence of food remains.
c. **Late Pleistocene to late Holocene (ca. 0.040my to recent; OIS 1 & 2):** represented by increasingly dense and highly diverse evidence of settlement, subsistence practices and ritual art, as well as grave sites and other remains.
d. **Historical (the last ca. 250 years):** represented by remains of crude buildings, livestock enclosures, wagon routes and watering points, as well as graves, comprising small cemeteries near farm settlements or isolated burial sites.

In summary, Pliocene and early Pleistocene sites are associated with sinkholes, exhumed breccias, pans, outwash gravels, drainage lines and river gravels. These sites are difficult to detect and because they are easily overlooked in the course of development work and are often damaged or destroyed in the process. Mid- to upper Pleistocene sites occur in similar contexts to the earlier material, but hill foot-slopes and outcrops of rock suitable for artefact production (e.g. chert, fine-grained quartzites) are also focal points. Late Pleistocene to late Holocene sites occur in almost every terrain setting, with the exception of very steep slopes and mountain tops. These sites often exhibit locally integrated distribution patterns which allow some reconstruction of land-use and subsistence. Major Holocene sites include stratified occupation deposits, containing an array of organic and inorganic residues. Heritage sites relating to the historical period relate mainly to early mining and farming settlement in the vicinity of Otavi, Grootfontein, Tsumeb and outlying villages.

3.2 Observations

A reconnaissance survey of Gai-Kaisa traversed the drainage lines of the eastern and southern margins of the property and, following existing farm tracks, traversed the entire property from east to west at several points. No archaeological sites such as described above were found in the course of the survey, although two grave sites of recent date were recorded in the near vicinity of the farmhouse. These are shown in Figures 2 and 3.

Figure 2: Grave of Rosmarie (1948) and Ernst Adalbert (1963) von Goldfus.

Figure 3: Grave of Theodor, farmworker (1966), with headstone circled.

The grave of Rosmarie (1948) and Ernst Adalbert (1963) von Goldfus (Figure 2), has a dolerite headstone and is surrounded by a fenced enclosure about 200m SW of the farmhouse (-19.89653S 17.83071E). The grave and its surroundings are clearly demarcated and adequately protected. The site is not considered to be vulnerable to disturbance. However, the grave of Theodor (Figure 3), a farmworker (1966) located approximately 240m NE of farmhouse (-19.89643S 17.83109E) is a different matter. The grave is marked by a crude concrete crucifix (now fallen) and the entire site (which may contain more than one grave) has been undermined by animal burrows. The site lies approximately 250m N of what appears to be an abandoned workers' compound. This site is considered to be vulnerable and merits enclosure as in the case of the previous site.

4. CONCLUSIONS & RECOMMENDATIONS

On the basis of the field survey reported here Gai-Kaisa is not considered to be archaeologically sensitive. No archaeological sites requiring further investigation or mitigation were located in the course of the survey. It is however recommended that the proponent should adopt the Chance Finds Procedure in Appendix 1 as part of the project Environmental Management Plan.

The two grave sites located on the farm are protected in terms of the Burial Place Ordinance (27 of 1966) which was enacted to "prohibit the desecration or disturbance of graves in burial places and to regulate matters relating to the removal or disposal of dead bodies". Permission will be required if the proposed development of the farm will encroach on the grave sites.

Appendix 1: Chance Finds procedure

Areas of proposed development activity are subject to heritage survey and assessment at the planning stage. These surveys are based on surface indications alone, and it is therefore possible that sites or items of heritage significance will be found in the course of development work. The procedure set out here covers the reporting and management of such finds.

Scope: The "chance finds" procedure covers the actions to be taken from the discovery of a heritage site or item, to its investigation and assessment by a trained archaeologist or other appropriately qualified person.

Compliance: The "chance finds" procedure is intended to ensure compliance with relevant provisions of the National Heritage Act (27 of 2004), especially Section 55 (4): *" a person who discovers any archaeological …. object ……must as soon as practicable report the discovery to the Council".* The procedure of reporting set out below must be observed so that heritage remains reported to the NHC are correctly identified in the field.

Responsibility:

Operator	To exercise due caution if archaeological remains are found
Foreman	To secure site and advise management timeously
Superintendent	To determine safe working boundary and request inspection
Archaeologist	To inspect, identify, advise management, and recover remains

Procedure:

Action by person identifying archaeological or heritage material

a) If operating machinery or equipment stop work

b) Identify the site with flag tape

c) Determine GPS position if possible

d) Report findings to foreman

Action by foreman

a) Report findings, site location and actions taken to superintendent

b) Cease any works in immediate vicinity

Action by superintendent

a) Visit site and determine whether work can proceed without damage to findings

b) Determine and mark exclusion boundary

c) Site location and details to be added to project GIS for field confirmation by archaeologist

Action by archaeologist

a) Inspect site and confirm addition to project GIS

b) Advise NHC and request written permission to remove findings from work area

c) Recovery, packaging and labelling of findings for transfer to National Museum

In the event of discovering human remains

a) Actions as above

b) Field inspection by archaeologist to confirm that remains are human

c) Advise and liaise with NHC and Police

d) Recovery of remains and removal to National Museum or National Forensic Laboratory, as directed.

Appendix 2: Burial Place Ordinance 27 of 1966

Republic of Namibia
Annotated Statutes

Burial Place Ordinance 27 of 1966

(OG 2728)
came into force on date of publication: 10 June 1966

ORDINANCE

To prohibit the desecration or disturbance of graves in burial places and to regulate matters relating to the removal or disposal of dead bodies.

(Assented to 3rd June, 1966)
(English text signed by the Administrator)

ARRANGEMENT OF SECTIONS

BE IT ORDAINED by the Legislative Assembly for the Territory of South West Africa as follows:-

Definitions

1. In this ordinance, unless the context indicates otherwise -

"Administrator" means the Administrator of the Territory of South West Africa;

"body" means any human dead body including the body of any still-born child;

"burial place" means any burial ground, whether public or private, or any place wherein one or more bodies are buried, cremated or otherwise disposed of or intended to be buried, cremated or otherwise disposed of.

Desecration of graves and removal of bodies

2. (1) No person shall desecrate or destroy a grave in a burial place or, without the written permission of the Administrator, disturb or cause such grave to be disturbed.

(2) Except where the exhumation of a dead body is ordered in terms of any other law for the purposes of forensic medicine or public health and subject to the provisions of section 222 of the Municipal Ordinance, 1963 (Ordinance 13 of 1963) no person shall exhume or cause to be exhumed or disturb or cause to be disturbed or remove or cause to be removed a body or the mortal remains of a body buried in a burial place without the written permission of the Administrator or unless such precautions are observed as may be prescribed by the Administrator or any medical practitioner appointed by him: Provided that no person shall be guilty of a contravention of this sub-section who temporarily of necessity disturbs or causes to be disturbed a body or the mortal remains of a body which is buried for the purpose of burying another body in the same grave.

[The Municipal Ordinance 13 of 1963 has been replaced by the Local Authorities Act 23 of 1992.]

(3) No person shall, except with the permission of the Administrator, in any way disturb, damage, remove or destroy a grave, monument, gravestone, cross, inscription, rail, enclosure, chain or erection of any kind whatever, or part thereof in any burial place.

(4) Any person acting in contravention of the provisions of this ordinance shall be guilty of an offence and shall on conviction be liable to a fine not exceeding *one hundred* rand or, in default of payment, to imprisonment for a period not exceeding *six* months or to both such fine and such imprisonment.

Short title

3. This ordinance shall be called the Burial Place Ordinance, 1966.

APPENDIX G: PROPOSAL FROM ENVIROX

Envirox (Pty) Ltd
Offices: 313 Boundary Road,
North Riding
Honeydew,
Tel: + 27 (0)11 397 5426

Customer Name. David van Breda

Company Name. Namibia Biomass Industries

Quote nr. [ ]

Date. 24 February 2020

SITE VISIT DETAILS

Please find below my proposal for extraction of charcoal dust. No site visit was conducted and therefore this quote is only for budgedery purposes. The below quote is merely an indication of costs involved for an Nederman MJC ATEX approved dust collector. It is imperative that the correct dust collector is installed, especially when dust is extracted that can ignite and cause an explosion within the dust collector. The proposed quote includes equipment that is ATEX certified and will prevent explosion. In the event of an possible dust explosion the unit will vent the explosion into an safe atmospheric area ensuring no employees or products are harmed in any way.

LCP Cartridge Dust Collector

The Perfect Fit

LCP cartridge dust collectors designed for continuous operation in process and general dust extraction applications with free-flowing dust. This new dust collector range offers two filter cartridge lengths and on-line high efficiency pulse jet cleaning.

Description

All LCP units have generously sized integral pre-separation chambers to increase their dust load capacity whilst reducing the load on the filter cartridges. Maintenance is from the top, within handrails if specified. A range of space saving integral fans from 5,5 kW to 18.5 kW may be specified, with optional air silencers. Larger units may be served by floor mounted high efficiency Combifab fans.

Options

- Hopper in the pyramidal or trough version
- Dust collector LCP without hopper or insertable version
- Dust can be stored in a bin (50L or 100L with wheels or without), plastic bag inserted, big-bag outlet, 55 gallon drum
- Discharge can be also via counter balanced valve

- Range of integral fans from 5,5 kW to 18.5kW with optional air silencers
- Combifab fans for higher airflow volumes
- ATEX certified explosion relief panels when handling explosive dusts St1, St2 or St3.
- Dedicated control systems for complete dust extraction installation.

Specification

- Airflow volumes from 5000 m^3/h to 300000 m^3/h
- Powder painted steel, thickness -3.0 mm, assembled from panels
- Weatherproof for exposed locations
- On-line cleaning with high efficiency diaphragm valves
- Large integral pre-separation chamber (across and side version)
- Different cartridge media types (CA 100, 140, 141, 150, 175, 190) to cater for most applications,
- Options with explosion relief area for St1 or St2. For St3 contact Nederman.

Nederman LCP ATEX Approved Dust collector.

Application	Charcoal Dust (Unburned)
Temperature inside filter	-20 to +60 deg. C
Pressure range	-6 to +2 kPa
Units	m^3/hr - m/min
Air volume m^3/hr	21000
Cartridge material	CA 140 Polyester, antistatic
Calculated filter area m^2	350
Dust type	Combustible St1 (Kst ≤ 200)
Filter size	LCP 7-49/323/2200/2100
Deflector	Yes
Internal filter length	2100 mm
Internal filter width	2200 mm
Real filtration area m^2	323

Total number of cartridges	49
No of rows	7
Hopper type	Pyramid hopper
Hopper outlet type	Flanged outlet type NRS3 for bin/Rot valve
Hopper inspection door	Left
Dust collection	Big-bag outlet
Valve at outlet	NRSZ3 (price included)
Leg height	Type 1550-2050
Fan or outlet location	On backside
Filter outlet size	1200x900
Inlet location	On back side
Filter inlet, number	2
Filter inlet size	410x410
Access to top	Ladder w/ cage left
Protection at top work	Guarding rails
Cleaning control	DFC-08M 110V/240V at 50/60 Hz AC
Filter controller location	Bottom of the dirty air chamber, left
Language in controller display	English
Insulation	None
Paint specification	Blue - RAL 5009 semi gloss (standard)

TOTAL PRICE (Includes controller)

Combifab Fans and Blowers

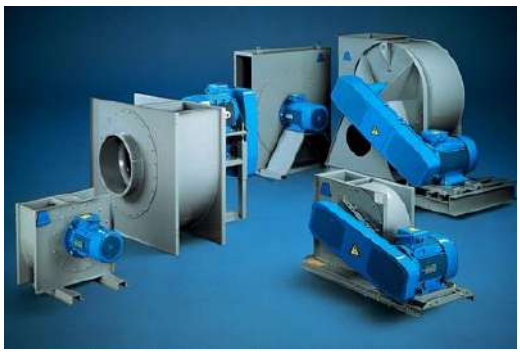
Fans and blowers for your dust collector

The Combifab range of highly efficient, quiet running radial fans include three dedicated impeller designs for handling clean air (R type), air containing dust and waste material (S type) and for transporting high concentrations wood dust and chips (T type). Versatile drives, including energy saving inverter drives ensure the fans are matched exactly to the required dutywith minimum environmental effect.

Air Volume Range: 680 to 68.000 m^3/hr (400 to 40,000 CFM)

Key features

* High efficiencies, up to 87%
* Wide range of airflow volumes and static pressures
* Direct drive and belt drive options
* Stainless or galvanized steel optional construction
* ATEX certified Baseefa 04ATEX0103 for explosive dusts
* Accurate control via efficient inverter drives
* Options include in-line and enclosure silencers



Centrifugal Dust Collector Fan - Combifab Series

The Combifab Series of fans are heavy duty centrifugal fans with three different fan wheel designs and four housing and drive configurations to meet the application requirements. Nederman stocks a large inventory of fans for immediate delivery so please call to check availability. Also, we carry used inventory for those on a budget.

When it is time to replace an existing fan or install a new system, a more efficient solution for the fan design may be a direct driven configuration with a Variable Frequency Drive - VFD on the fan motor in lieu of a belt driven configuration. Belt drive fans require 2-5% more energy than a Direct Drive and VFD arrangement. Furthermore, with this type of configuration, the fan performance can be modified manually through the VFD control interface and a PID Control Loop. Autogates can be installed to minimize energy consumption.

Bladed Impellers - The Heart of the System

Clean Air Impeller - Type R The clean air impeller is a closed bladed impeller with backward curved blades. This impeller is used for transport of clean air and of air with a small quantity of fine dust, such as welding smoke, oil mists or exhaust gases. The clean air impeller has an efficiency of up to 87%.

Chip Impeller - Type S The chip impeller is a closed, partly self-cleaning bladed impeller with straight, backward oblique blades. This impeller is used for transport of grinding and polishing dust, dry sawdust and shavings, etc.The chip impeller has an efficiency of up to 81%.

Transport Impeller - Type T The transport impeller is an open, self-cleaning bladed impeller with straight, radial blades. This impeller is used for transport of shavings, chips, etc. The transport impeller has an efficiency of up to 61%.

CombifabFan ATEX certified – Charcoal Dust

Application	not specified
Airflow actual m^3/h	21000
Altitude m above sea level	600
Total pressure increase Pa	3077
Operational temperature deg.C	50
Calculated impeller RPM	1460
Fan impeller type	F40 R
Fan inlet diameter	450 mm
Drive type	Direct
Motor Standard	IEC
Motor kW	30 kW
ATEX classification	Internal 2D / External Non
Internal / External Ex Marking	II 2D Ex c IIIC T135ºC Db / None
Gas temperature	-20 to +60 deg C
Fan direction	RD90
Inspection door option	Standard position
Inspection door location	12:00 hrs
Weight excl. motor kg	304
Total weight of fan	579
Fan max RPM	1888
Motor vendor	Standard motor

Current frequency	50Hz
Motor rpm	4 Pole ~1500 at 50Hz
Motor voltage	400/690V
Fan motor efficiency	IE3
Thermal protection	3xPTC + PT100 (Flange-end)
Vibration sensor	Yes
Motor building form	B35 with legs (foot)/flange
Motor frame size	200
Paint specification	Blue - RAL 5009 semi gloss (standard)
Sparkless inlet	Yes
Vibration absorbers	Yes
Vibration absorber type	Foot vibration W75
Drain plug	Yes
Motor Pole	4 Pole

Sales Price

CARZ back-pressure flap valve

Designed to prevent the effect of a pressure wave and flames caused by an explosion from returning along the pipework in which it is mounted.

It is effective up to a maximum declared reduced explosion pressure within the protected enclosure (typically ATEX Zone 20 internally) and acts as an isolating valve during the explosion.

The CARZ Explosion Isolation flap prevents the devastating effects of a pressure wave and flame front, from a dust explosion downstream, from traveling back along the ductwork, which is fitted. The product is manufactured according to ATEX quality assurance standards for production.

It is effective up a maximum reduced explosion pressure in the protected space (typically ATEX zone 20, internal) and acts as an isolating valve during an explosion.

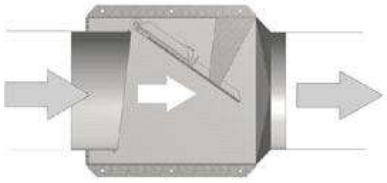
In normal operating mode it is held open against gravity by the dust laden air stream flowing in the direction opposite to that of the explosion pressure wave.

Benefits:

- Prevents devastating effects of a dust explosion from spreading
- Prevents stray dust returning along the duct when dust collector is stopped
- Available with flange or QF collar for connecting to different pipe systems

- Suitable for transporting explosive dust of class St1

Suction direction



Explosion direction

Item	Description	Qty	Price/Unit	Amount (ZAR)
	Non-Return CARZ Explosion Valve			
73001223	CARZ 400mm ST1 EX D Valve	2		
			TOTAL (excluding VAT)	

Ducting and Installation (Based on drawing completed – Budged only)

Installation (3 weeks)	Included
Accommodation (3 weeks)	Included
Ducting (+- 180m in total)	Included
Ducting Supports (All wire rope and Unistrut)	Included
Extraction points support structures	Included
Consumables	Included
Dampers (For balancing) Note: (14 x Butterfly dampers)	Included
Transport and delivery (Ducting, fan, unit and inst team)	Included
Off Loading at site (Customer to offload with forklift)	Excluded
Lifting and Rigging equipment (Customer to provide crane, forklift or cherry picker if required)	Excluded
Electrical Starter (Connections to be done by client electrician, starter will be supplied)	Included
Electrical Supply (From customer DB board to panel)	Excluded
Civils	Excluded
Pneumatic Connections and supply	Excluded
Ned Quote Drawings	Included
Project Management	Included
Commissioning	Included
Spare parts	Excluded

Total installation price

TOTAL PRICE INCLUDING INSTALLATION

Quotation period : 30 days

Time of delivery : 14-18 Weeks after receipt of order, deposit and signed scope document.

Payment terms : 50% Deposit on Order placement
: 30% before delivery
: 20% on Commissioning

The Envirox Commercial Terms and Conditions of Tender and Sale shall apply, unless otherwise agreed to in writing by both parties before the placement and acceptance of any order. A copy of Envirox Standard Commercial Terms and Conditions of Tender and Sales is available upon request.

The quotation is subject to such circumstances that affect price and delivery as well as circumstances beyond our control. We reserve the right to make alterations of dimensions of the system depending on the projection in detail. Furthermore, our quotation is subject to possible special demands from the authorities.

Price may change subject to exchange rate changes. We hope our quotation will be of interest to you and should be pleased to execute your order, in the meantime please do not hesitate to contact us for further information.

This quotation and attachments contain confidential information intended only for the person to whom it is addressed to. Please refer to the above quotation number when placing your order. A technically and commercial clear order must be forwarded to us when placing your order. Please take note that all prices are exclusive off VAT. Unless specified otherwise the technical information in this quotation will be the final specification as discussed and agreed to.

Yours faithfully

envirox
Envirox (Pty) Ltd.
The Industrial Air Filtration Company

CERTIFIED Nederman Combustible Dust Expert

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