PROPOSED PROSPECTING RIGHT ON PORTIONS 1, 2 AND 3 OF THE FARM KAMBREEK NO 38 AND KLEIN PELLA NO 40 (1 546.52 HA), FOR COPPER ORE, IRON ORE, LEAD, LITHIUM ORE, RARE EARTHS AND ZINC ORE IN THE NAMAQUALAND MAGISTERIAL DISTRICT IN THE NORTHERN CAPE PROVINCE.

INVASIVE PLANT SPECIES MANAGEMENT PLAN

MAY 2024

REFERENCE NUMBER: *NC 30/5/1/1/2/13459 PR*

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EXECUTIVE SUMMARY

African Exploration Mining and Finance Corporation SOC Ltd ("hereinafter referred to as "the Applicant"), applied for environmental authorisation (EA) and a prospecting right for Copper ore, Iron ore, Lead, Lithium ore, Rare Earths and Zinc ore on portions 1, 2 and 3 of the farm Kambreek no 38 and Klein Pella no 40 within the Namaqualand Magisterial District in the Northern Cape Province. The proposed activity will make use of non-invasive as well as invasive prospecting that will include borehole drilling to retrieve geological core samples. No bulk sampling will be done.

The proposed project triggers listed activities in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) and the Environmental Impact Assessment Regulations 2014 (as amended 2017) and therefore requires an environmental impact assessment (basic assessment process) that assess project specific environmental impacts and alternatives, consider public input, and propose mitigation measures, to ultimately culminate in an environmental management programme that informs the competent authority (Department of Mineral Resources and Energy) when considering the environmental authorisation. This report, the Draft Basic Assessment Report, forms part of the departmental requirements, and presents the first report of the EIA process.

Project Description

The proposed prospecting footprint applied for is 1 546.52 ha on portions 1, 2 and 3 of the farm Kambreek no 38 and Klein Pella no 40 for copper ore, Iron ore, Lead, Lithium ore, Rare Ear and 3 of the farm Kambreek no 38 and Klein Pella no 40 within the Namaqualand Magisterial District in the Northern Cape Province.

The proposed activity will make use of non-invasive as well as invasive prospecting activities that will include borehole drilling to retrieve geological core samples. No bulk sampling will be done.

Non-Invasive Activities will consist of the following:

Desktop study

- Desktop study will include compilation of existing and historical geological information to enable focus and targeting of ongoing activities.

Remote sensing:

- Remotely sensed datasets will be acquired from public domains and processed to extract any existing features associated with deposits of the minerals being applied for.

Field mapping

- Field mapping will be conducted to map lithological units and structures and to identify any features related to deposits being applied for. Also, this will aid in assessing the results of the processed remotely sensed data.

Geochemical survey

- Geochemical survey will be carried out to identify any anomalous concentrations of zinc, iron, lead, copper, nickel, lithium and rare earth minerals in the prospecting area.

Geophysical survey

- Geophysical survey or procurement of public and private geophysical data that exists over the project area will be carried out to locate geophysical anomalies associated with deposits of metals being applied for.

Resource evaluation

- Should potential targets be identified by any of the activities outlined above, the focus of the project will be to define a Mineral Resource as defined by the SAMREC Code.

Invasive Activities will consist of the following:

Drilling/Trenching

- The implementation of trenching and/or drilling will be determined based on the results from initial exploratory work. Either technique will be implemented at spacing grid capable of providing an Inferred Mineral Resource. This Resource is defined at a low degree of confidence but is sufficient to be used to complete a Scoping Study and to evaluate the economic feasibility of the project to advise the decision to continue to feasibility study work.
- Drilling/Trenching will be carried out to provide sample material from intersections of the targeted strata or geological features. A small excavator or tractor-loader-backhoe will be used for trenching. On the other hand, the preferred method to employ for drilling is Reverse Circulation (RC) and/or diamond drill techniques. The objective of drilling/trenching programme is to assess the presence of potentially economic mineralisation. The number of drill holes to be dug and their depths to the top will depend on the results of Phase 1 and initial part of Phase 2.

Site Specific Infrastructure:

The prospecting site will contain the following:

- Surveying Equipment;
- Chemical toilet;
- Drilling equipment;
- Geophysical logging equipment;
- Field Vehicles;
- Sample Analysis equipment; and
- Other relevant field equipment.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS

AIMP	Alien Invasive Management Plan
AIPs	Alien Invasive Plant Species
AIS Regulations	Alien and Invader Species Regulations, 2014 (amended 2016)
ARC	Agricultural Research Council
CARA	Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)
DWS	Department of Water and Sanitation
EDRR	Early Detection and Rapid Response
EMPr	Environmental Management Programme
GDP	Gross Domestic Product
GPS	Global Positioning System
IPSMP	Invasive Plant Species Management Plan
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
NEMA	National Environmental Management Act, 1998 (Act No 107 of 1998)
NEM:BA	National Environmental Management: Biodiversity Act, 2004 (Act No 10 of 2004)
NEM:PAA	National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003)
NWA	National Water Act, 1998 (Act No 36 of 1998)
PCO	Pest Control Officer
PPE	Personal Protective Equipment
SANBI	South African National Biodiversity Institute
WFW	Working for Water

DECLARATION OF INDEPENDENCE

I, Sonette Smit, in my capacity as specialist consultant declare that I:

- act as independent consultant;
- will perform the contracted work in an objective manner, even if the results and findings are not favourable to the holder of the authorisation;
- will adhere to and comply with all responsibilities as indicated in the National Environmental Management Act and Environmental Impact Assessment Regulations;
- do not have and will not have any vested interest in the activity other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014; and
- reserve the right to modify aspects pertaining to this study should additional information become available through ongoing research and further work in this field.

Sonette Smit	Date:
	28 May 2024

CLIENT REVIEW AND COMMENT

I reviewed and understood the contents of this report.

I acknowledge that this Alien Invasive Management Plan is a work in progress.

NB: The proposed control methods are only recommendations based on information available to the environmental consultant at the time. The Environmental consultants employed at Greenmined Environmental are not registered Pest Control Operators (PCO) and in the circumstances the site should ensure that the expert advice and opinion of a registered PCO is sought prior to the commencement and implementation of control methods pertaining to invasive species.

FINAL DOCUMENT TO BE SIGNED BY APPLICANT

_____ _____

Print name Signature

_____

Date:

1. INTRODUCTION

This document was prepared by Greenmined Environmental (Pty) Ltd as an independent environmental consultancy appointed African Exploration Mining and Finance Corporation SOC Ltd, to develop an Alien Invasive Management Plan (AIMP) for the prospecting right to prospect for copper ore, Iron ore, Lead, Lithium ore, Rare Earths and Zinc ore within the Namaqualand Magisterial District in the Northern Cape Province.

The prospecting activities can be best described in the following phases:

DESCRIPTION OF PLANNED NON-INVASIVE ACTIVITIES:

(These activities do not disturb the land where prospecting will take place, e.g. aerial photography, desktop studies, aeromagnetic surveys, etc.)

Phase 1:

Database compilation

Upon granting of the Prospecting Right, the initial activity will be to source additional public domain data from agencies such as the Council for Geoscience and Department of Mineral Resources. In particular, historical exploration work such as sample data, geophysics, and diamond drill information is particularly relevant to inform the ongoing exploration programme.

Preliminary project logistical activities

Prior to engaging in exploration of any new area, it is necessary to contact and obtain the permission of the surface rights holders to engage in exploration activities on their land. Initially, the site exploration works will be the low-key activities mentioned below; therefore, accommodation will be at a suitable local commercial facility. Should the project progress, certain, logistical activities such as identification of a suitable site office/accommodation will require completion prior to commencing Phase 3 activities.

Remote sensing/Field mapping/Geochemical survey/Geophysical survey

These activities will be conducted to outline potential deposits of the metals being applied for. Remotely sensed data such as ASTER and Sentinel multispectral data will be processed using GIS software to locate features diagnostic to these deposits. As for field mapping, it will be conducted by walking over the prospecting right and taking field observations and samples of the rocks that outcrop; Geochemical survey will be conducted preferably through hand-held XRF techniques.

With regards to geophysics, public and private domain geophysical data that exists over the project area will be procured and utilised to facilitate and inform the ongoing exploration. At any stage of the project, it may be decided that additional, more detailed geophysical surveys may be required for various technical reasons. These surveys may comprise magnetic and electromagnetic surveys although other techniques may also be considered. The decision to utilise additional geophysical methods will be taken by the Competent Person, in consultation with the companies consulting geophysicists, at the appropriate stage of the project. All the above work will be continually compiled and interpreted within the GIS environment. This will enable the focus of ongoing activities on the areas of potential.

DESCRIPTION OF PLANNED INVASIVE ACTIVITIES:

(These activities result in land disturbances e.g. sampling, drilling, bulk sampling, etc.)

Drilling/Trenching

Drilling/Trenching will be carried out to provide sample material from intersections of the targeted strata or geological features. A small excavator or tractor-loader-backhoe will be used for trenching. On the other hand, the preferred method to employ for drilling is Reverse Circulation (RC) and/or diamond drill techniques. The objective of drilling/trenching programme is to assess the presence of potentially economic mineralisation. The number of drill holes to be dug and their depths to the top will depend on the results of Phase 1 and initial part of Phase 2.

At this stage of the project, it is impossible to define the exact locations of drill sites or number of drillholes to be dug. However, the detailed drilling spacing will be planned to allow the defining of an Inferred Mineral Resources as per the SAMREC code. Should there be a need to conduct an extra exploration work, which is not indicated herein, in order to clearly define Mineral Resource Category, the Department of Mineral Resources will be provided with an addendum in respect to the Prospecting Work Programme. Due to the small scale and nature of the prospecting activities the pollution potential is of low significance. Prior to moving to the next drill block these sites will have to be fully rehabilitated as per the mitigation measures set out in this document as well as in consultation with the landowner / landowners, thereby keeping the impact on the receiving environment as low as possible.

DESCRIPTION OF PRE-/FEASIBILITY STUDIES:

(Activities in this section include but are not limited to: initial geological modelling, resource determination, possible future funding models, etc.)

Scoping study

Following the completion of the Phase 2 and initial stages of Phase 3 work and should a potentially economic Mineral Resource have been defined that is metallurgically recoverable; a Scoping Study will be completed as per normal industry practice. This will include a preliminary mine and plant design, provisional environmental and social impact studies, and a financial model that will provide an indication whether the project is potentially viable. This work is generally performed by a Competent Person and will be done off-site. Should the Scoping study prove positive, the decision will be taken to move the project to the Feasibility study.

Feasibility study

A multi-disciplinary pre-feasibility study will be done based on the geological model and mineral resource category outlined above. The outcome of the pre-feasibility Study will be a complete mine and plant design, together with a preliminary EMPR for the operations. Should this prove positive, feasibility study work will commence.

Feasibility study will essentially improve the degree of accuracy of the pre-feasibility. This may include the detailed mine design, bulk sampling, or trial mining; preparation and application for the water use licence, EMPR, and mining licence; and placement of provisional orders for construction. The outcome of the feasibility study will provide a blueprint for construction, and the procurement of permitting and project finance.

According to Mucina & Rutherford (2006) The Project Area is situated in the Bushmanland Arid Grassland (NKb 3), Eastern Gariep Plains Desert (Dg 9), Eastern Gariep Rocky Desert (Dg 10) and Lower Gariep Alluvial Vegetation (Aza 3) vegetation types according to SANBI (2018). Descriptions of the vegetation types are taken directly from Mucina & Rutherford (2006). The majority of the area consists of Often sloping plains, sharply contrasting with the surrounding rocky hills and mountains. Typical wash vegetation in the breaks between the mountains to the Orange River. Grassland dominated by ‘white grasses’, some spinescent (*Stipagrostis* species), on many of the flats with additional shrubs and herbs in the drainage lines or on more gravelly or loamy soil next to the mountains. The area has a conservation target of 34%. None conserved in statutory conservation areas. Few intact examples of this vegetation remain. Heavy grazing and arid climate combined with the ease of accessibility of the vegetation to stock mean that pastoral activities in the past have significantly altered the structure and composition of vegetation of this unit. In some areas Prosopis shows potential to become a serious problem, especially around natural springs or aquifers. Some very restricted areas are cultivated, mainly with date palms and grape vines.

The information used in this AIMP was mostly gathered from the Department of Water and Sanitation- (DWS), the Agricultural Research Council- (ARC), and the Working for Water web-sites. There are

around 379 problem plants listed as Category 1, 2, or 3 alien invasive species in the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA) and Category 1a and b, 2 and 3 under the National Environmental Management Biodiversity Act (NEM:BA).

This document focuses mainly on alien invasive species which are listed under legislation and that are typically associated with the Nama Karroo Biome as well as the Desert Biome. The document was compiled in such a way that other species can be added, should they be discovered on the property of concern, or should they become problematic plants within the area.

The AIMP format includes a summary on the legislation, a brief overview of the problems associated with alien invasive species establishment, various control and eradication methods available, a list of chemicals that are registered and can be utilised against alien invasive species and information sheets for the alien invasive species of concern. The information sheets indicate the category the alien invasive species belongs to, the growth form of the species, the control measures that can be used against the species, the monitoring methodology that should be applied and, finally, indigenous species that can be utilised for rehabilitation of areas where large infestations occurred. The use of the information sheets allows for easy update of the various information as research uncovers newer, improved control measures against species and as biological control agents become available on the market.

> Global trade and transportation have increased the opportunities for plants and other invasive species to cross geographic boundaries like never before. The invasive species problem is expanding rapidly because of the introduction of an increased variety of non-native species and many new types of infestation pathways. Natural controlling processes and limiting factors that kept species in check in their native ecosystems are not present in their new habitats, thereby enabling the populations to thrive. Alien invasive plants species (AIPs) can out-compete native species, especially when ecosystem health is stressed by factors such as drought, fire, pollution, resource over-utilization and landscape disturbances.
>
> Lack of knowledge about how invasive species function in their new environment, significantly inhibits the ability to detect and eradicate new or small infestations. Efforts to find and eliminate new infestations are hampered by the lack of an effective early warning and rapid response systems. In addition, there is a shortage of safe and effective techniques to limit the impact on non-target areas or sensitive natural species. Furthermore, control efforts can be hampered when they extend across multiple political jurisdictions and ownerships especially in urban areas. Rehabilitation and restoration efforts require new and expanded sources of endemic plant materials and improved techniques to repair damaged ecosystems.

1.1 TERMS OF REFERENCE

African Exploration Mining and Finance Corporation SOC Ltd ("hereinafter referred to as "the Applicant"), applied for environmental authorisation (EA) and a prospecting right for Copper ore, Iron ore, Lead, Lithium ore, Rare Earths and Zinc ore on portions 1, 2 and 3 of the farm Kambreek no 38 and Klein Pella no 40 within the Namaqualand Magisterial District in the Northern Cape Province. The proposed activity will make use of non-invasive as well as invasive prospecting activities that will include borehole drilling to retrieve geological core samples. No bulk sampling will be done.

This document, the Alien Invasive Management Plan (AIMP) was compiled in order to assist the applicant to constantly monitor the prospecting area for problem species. The AIMP includes alien plant species removal, control and management procedures. The following aspects are listed and discussed below:

1. Alien plant identification and listing;
2. Control of alien species;
3. Methods of removing alien species;
4. Alien plant material disposal;
5. Eradication tool for invasive plant species;
6. Site specific guidelines; and
7. Rehabilitation guidelines for reclaimed areas.

NB: The proposed control methods are only <u>recommendations</u> based on information available to the environmental consultant at the time. The environmental consultants employed at Greenmined Environmental are not registered Pest Control Operators (PCO) and in the circumstances the site should ensure that the expert advice and opinion of a registered PCO is sought prior to the commencement and implementation of control methods pertaining to invasive species.

1.2 REFERENCE DOCUMENTS

The following list of documentation was used to formulate the objectives for the AIMP:

- Alien and Invader Species Regulations, 2014 (as amended 2016) (AIS)
- Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (as amended) (CARA);
- Fertiliser, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No. 36 of 1947) (as amended);
- National Environmental Management Act, 1998 (Act No 107 of 1998) (as amended) (NEMA);
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (as amended) (NEM:BA);
- National Water Act, 1998 (Act No. 36 of 1998) (as amended) (NWA);
- Policies on alien invasive eradication methods.
- The Department of Water Affairs and Forestry Environmental Best Practice Specifications of 2005; and

2. OBJECTIVE

This document describes the potential sources of AIP infestation and provides a method for its control and management. Furthermore, it aims to provide methods to minimise and monitor the AIPs infestation as a result of vegetation clearance due to the prospecting activity.

The primary objective of this document is to provide an AIPs control and management plan that focuses on AIPs control measures to be implemented by the client on the site.

This objective will be met through the implementation of the management measures specified in this plan, including:

- Effective management of invasive species present on site;
- Control and rehabilitation of open or unused areas at the site where possible; and
- Minimising re-invasion through preventative measures such as regular monitoring and the planting of species to cover open areas.

3. WHAT IS ALIEN INVASIVE PLANT SPECIES?

According to the book, *Problem Plants of South Africa* (Bromilow 2001) a weed is a plant in the wrong place at the wrong time. Problem plants are described as vigorous growers that are easily adaptable and mostly exotic or foreign in origin. Weeds usually are pioneer plants that invade disturbed spaces such as stockpile areas, overburden and topsoil stockpiles and firebreaks. Invasive plants are plants that have been imported and has the ability to invade the natural vegetation.

Alien invasive plants and alien invasive infestations have several repercussions, which includes environmental, social and economic. Some of the more obvious issues are:

- These plants absorb and transpire a large amount of water, which is wasted/removed for use by indigenous plants. This leads to the reduction of water flow in the vicinity of water bodies and alters aquatic ecosystems.
- When invasive species are in close proximity to watercourses, the plants may alter riverbanks and highly increase the potential for erosion that could in turn impact the integrity of the watercourse and alter flood lines. This has negative consequences on associated ecosystems and all downstream water users.
- Large stands of alien invasive species result in loss of productive land resulting in associated negative economic and social impacts.
- Large infestations reduce the availability of land to indigenous species. This has ecological implications when biodiversity is directly impacted, and social implications when natural resources become scares.
- Alien invasive species increase the dry material ratio of the veldt, thereby directly increasing the veldt fire hazards.

Therefore, the benefits of eradicating and controlling alien invasive species extends to the social, economic- and environmental aspects of South Africa.

Invasive species have been characterized as a “catastrophic wildfire in slow motion”. Thousands of invasive plants have infested hundreds of millions of hectares of land and water across the country causing massive disruptions in ecosystem function, reducing biodiversity and degrading ecosystem health. The health and function of forests, mountains, wetlands, and rivers have been affected by alien plant invasion which outcompete indigenous or endemic plant species and drain the water resources.

A species is considered invasive if it meets these two criteria:

- It is non-native to the ecosystem under consideration; and

- Its introduction causes or is likely to cause economic or environmental harm or harm to human health.

Appendix 1, of this document highlights, listed alien invasive species common in the Nama-Karoo Biome that might occur, that need to be controlled. The list also indicates the control methods to be applied.

4. LEGAL FRAMEWORK

4.1 NATIONAL ACTS

The Constitution of the Republic of Southern Africa (Act No 108 of 1996) – Section 24

The Constitution is South Africa's overarching law. It prescribes minimum standards with which existing and new laws must comply. Chapter 2 of the Constitution contains the Bill of Rights in which basic human rights are enshrined. Section 24 of this chapter states that "*Everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development*."

Government's commitment to give effect to the environmental rights enshrined in the Constitution is evident from the enactment of various pieces of environmental legislation since 1996, including the National Water Act, the National Environmental Management Act, etc.

National Environmental Management Act, 1998 (Act No 107 of 1998)

NEMA replaces a number of the provisions of the Environment Conservation Act, 1989 (Act No. 73 of 1989). The Act provides for cooperative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote cooperative governance and procedures for coordinating environmental functions. The principles enshrined in NEMA guide the interpretation, administration and implementation of the Act with regards to the protection and / or management of the environment. These principles serve as a framework within which environmental management must be formulated. Section 2(4) specifies that *"sustainable development requires the consideration of all relevant factors including the following aspects specifically relevant to biodiversity":*

- The disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimized and remedied;
- The development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardized;
- A risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and
- Negative impacts on the environment and on people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimized and remedied.

The costs of remedying pollution, environmental degradation, and consequent adverse health effects and of preventing, controlling or minimizing further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.

Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

Of particular importance are the Environmental Impact Assessment (EIA) regulations of the Act, which identify activities that may have a substantial detrimental effect on the environment. The identification of these activities results in the activity being prohibited unless the competent authority has granted a written authorization after the consideration of an environmental impact assessment or basic assessment.

Conservation of Agricultural Resources Act, 1983 (Act No 43 of 1983)

South Africa has numerous problematic alien invader species. The Conservation of Agricultural Resources Act, 1983 was promulgated to amongst other things combat the invasion and spread of such species. The Act categorizes weeds into three categories, with varying degrees of action required for each category of weeds.

The Conservation of Agricultural Resources Act, No. 43 of 1983, (CARA) as amended in March 2001, sets out the regulations regarding the control of invasive plants and weeds under Regulations 15 and 16 and provides lists of species declared as invasive plants and indicators of bush encroachment. The Regulations classify the listed alien invasive plants into three categories. The categories can be described as follows:

Category 1: Plants that are alien invasive species and must be eradicated and controlled. These species have little economic or social value and their invasive habits outcompete indigenous species, severely alter ecosystems and threaten local biodiversity.

Section 15A of CARA states that:

1. Category 1 plants may not occur on any land or inland water surface other than in biological control reserves.
2. A land user shall control any Category 1 plants that occur on any land or inland water surface in contravention of the provisions of sub-regulation (1) by means of the methods prescribed in regulation 15E.
3. No person shall, except in or for purposes of a biological control reserve –
    a. establish, plant, maintain, multiply or propagate Category 1 plants; and
    b. import or sell propagating material of Category 1 plants or any Category 1 plants;
    c. Acquire propagating material of Category 1 plants or any Category 1 plants.
4. The executive officer may, on good cause shown in writing by the land user, grant written exemption from compliance with the requirements of sub-regulation (1) on such conditions as the executive officer may determine in each case.

Category 2**:** Species that have commercial or utility value and may only be grown in demarcated areas, in a controlled manner and under a permit.

Section 15B of CARA states that:

1. Category 2 plants may not occur on any land or inland water surface other than a demarcated area or a biological control reserve.

a. The executive officer may on application in writing demarcate an area as an area where Category 2 plants may occur, be established and be maintained.
b. An area in respect of which a water use license for stream flow reduction activities has been issued in terms of section 36 of the National Water Act, 1998 (Act No. 36 of 1998) shall be deemed to be a demarcated area.

2. The executive officer shall demarcate an area for the occurrence, establishment and maintenance of Category 2 plants only if –
   a. The Category 2 plants in the area are cultivated under controlled circumstances;
   b. The land user concerned has been authorised to use water in terms of the National Water Act, 1998 (Act No. 36 of 1998);
   c. The Category 2 plants or products of Category 2 plants in the area are demonstrated to primarily serve a commercial purpose, use as a woodlot, shelter belt, building material, animal fodder, soil stabilisation, medicinal or other beneficial function that the executive officer may approve; and
   d. All reasonable steps are taken to curtail the spreading of propagating material of the Category 2 plants outside the demarcated areas.
3. When an area is demarcated for the occurrence, establishment and maintenance of Category 2 plants the executive officer may impose such additional conditions as may reasonably be deemed necessary to keep the Category 2 plants in the area in check.
4. No person shall sell propagating material of Category 2 plants or any Category 2 plants to another person unless such other person is a land user of a demarcated area or of a biological control reserve.
5. No person shall acquire propagating material of Category 2 plants or any Category 2 plants unless such material or such plants are intended for use in a demarcated area or in a biological control reserve.
6. Propagating material of Category 2 plants or Category 2 plants shall only be imported or sold in accordance with the provisions of the Plant Improvement Act, 1976 (Act No. 53 of 1976), the Agricultural Pests Act, 1983 (Act No. 36 of 1983) and the environment conservation regulations.
7. A land user shall control any Category 2 plants that occur on any land or inland water surface in contravention of the provisions of sub-regulation (1) by means of the methods prescribed in regulation 15E.
8. Unless authorised thereto in terms of the National Water Act, 1998 (Act No. 36 of 1998), no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland.

9. The executive officer may, on good cause shown in writing by the land user, grant written exemption from compliance with one or more of the requirements of sub-regulations (1), (3), (5), (6), (8) and (9) on such conditions as the executive officer may determine in each case.

Category 3: Species that often have ornamental value and may be grown where they currently exist but cannot be planted, propagated or traded.

Section 15C of CARA states that:

1. Category 3 plants shall not occur on any land or inland water surface other than in a biological control reserve.
2. Subject to the provisions of sub-regulation (3), the provisions of sub-regulation (1) shall not apply in respect of Category 3 plants already in existence at the time of the commencement of these regulations.
    a. No land user shall allow Category 3 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland.
    b. The executive officer may impose such additional conditions as may reasonably be deemed necessary with regard to Category 3 plants already in existence at the time of the commencement of these regulations.
    c. A land user must take all reasonable steps to curtail the spreading of propagating material of Category 3 plants.
    d. The executive officer may, after consultation with the land user, issue a direction in terms of section 7 of the Act that Category 3 plants in existence at the time of the commencement of these regulations must be controlled by means of the measures prescribed in regulation 15F.
3. No person shall, except in or for purposes of a biological control reserve –
    a. plant, establish, maintain, multiply or propagate Category 3 plants;
    b. import or sell propagating material of Category 3 plants or any Category 3 plants;
    c. acquire propagating material of Category 3 plants or any Category 3 plants.
4. The executive officer may, on good cause shown in writing by the land user, grant written exemption from compliance with one or more of the requirements of sub-regulations (1), (3) and (4) on such conditions as the executive officer may determine in each case.

The National Department of Agriculture is responsible for administering the CARA act and landowners having alien invasive species on their property may be penalised. Penalties can be in the form of fines or imprisonment. It is therefore important to have an alien invasive management plan in place that aims at primarily eradicating and secondly controlling alien invasive species. It is also important to keep records of all procedures followed and to have photographic records, as many alien invasive species are difficult to completely eradicate

National Environmental Management: Biodiversity Act, 2004 (Act No 10 of 2004)

The National Environmental Management: Biodiversity Act, 2004 (NEM:BA) provides for the management and conservation of biological diversity and components thereof; the use of indigenous biological resources in a sustainable manner; the fair and equitable sharing of benefits rising from bio-prospecting of biological resources; and cooperative governance in biodiversity management and conservation within the framework of NEMA. The Act also gives effect to international Strategic Review of the Status of Biodiversity Management in the South African Mining Industry agreements relating to biodiversity. The Act states that the Minister of Environmental Affairs and Tourism may identify any process or activity in a listed ecosystem as a threatening process and will, thereafter, be regarded as an activity contemplated in Section 24(2)(b) of NEMA which states that:

a. Specified activities may not be commenced without prior authorization from the Minister or MEC and specify such activities. This Act allows for any person, organization or organ of state to contribute to biodiversity management. Such a party may submit to the Minister a draft management plan for an ecosystem or species. Should the Minister approve the management plan, an agreement can be entered into regarding the implementation of the plan.
b. The NEM:BA established the South African National Biodiversity Institute (SANBI) and gave it a mandate regarding monitoring, advising and co-coordinating biodiversity issues in South Africa.

The Alien and Invader Species (AIS) regulations was subsequently published in terms of section 97(1) of NEM:BA in August 2014 and amended in July 2016. The AIS regulations, 2014 grouped plants into four categories and prescribes the subsequent management of each category.

Category 1a: Invasive plant species requiring compulsory control. These plants must be removed and destroyed and any species falling within this category is by law required to be eradicated from the environment. No permits should be sought or given to keep or propagate plant species falling within this category. Any form of trade or planting is strictly prohibited.

Category 1b: Invasive plants requiring compulsory control as part of alien invasive plant species control programme. These plants are considered to have high invasive potential, thus require removal and eradication. Plants falling within this category qualify for governmental sponsored alien invasive plants control and management programmes. Furthermore, no permits will be issued to keep or sell plant falling within this category.

Category 2: The plants falling within this category are alien invasive plants regulated by area or locality. These alien invasive plant species require a demarcation permit in order to import, grow, breed, sell, buy or accept as gifts. However, no permit will be issued for invasive plant species within this category existing in riparian areas or zones.

Category 3: These alien invasive plant species are regulated by activity, thus an individual plant permit is required to import, grow, breed, possess, sell, buy, or move these plants. No permit is issued for Category 3 alien invasive plant species existing in riparian areas.

In order to identify invasive plants in need of controlled/eradication from site, the plants specified in these groups must be used as a guideline.

National Environmental Management: Protected Areas Act, 2003 (Act No 57 of 2003)

The National Environmental Management: Protected Areas Act, 2003 (Act No 57 of 2003) (NEM:PAA) provides for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes; for the establishment of a national register of all national, provincial and local protected areas; for the management of those areas in accordance with national norms and standards; for intergovernmental co-operation and public consultation in matters concerning protected areas; for the continued existence, governance and functions of South African National Parks; and for matters in connection therewith.

Mineral and Petroleum Resources Development Act, 2002 (Act No 28 of 2002) (Section 37(1))

According to the MPRDA, any prospecting or mining operations must not result in unacceptable pollution, ecological degradation or damage to the environment and must be conducted in accordance with generally accepted principles of sustainable development by integrating social, economic, and environmental factors into the planning and implementation of projects. Section 37 (1) of the MPRDA acknowledges that the principles set out in Section 2 of the NEMA, apply to all prospecting and mining operations and serve as guidelines for the interpretation, administration, and implementation of the environmental requirements of this Act. In addition, mining right holders must give effect to the objectives of integrated environmental management as laid out in Chapter 5 of the NEMA. The MPRDA also obliges the owner of the mining right to rehabilitate disturbed areas and holds the owner responsible for any environmental degradation on his/her site.

National Water Act, 1998 (Act No. 36 of 1998)

The mining industry is itself dependent on key resource inputs such as water, the provision of which depends on the health and integrity of ecosystems.

The National Water Act, 1998 (NWA) is a legal framework for the effective and sustainable management of water resources in South Africa. Central to the NWA is recognition that water is a scarce resource in the country which belongs to all the people of South Africa and needs to be managed in a sustainable manner to benefit all members of society. The NWA places a strong emphasis on the protection of water resources in South Africa, especially against its exploitation, and the insurance that there is water for social and economic development in the country for present and future generations.

National Forests Act, 1998 (Act No. 84 of 1998)

The Act protects State Forests, Forest Nature Reserves and Wilderness Areas, and the plant and animal life contained therein. In addition, the Act allows for management programmes to be established in order to prevent soil erosion and fire, maintain the natural genetic and species diversity and control plants and animals which are harmful to a particular area. The Act provides for the control and reasonable access to State Forests for the purposes of recreation, education, culture or spiritual fulfilment as well as prohibiting any person from damaging State Forests or contributing to the threat of fire. Forest officers are empowered to arrest any person who has contravened this Act and may seize such person's property. This act also refers to the protected trees that are listed and the licencing permits that is needed to remove or relocated if needed.

Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No. 36 of 1947)

This Act provides for the following:

- appointment of a Registrar of Fertilizers, Farm Feeds and Agricultural Remedies;
- the registration of fertilizers, farm feeds, agricultural remedies, stock remedies, sterilizing plants and pest control operators;
- regulate or prohibit the importation, sale, acquisition, disposal or use of fertilizers, farm feeds, agricultural remedies and stock remedies; and
- designation of technical advisers and analysts; and to provide for matters incidental thereto.

In other words, this Act governs the use and application of herbicide:

- All herbicide applications are to be made under the direct supervision of a registered Pest Control Operator.
- All persons applying herbicides are to be trained in their use.
- Correct Personal Protective Equipment (PPE) must be worn.
- Only registered herbicides may be used.
- Correct storage facilities must be used.

4.2 PROVINCIAL ACTS, PLANS, POLICY AND ENVIRONMENTAL GUIDELINES

Bioregional Plans

The bioregional plans aim to provide maps of biodiversity priorities with accompanying land-use planning and decision-making guidelines in order to inform decisions associated with land-use planning, environmental assessment, natural resource management and authorization.

Biodiversity Management Plans

Biodiversity management plans ensure the long-term survival in nature of species; to provide the responsible person or organ of state effective monitoring and reporting on species progress and to be consistent with acts, frameworks and applicable bioregional plans or any plans issued in terms of Chapter 3 of the NEMA or any municipal integrated development plans, etc.

National Biodiversity Strategies and Action Plans

The goal of national biodiversity strategies and action plans is to conserve and managed terrestrial and aquatic biodiversity to ensure a sustainable and equitable benefits.

National Biodiversity Assessment

Formerly known as National Spatial Biodiversity Assessment which is a systematic biodiversity planning approach that aims to give a comprehensive biodiversity assessment (previously it focused on spatial only) throughout the country. Its focus is to mainstream biodiversity priorities throughout the economy and making links between biodiversity and socio-economic development.

Mining and Biodiversity Guideline

The mining industry plays a vital role in the growth and development of South Africa and its economy. Since the earliest discoveries of minerals in the region, this rich endowment of mineral resources has been a key driver of South Africa's social and economic development. Mining continues to be one of the most significant sectors of the country's' economy, providing jobs, growing our GDP and building relations with international trading partners.

On par with this mineral wealth are exceptional endowments of biodiversity and ecosystems. South Africa is globally renowned as a mega-diverse country that harbours an exceptional number of species in relation to most other countries. This rich biodiversity and ecological infrastructure underpin and support the social and economic development in numerous direct and indirect ways. It is currently impacted upon by mining and other land uses in ways that are not sustainable.

Sustaining the goods and services that flow from ecosystems, and the benefits that these provide over the long term, will require limits in mining and other activities in certain areas. South Africa's Constitution and the laws stemming from it recognise the vital role of both ecological and mineral resources in a development path built upon the socially just, environmentally sustainable and economically efficient use of these resources.

The Guideline offers six principles that should be applied towards good decision making when addressing biodiversity issues and impacts in a mining context:

- Apply the law;
- Use the best available biodiversity information;
- Engage stakeholders thoroughly;
- Use best practice environmental impact assessment to identify, assess and evaluate impacts on biodiversity;

- Apply the mitigation hierarchy in planning any mining-related activities and to develop robust environmental management programmes (EMPr); and
- Ensure effective implementation of the EMPr, including adaptive management.

5. ROLES AND RESPONSIBILITIES

African Exploration Mining and Finance Corporation SOC Ltd is the responsible prospecting right applicant and will be accountable for the effectively implementation of this plan. The alien invasive management plan is legally binding and must be implemented to fulfil the requirements of relevant legislations and recommendation.

6. CONTROL OF ALIEN INVASIVE AND PROBLEM PLANT SPECIES

Alien plant invasions cause a decline in species diversity, local extinction of indigenous species and ecological imbalance. Thus, preventing the onset of an alien invasion, management of further spreading is required as problem plants outcompete indigenous plant species and quickly establish themselves in an area. In light of this, a national strategy was compiled identifying four primary programs to address the management of alien invasive plant species as listed below:

1. Prevention: Keep the invasive species out;

2. Early detection and rapid response: Detect and eradicate invasive species to stop them from spreading;

3. Control and management: Eliminate or control the problem of invasive species; and

4. Rehabilitation and restoration: Heal, minimize, or reverse the harmful effects from invasive species.

The occurrence of alien invasive plants not only affect the growth and distribution of natural endemic plants, but they also use more water than indigenous plants, some have toxic fruits or leaves which when consumed could lead to fatalities. Therefore, alien invasive plant species need to be controlled or removed and the following section contains different methods that can be used.

The ultimate aim of an alien invasive management plan is to completely eradicate problem species from site. This is often very difficult as many of the species have seeds that remain viable for a very long time and even after physical removal of plants, the seeds germinate to form new infestations. An alien invasive management plan must therefore be an ongoing practice over many years and should follow the following phases:

1. The initial bulk eradication of alien invasive species by chemical or mechanical means, and in some instances biological control agents. This may also require rehabilitation if large stands of alien invasive species are removed. Local, indigenous species should be planted in the disturbed areas;

2. There should also be immediate follow up and all seedlings should be pulled out and removed. This should be done regularly, although the timeframes will vary from species to species depending on their growth forms and rates; and

3. Finally, monitoring of areas that appear to be under controlled must continue on at least an annual basis. Rehabilitated areas should also be monitored, and action taken immediately if regeneration of problem plants occur.

Various options are available for the control of alien invasive species, including mechanical, chemical, and biological control. In most instances, mechanical means are utilised and include physical removal of plants. Research on use of herbicides has been conducted on many species and can be applied in conjunction with mechanical methods. For some species, herbicides have not yet been fully researched and/or herbicides have not been registered and these need to be mechanically controlled. The Department of Water and Sanitation's Working for Water section provides guidelines to the preferred clearing methods for most problem plants. This information can be obtained from their website: http://www.dwaf.gov.za/wfw/Control/. The selection of appropriate methods of control shall be based on the species to be controlled, the size of the plants, the density of the stand, the accessibility of terrain and environmental safety.

Biological control of alien invasive species is an ongoing process with some biological control agents having been released on various alien invasive species showing varying degrees of success. Biological control options need to be carried out with specialist advice from academic or research institutes involved in research of alien invasive species.

Control options must consider the species being controlled, as well as the ecosystem in which the control options are being applied. For instance, some of the herbicides registered for control of alien invasive species may not be used in riparian areas, while some should preferably be used in areas where natural grass cover occurs. Some herbicides should only be utilised after consultation with a Working for Water technical advisor.

The control options are discussed below as individual actions, but in many cases integrated measures (more than one (1) control measure) are taken for more effective control of alien invasive species.

The Department of Water and Sanitation proposes that the following methods of control for age or size target plants:

- Seedlings

  Hand pulling or hoeing:
  - Hand pulling/hoeing should be carried out in sparse stands.
  - Seedlings should be severed below the soil surface or removed from the soil. Soil disturbance should be minimized to reduce re-germination.

  Herbicides:
  - Herbicides can be used on dense stands.

- Saplings

  Hand pulling or hoeing:
  - Where appropriate saplings can be removed manually as described above.

  Herbicides:
  - Foliar sprays can be carried out depending on the density of the stand. Fan nozzles should be fitted for overall spraying and solid cone nozzles for individual plant treatment. Spraying should be restricted to plants waist high or lower. Ensure there is sufficient foliage to carry the herbicide to the root system.
  - Basal stem treatments of suitable herbicides in diesel can be carried out to the bottom 250 mm of the stem. Applications should be by means of a low pressure, coarse droplet spray from a narrow angle solid cone nozzle.
  - Cut stump treatments can be used where stems are cut as low as practical. Herbicides are applied in diesel or water as recommended for the herbicide. Applications in diesel should be to the whole stump and exposed roots and in water to the cut area as recommended on the label.
  - The application of herbicides should only be sprayed/used on site by a registered pest control officer.

- Mature Trees (trees above shoulder height or robust bushes 12 – 18 months or older)

  Ring Barking:

  - Bark must be removed from the bottom of the stem to a height of 0.75 – 1.0 m. All bark must be removed to below ground level for good results.
  - Where clean de-barking is not possible due to crevices in the stem or where exposed roots are present, a combination of bark removal and basal stem treatment should be carried out.

  Frilling or partial frilling:

  - Cuts should be made through the bark into the sapwood by means of a light axe and a suitable herbicide must be applied into the cuts.

  Basal stem treatments:

  - Suitable herbicides should be applied in diesel to the base of the stem and to any exposed roots. Stems with a diameter up to 50 mm should be treated to a height of 250 mm and stems above 50 m diameter to a height of 500 mm. This method is only suitable for stems up to 100 mm in diameter.

  Cut stump treatment:

  - Stumps should be cut as low as practical and the herbicide applied. Applications in diesel should be to the whole stump and exposed roots and in water to the cut area as recommended on the label.

When herbicides are chosen as the preferred control method the guidelines of Working for Water (DWS) as stipulated in the Policy on the Use of Herbicides for the Control of Alien Vegetation must be followed:

- Herbicides selected for control shall be registered for use on that species under the conditions specified.
- Protection of the environment is of prime importance. Riparian areas must be protected and only herbicides that are approved may be used. Washing of equipment or disposal of waste spray mixture is prohibited in or near water courses where contamination of water can occur.
- Empty herbicide containers must be disposed of as hazardous waste and may not be used for any other purpose.
- Equipment must be washed where there is no danger of contamination of a water source or natural vegetated area. It is proposed that washing be restricted to the wash bay.
- Product and spray mixtures should be stored so that it is inaccessible to the public. Site management must ensure that the Safety Data Sheet of the product is available on site.

- The application of herbicides should only be sprayed/used on site by a registered pest control officer.

4.3 CHEMICAL CONTROL

Chemical control requires the application of herbicides which can either be highly selective, or non-selective (inhibit certain plants or toxic to all plants respectively),or can be localised or systemic (act on the area where it is applied or attack areas of growth respectively). In most cases, herbicides utilised against alien invasive species are systemic.

Selective herbicides have been registered against specific alien invasive species and the plant names are shown on the labels. Many alien invasive species, however, do not have registered herbicides, and in such cases general herbicides such as Garlon 4 (used with wetter Actipron when applied as spray), Roundup, Mamba, Clearout, or Tumbleweed (the latter 4 on less woody species) can be tested but success is not guaranteed. When the test show positive results, it is suggested that the results be communicated to various research institutes (reference http://www.wessa.org.za).

Chemical control is at times the only viable option for the control of invasive species, and more often than not is more cost effective and less time-consuming than mechanical control options. If used incorrectly, chemical control can be damaging to the receiving environment and affect indigenous species negatively. Specialised equipment and training and/or supervision and, in some cases, technical advice are required.

4.3.1 Control methods, equipment, and safety precautions

When applying herbicides, always follow dosage recommendations and application procedures described on the labels. Increasing dosages may have negative impacts on the receiving environment and may reduce the efficacy of the herbicide.

When applying herbicides, it is important to consider the following:

- Chemical control of alien plants is not recommended in aquatic systems due to the risk of pollution, but may be used on the floodplain in conjunction with cutting or slashing of plants;
- Chemicals should only be applied by qualified personnel;
- Only approved chemicals should be applied;
- Follow the manufacturer's instructions carefully;
- Appropriate protective clothing must be worn;
- Chemicals to be applied immediately after cutting;
- Only designated spray bottles to be used for applying chemicals; and

- Decanting of chemicals and cleaning of equipment should be undertaken at a designated location using drip trays and ground sheets to prevent spillage and contamination of the soil.

Do:

- Spray when plants are actively growing;
- Ensure that herbicide is mixed according to label application rates (info on herbicides to use can be requested from Department of Agriculture, Forestry and Fisheries or National Department of Agriculture or relevant entities);
- Ensure correct application of safety gear at all times;
- Plan the application of herbicides before the operation commences;
- Spray when the sun is shining;
- Use a drip sheet and keep herbicide in a demarcated area in the veld, out of direct sunlight;
- Apply spray to the canopy and stems;
- Include dye to assist in the identification of areas that have been cleared; and
- For certain species mainly, for foliar application, a wetting agent should be added to the herbicide mix to allow for better absorption.

Do not:

- Spray during strong wind, or where there is the slightest evidence of drift;
- Spray when it is very hot;
- Spray when plants are stressed or dormant;
- Spray plants that are over 1 m;
- Apply herbicide in the rain or on wet, damp leaves; and
- Spray near children, animals or water bodies.

In addition, it is always best to control invasive alien plants when the plants are young, rather than when it is woody and difficult to remove by hand. Furthermore, it is sometimes difficult to distinguish between young invasive species and natural species, so care should be taken at all times. Consider engaging an experienced alien clearing team (Department of Water Affairs - Working for Water unit could offer assistance and expertise on how best to remove and manage alien plants on the property).

4.3.1.1 *Foliar Application*

This method requires the herbicide to be sprayed onto leaves and young stems. The herbicide is sprayed in quantities on these plant parts to the extent just prior to running off the leaves and stems. In some instances, other agents are applied to increase the adhesiveness of the herbicide or to increase the liquidity of the herbicide. Sufficient foliage must to be present for the herbicides to be effective and in cases of re-growth, minimum heights of 0.5 m need to be reached prior to application. Equipment will require adequate spray packs, proper measuring equipment to mix correct doses and safety gear, which will include at least rubber gloves, safety glasses and masks. Do not spray just before rain (a rainfall-free period of 6 hours is recommended) or before dew falls. Avoid spraying in windy weather as the spray may come into contact with non-target plants. Spraying dormant or drought stressed plants is not effective as they do not absorb enough of the herbicide.

4.3.1.2 *Basal Stem*

This method is used for smaller woody species with thin stems (< 20 cm) and bark. The herbicides are mixed with diesel at dosages recommended on labels and applied to the stems from ground level to at least 0.3 m with a paint brush. Spraying can be used as an alternative. This method should also be applied to bark remnants left on the stem during strip-barking. Equipment will require adequate spray packs or paintbrushes, proper measuring equipment to mix correct doses and safety gear, which will include at least rubber gloves, safety glasses and masks.

4.3.1.3 *Frilling*

This method is described in the mechanical control measures and repeated here as it is always accompanied by the application of herbicides. Herbicides are mixed with water at the recommended dosage and applied with a hand-held syringe or sprayer. Equipment will require adequate spray packs or syringes, proper measuring equipment to mix correct doses and safety gear, which will include at least rubber gloves, safety glasses and masks.

4.3.1.4 Stem Injection

This method is limited for use on cacti. Four (4) holes (for a 2 m plant) are made near the base of the stem and around 2 ml of water-soluble herbicide solution, mixed at recommended dosage is poured in each hole. Equipment will require adequate syringes, proper measuring equipment to mix correct doses and safety gear, which will include at least rubber gloves, safety glasses and masks.

4.3.1.5 Stump Application

This entails the application of herbicides to the cut stumps of felled trees. The stump should be short, level and smooth with all bark in place. Stems should be cut as low as practical and stipulated on the label. The herbicide should be mixed to the correct dosage and applied no later than twelve (12) hours after the felling. For cut stump applications, the herbicide should be closely sprayed onto the outer rings of the stump and the entire stump for stems < 50 mm wide. In specific instances herbicide will need to be applied to the cut surface, the sides and any exposed roots. Equipment will require adequate spray packs, proper measuring equipment to mix correct doses and safety gear, which will include at least rubber gloves, safety glasses and masks. Herbicides are applied in diesel or water as recommended for the herbicide. Applications in diesel should be to the whole stump and exposed roots and in water to the cut area as recommended on the label.

4.3.1.6 *Stalk Immersion*

There are currently no alien invasive species which have herbicides registered against them for this particular method. It may be successful on climbers and should be tried if mechanical control options are unsuccessful or difficult. The method includes the cutting of main stems at <1 m height, the digging up of roots or treatment of roots with herbicide and the placement of an inverted plastic bottle containing herbicide over the stem. The bottle should be secured in place and checked regularly to see if herbicide is still present. The generic herbicides mentioned above can be tested for this method. A hazardous sign or tape should be placed around the bottle. Equipment will require adequate plastic bottles, proper measuring equipment to mix correct doses and safety gear, which will include at least rubber gloves, safety glasses and masks.

4.3.1.7 *Soil application*

This requires the application of herbicides to soils and should only be utilised by technical specialists.

4.3.2 Registered herbicides that can be utilised

Various herbicides are mentioned in

Table 1 below. Many alien invasive species do not have specific registered herbicides which have been properly researched and tested. In these instances, only mechanical measures have been discussed but the general herbicides listed in table 1can be tried against these species, although success may not be guaranteed.

Table 1: *List of herbicides, which can be used for control of alien invasive species and problem plants.*

TRADE NAME	ACTIVE INGREDIENT	ACTIVE INGREDIENT	GENERAL COMMENTS
Mamba 360 SL	Glyphosphate isopropylammonium salt	360 g/l	Can be used as a general herbicide.
Touchdown Forte	Glyphosphate trimesium	480 g/l	
Viroaxe	Triclopyr butoxyethyl ester	480 g/l	Do not apply in riparian areas. Use preferentially in grassy areas.
Garlon 480 EC	Triclopyr butoxyethyl ester	480 g/l	Can be used as a general herbicide. Use preferentially in grassy areas. Use Actipron for wetter spray applications.
Timbrel 360 SL	Triclopyr triethylammonium salt	360 g/l	Do not apply in riparian areas. Consult working for water technical advisor.
Stumpout	Mycoherbicide		
Chopper SL	Imazapyr	100 g/l	Do not apply in riparian areas.
Access 240 SL	Picloram potassium salt	240g/l	Needs to be used in selected areas only. Consult working for water technical advisor.
Roundup	Glyphosphate isopropylammonium salt	450 g/l	Can be used as a general herbicide.
Clearout	Glyphosphate isopropylammonium salt	360 g/l	Can be used as a general herbicide.
Tumbleweed	Glyphosphate isopropylammonium salt	240 g/l	Can be used as a general herbicide.
Taskforce	Flupropanate, present as sodium salt	745g/l	
Starane 200	Fluroxypyr	200 g/l	

N.B. A PCO should always be consulted before applying herbicides to the environment. Always wear the appropriate safety clothing when working with herbicides. Mix all herbicides on a drip groundsheet when working in the veld. Keep away from watercourses. Do not rinse herbicide equipment in the veld. Always read the herbicide label and observe instructions for safe use of herbicide.

4.3.3 Mycoherbicides

A mycoherbicide is applied as an herbicide but is not a chemical agent. It is instead a mixture of fungal spores which tend to be host-specific and on application these spores penetrate the plant where the fungus germinates. The pathogen may result in the killing of the undesirable plant. One (1) mycoherbicide, Stumpout, has been registered for application to various wattle species stumps.

4.4 MECHANICAL CONTROL

Mechanical control means the physical removal of plants from the problem area. It is often accompanied by chemical control although these are further discussed below. Some common mechanical control methods include uprooting, hand pulling, felling, slashing, mowing, ring barking, bark stripping and frilling. It is an effective method if applied frequently,but is labour intensive during times when infestation levels are high, and requires constant follow-up. An advantage is that mechanical control requires minimal technical knowledge, little training and/or supervision. Also, with effective rehabilitation of areas concerned, the disturbance to the environment is minimal, as no other active agents were introduced to the environment.

4.4.1 Control Methods, Equipment and Safety Precautions

When applying mechanical control methods, it is important to consider the following:

- Always start at the highest point and work downwards i.e. downhill or downstream;
- Start from the edge of the infestation and work towards the centre;
- Take care to prevent the spread of cuttings, which could take root further downstream;
- Ensure all root material is removed;
- Once plants have been removed, banks and slopes should be stabilised by erosion protection measures (such as geotextiles or other suitable material); and
- When stacking material, take note of fire protection measures and remember to always stack the material in rows.

4.4.1.1 *Uprooting and Hand Pulling*

Hand pulling is most effective where plants are small (30 cm), immature or shallow rooted. This entails the physical removal of plants by grabbing them at their base and pulling them out of the ground with their roots. In some situations, the root systems will need to be dug out, and hoes, spades and pick-axes may be required. This process should preferably be conducted when plants are not seeding. If this is not possible, the seed heads should be carefully removed and disposed of prior to the control method being applied. Thick leather gloves and safety glasses should be worn during this process.

4.4.1.2 *Felling*

In situations where trees are on a slope or in a precarious situation, the species must be controlled *in situ* and not felled. This control option entails the physical removal of woody plants using chainsaws, axes or machetes. Preferably de-branch cut trees. Generally, the plants are cut as low to the ground as possible, but this does vary with some species. Again, gloves and safety glasses should be used during this process and training may be required with felling of large trees as safety precautions has to be adhered to. Herbicides must immediately be applied (no later than 30 min) to the cambium layer; and all the cuts in the cambium layer must be treated. This control measure may be accompanied with chemical control measures where applicable.

4.4.1.3 *Slashing and mowing*

This method is most effective for plants in the immature stage, or for plants that have relatively woody stems/trunks. This is an effective method for non-resprouters or in the case of resprouters (coppicing), if done in conjunction with chemical treatment of the cut stumps. This is the physical removal of herbaceous plants from the base using machetes or lawn mowers. This process should preferably be conducted when plants are not seeding. If this is not possible, the seed heads should be carefully removed and disposed of prior to control method being applied. Gloves and safety glasses should be worn during this process. Use tools such as pangas (slashers), handsaws, bow-saws, chainsaws, brush cutters and axes.

4.4.1.4 *Ring barking and bark stripping*

This entails the removal of bark from the base of the stem (from below the soil layer) to a height of about 1 m. In some instances, the cambium (include the cork layer) is also removed in a 30 cm wide band around the stem at a height of around 50 cm. Bush knives or hatchets should be used for debarking and safety gear should include at least gloves and safety glasses. This control measure may be accompanied with chemical control measures where applicable.

Application of suitable herbicide in diesel can be carried out to the bottom 250 mm of the stem. Applications should be by means of a low pressure, coarse droplet spray from a narrow angle solid cone nozzle or by using a paintbrush. If multi stemmed, then each stem needs to be treated. Remove the bark and cambium around the trunk of the tree for a continuous band around the tree at least 25 cm wide, starting as low as possible. Where clean de-barking is not possible due to crevices in the stem or where exposed roots are present, a combination of bark removal and basal stem treatments should be carried out; and for better control of aggressively coppicing species pull off the bark below the cut to ground level (bark stripping), to avoid the use of herbicides.

Note: Since this method means that the tree is left standing, it is only recommended for single trees, not for stands.

Slashers or axes should be used for debarking. Where bark stripping is used, then all the bark shall be stripped from the trunk between the ground level and 1 meter above ground level; and application of suitable herbicide can also be used with this method. Applications should be by means of a low pressure, coarse droplet spray from a narrow angle solid cone nozzle or by using a paintbrush.

4.4.1.5 *Frilling*

This method uses an axe or bush knife which cut into the bark and cambium layer at angles in a ring around the tree. The cuts are made around 0.5 m above ground.

The cuts should be right through the cambium layer and form a solid ring of cuts around the trunk of the tree. Immediately apply the registered herbicide to the cuts by spraying into the 'frill'. The 'frill' needs to be deep enough to retain the herbicide.

This method is always accompanied by chemical control measures. Safety glasses and gloves should be worn.

4.4.1.6 Grubbing/ hoeing/ digging out/ tree poppers

Grubbing, hoeing, or digging involves the use of a hoe, stick, tree popper or spade. The entire plant and root must be removed. Use the following method:

- Dig around the plant making sure the sand is loosened around the root system;
- Dig down, under the roots, applying pressure, and wrench the entire plant out;
- Kicking the plant may help to dislodge it, however, care should be taken if the plant is seeding, as dry seeds may be dislodged; and
- Stockpile removed material into piles of 2 m high, 3 m wide windrows/stacks.

4.5 BIOLOGICAL CONTROL

Biological control is an attempt to introduce the plant's natural enemies (such as pathogens, invertebrates and vertebrates) to its new habitat, with the assumption that these natural enemies will remove the plant's competitive advantage until its vigour is reduced to a level comparable to that of the natural vegetation.

This method is considered because:

- It is environmentally responsible as it does not cause pollution and affects only the target plant;
- It is cost-effective;
- It does not disturb the soil or create large empty areas where other invaders could establish, as it does not kill all the target plants at once; and
- It allows the natural vegetation to recover gradually in the shelter of the dying weeds.

Natural enemies that are used for biological control are called bio-control agents. In the control of invasive plants, the bio-control agents used most frequently are insects, mites and pathogens (disease-causing organisms such as fungi). Bio-control agents target specific plant organs, such as the vegetative parts of the plant (its leaves, stems or roots) or the reproductive parts (flowers, fruits or seeds). The choice of bio-control agents depends on the aim of the control project. If the aim is to eradicate the invasive plant species, scientists select the types of bio-control agents available which will cause the most damage. In such projects, scientists may use agents that affect the vegetative parts of the plant as well as agents that reduce seed production. However, if the target plant is useful in certain situations but becomes a pest when uncontrolled, conflict of interests arises regarding biological control. This conflict is usually resolved by avoiding bio-control agents that have the ability of causing damage to the useful part of the plant, and instead using only seed-reducing agents.

These reduce the reproductive potential of the plants, curb their dispersal and reduce the follow-up work needed after clearing, while still allowing for the continued utilisation of the plant. For instance, trees are normally grown for their wood, but the seeds are seldom utilised. If seeds are needed to replant a plantation, a seed orchard can be specially protected against the bio-control agents in the same way as other crops are protected against insect pests.

If, on the other hand, the pods are the most valuable part of the tree, as in the case of mesquite (*Prosopis* spp.), bio-control agents can be selected that will prevent pod production. The seed-feeding beetles that were introduced against mesquite prevent only the germination of seeds from animal droppings, without significantly reducing the nutritional value of the pods, and in other words do not prevent pod or seed production. Bio-control agents are mostly introduced from the country of origin of the plant. The bio-control method is considered to be the safe and environmentally friendly control method due to the methodology and care taken into implementing it.

4.5.1 Implementing Biological Control

Before the official release of a bio-control agent in South Africa, extensive studies are carried out in a quarantine facility to ensure the agent will not damage other, non-target plants.

A bio-control agent is only released once it has been proved as sufficiently host-specific for release in this country. Tested and approved bio-control agents therefore do not pose a threat to our own crops or indigenous vegetation, or to those of neighbouring countries. No cases have occurred of weed bio-control agents changing their host plant affinities after their release in a new country to include plants other than those known to be acceptable hosts.

4.5.2 Effectiveness of Biological Control Method

Probably without exception, bio-control agents do not completely exterminate populations of their host plants. At best, they can be expected to reduce the weed density to an acceptable level or to reduce the vigour and/or reproductive potential of individual plants. The fact that a few host plants always survive, in spite of the attack by a bio-control agent, actually ensures that the agent does not die out as a result of a lack of food. The small population of bio-control agents that persists will disperse onto any re-growth or newly-emerged seedlings of the weed. For this reason, bio-control can be regarded as a sustainable control method. Biological control works relatively slowly. On average, at least five years should be allowed for a bio-control agent to establish successfully before causing significant damage to its host plant. Unfortunately, not all growth of invasive plant species can be curbed purely by biological control. It could happen that effective bio-control agents do exist, but cannot be released in South Africa because they are not sufficiently host-specific.

Alternatively, the invasive plant might be a man-made hybrid between two or more species and is no longer an acceptable host to the natural enemies of either of the parent plants. It could also happen that the natural enemies of some plants are not adapted to all the climatic regions in which the plant is a problem in South Africa, or that the habitat already contains predators or parasitoids that attack the bio-control agents. In such cases, biological control will have to be replaced or supplemented by chemical or other control measures.

4.5.3 Integrating Biological Control into Weed Management

In some instances, bio-control agents may effectively control a weed on their own. In other cases, the bio-control agents should be incorporated into a more comprehensive weed control programme that might include other methods of control such as chemical and mechanical control as well as utilisation of products of the weed. To make optimal use of the available bio-control agents, the following points should be considered:

- The possible use of bio-control agents should be kept in mind during the planning phase of any weed control program; and
- The person in charge of planning must find out which agents are available, what they do and how to use them. One then has to consider how best to integrate the use of the bio-control agents with the other control methods.

4.5.4 Biological Control Agent Reserves or Refugia

The mechanical or chemical clearing of large weed infestations may eliminate any bio-control agents present on the weed in that area. It is therefore essential to establish small reserves of healthy, mature plants on which the agents can survive and reproduce and from which they can spread onto plants that may have escaped the clearing process.

Some agents disperse rapidly on their own and can readily colonise extensive areas, while others; such as *cochineal* insects and mealy bugs have to be collected manually from the reserves and released in the target areas. Therefore, a person involved in cactus bio-control should always remove some insect-infested cactus plant material and distribute it to healthy cactus before the *cochineal* or mealy bugs have destroyed their host plants in a specific area. This ensures that the bio-control agents do not become extinct locally, but maintain their presence in the area to colonise re-growth.

4.6 HANDLING AND DISPOSAL OF PLANT DEBRIS OR MATERIAL

The unwanted plant material from mechanical or chemical clearing should not be kept on site as it attributes to the fire risk by providing fuel. Therefore, the following handling and disposal method could be utilized as some of the debris can offer services and some can be completely disposed of:

4.6.1 Stacking

- Stacking the cut material in heaps, or in windrows along slope contours to reduce erosion, facilitates easy access for follow-up. It also assists in containing the resulting fuel load and therefore the risk of uncontrolled fire;
- Keep stacks well apart to prevent fires from crossing easily; not less than five meters apart, this is naturally dependant on the size of the stack and the resulting fire intensity when they burn. Stockpile removed material into piles of 2 m high, 3 m wide windrows/stacks;
- Stack light branches separately from heavy timber (75 mm and more). Preferably remove heavy branches to reduce long burning fuel loads that can result in soil damage from intensely hot fire; and
- Do not make stacks under trees, power and telephone lines, within 30 meters of a fire belt or near watercourses, houses and other infrastructure.

4.6.2 Disposal

- Plant material should be used beneficially wherever possible, as opposed to disposing it at a landfill site where it takes up valuable airspace;
- Woody and dry material, provided no seeds are present, can be chipped and used as mulch or made available to the local community for firewood;
- Wet material and aquatic weeds should be combined with other organic matter and composted. Alternatively, it may be possible to use it for basket making, animal feed or other uses.
- Material which cannot be used beneficially must be disposed of at a registered and approved disposal site.
- When removing material, take care to remove all debris, including shoots and seeds.

4.7 CONTROL PHASES

Alien invasive plant species removal should ideally adopt a hands on approach. The combination of two or all three control methods could prove more effective than using one control method in combating the problematic plant species. Therefore, it is advisable that landowners should:

- not allow conditions to develop on their land that will contribute to the spread of a wildfire;
- remove invasive alien plants that create large fuel loads or cause fires to burn intensely; and

- take steps to fireproof their property and possessions. These apply especially to those living on the edge of open areas or in close proximity to fire prone areas.

Furthermore, any control programme for alien vegetation must include the following three phases;

1. **Initial control:** drastic reduction of existing population;
2. **Follow-up control:** control of seedlings, root suckers and coppice growth; and
3. **Maintenance control:** sustain low alien plant numbers with annual control.

The initial control in most cases, involves mechanical methods and in the case of heavy infestation, machinery could be used. The initial control is a drastic measure to reduce the number of adult and large invasive plants.

The follow-up control serves are measures to reduce the ability of the mechanically removed plant species for coppice or having the infestation proliferate such as to negate the efforts of initial control. Therefore, follow up control of alien seedlings and coppice re-growth is essential to achieve and sustain the progress made with initial control work.

Maintenance control entails regular monitoring to prevent the occurrence of re-colonisation or re-infestation. The monitoring should take place timeously so to prevent infestation of the cleared area by another alien invasive plant species.

7. ALIEN INVASIVE PLANT ERADICATION TOOL

Working for Water provides the site manager with an implementation tool to control problem species and keep the site free of invasive plants:

Step 1: Conduct Site Assessment;

- Identify areas where alien invasive species need to be eradicated and controlled. Take pictures of these sites so as to have a pre-control photographic reference of the site. In this way comparisons can be made at later stages to see if control measures are adequate.

Step 2: Set objectives based on resources available and priorities:

- Prioritize management of plants according to the categories stipulated in the AIS regulations.

- Consider control options that will be applied in these areas. Consider integrated approaches and ensure approaches are not conflicting with each other. Also consider safety aspects such as trees on a slope which should not be felled but treated *in situ*.

Step 3: Develop and implement an action plan to achieve objectives:

- The plan must be long term and should include a clearing plan that includes follow up actions for rehabilitation of the cleared area.
- The site plan should include a map showing the areas invested with problem plants.
- Lighter invested areas should be cleared first to prevent the build-up of seed banks, while the control plan works progressively towards the areas with denser stands.
- Educate workers on the species that needs to be eradicated, as well as the specific method to be used.
- Conduct control of invasive plant species.
- Remove plant remains to a suitable disposal area.
- Prevent dispersal of seeds.
- Strive for collective management and planning with neighbours to prevent seed dispersal of problem plants across boundaries.
- When removing alien invasive species from infested areas, always work from lower infested areas towards more infested areas and from higher-lying areas to lower areas;
- Try to remove alien invasive species when they are not seeding. If seeding, then seed heads should first be carefully removed and disposed of in a sealed bag so as not to spread the seeds;
- If soils are disturbed during the process, then these should be carefully levelled, slightly pressed down and covered with leaf litter or cut vegetation that is seed-free. Some alien invasive species release chemicals that suppress growth of other plants and these should not be utilised as leaf litter under any circumstances. The soil can also be re-seeded with indigenous vegetation;
- To reduce the risk of spread via seeds, flowers should be removed from the plants prior to seeding. To prevent further infestations, remove seeds, fruits, bulbs, corms, tubers and any other vegetative parts that may root from the site in sealed bags and dispose of safely. In some instances, these parts should be burnt on site immediately.
- Consider herbicide practices to integrate with physical removal where possible, with use of generic herbicides on alien invasive species without registered herbicides; and

- Consider the uses of plants that will be removed. Options such as its potential for compost heaps (as long as it is seed free), potential as leaf litter (as long as it is seed free) and possible options for timber and cork markets. As stated earlier, some alien invasive species release chemicals that suppress growth of other plants and these should not be utilised as leaf litter under any circumstances.

Step 4: Monitor performance and change actions if necessary

- Conduct monthly inspections to enable early detection of grow back.
- Regularly follow up on areas where infestations were treated and re-apply control measures if necessary. Once again, take photographs of sites regularly and keep records of actions that were taken so that evidence is in place with regard to control measures that were successful and those that were not.
- Consider rehabilitation of area cleared of invasive species at every stage of the control programme and consider the need to re-introduce local indigenous species to help the natural ecology stabilise within the areas.
- Consider training of employees. Courses range from introductory and awareness courses to those that qualify individuals as alien invasive control officers.

Table 2: *Alien invader plants control plan to be implemented by site management*

ALIEN INVASIVE PLANTS CONTROL PLAN		
Method / Procedures	**Equipment**	**Responsibility**
1. PLANT IDENTIFICATION AND LISTING		
✸ The site must be visually inspected for alien plant species and the observed AIP's must be listed. ✸ All observed and identified plant species should be categorised according to the list contained Appendix 1 and be removed according to the methods stipulated under heading 2 and 3 of this table.	✸ Camera ✸ Global Positioning System (GPS) ✸ AIPs and problem plants identification guides such as Bromilow's *Problem Plants of South Africa: A guide to the identification and control of invasive plants* as well as Henderson's *Alien Weeds and invasive plants – Complete guide to declared weeds and invaders in South Africa.*	**Stage 1:** Identification and listing should be done by site management utilizing the suggested field guides. ✸ Time frame – for the duration of the operational and decommissioning phases. ✸ AIPs are opportunistic species that will use the gap created by project disturbance to spread and establish themselves. Therefore, a monthly monitoring regime, to assess alien invasion, should be maintained
2. CONTROL OF AIPS		

Table 2: *Alien invader plants control plan to be implemented by site management*

ALIEN INVASIVE PLANTS CONTROL PLAN		
Method / Procedures	**Equipment**	**Responsibility**
✷ Site management shall appoint a suitably qualified specialist and/or contractor who will be able to distinguish between the invasive and indigenous plant and clear the alien invasion. ✷ Four methods can be applied for alien infestation clearing as stipulated by DWS: ✘ Mechanical control; ✘ Chemical control; ✘ Biological control; ✘ Integrated control.	✷ It is advised that an experienced alien invasive removal contractor be appointed as there is a need to: ✘ Train personnel on how to handle machinery used in mechanical control; ✘ Train personnel to handle, mix and apply the herbicides used for chemical control; and ✘ Provide guidance on which insects or pathogens to use if management opts for biological control.	**Stage 2:** Site management is advised to liaise with the South African National Biodiversity Institute (SANBI) Alien Invasive Plants Early Detection and Rapid Response (AIP EDRR) Unit (contact: 021 799 8837 or alienplants@sanbi.org.za) on the management of AIPs found on the property. ✷ Time frame: Operational-, and decommissioning phases as well as the 12 months after care period of the prospecting area. ✷ Furthermore, liaison could be established with the Agricultural Research Council - Plant Protection Research Institute (ARC-PPRI) based in Pretoria with regards to guidance on the use of biological control organisms (contacts: infoppri@arc.agric.za or call 012 808 8000). ✷ Management can access the DWA-WfW website to download treatment guides for terrestrial AIPs or those identified at the site. Or, to request a clearing form/application for the WfW personnel to clear the site.

3. REMOVAL METHODS FOR AIPS

Table 2: *Alien invader plants control plan to be implemented by site management*

ALIEN INVASIVE PLANTS CONTROL PLAN		
Method / Procedures	**Equipment**	**Responsibility**
✸ All Category 1a & b species shall be removed from the site on a continuous basis. Method for removal of seedlings: ✸ Seedlings and new sprouts should be removed by hand and not be allowed to reach seed bearing age. ✸ Seedling should be removed when the soil is wet, preferably after rainfall; Method for removal of mature plants: ✸ Mature plants must be cut off using a chainsaw or brush cutter as close as possible to the ground. ✸ Herbicides can be used for application to the stump.	✸ Chainsaw or brush cutter is recommended (N.B. Training is crucial for operating these machines).	**Stage 3:** Site management is responsible for removal of all AIPs as indicated in the methods. ✸ Time frame: Operational-, and decommissioning phases as well as the 12 months after care period of the prospecting area. ✸ For mechanical removal of mature plants, a trained and experienced individual should be used to operate the equipment.
4. DISPOSAL OF AIP CUTS OR MATERIAL		

Table 2: *Alien invader plants control plan to be implemented by site management*

ALIEN INVASIVE PLANTS CONTROL PLAN		
Method / Procedures	**Equipment**	**Responsibility**
✸ All alien plants removed from the site are to be disposed of at an approved or licensed waste disposal site if no alternative use for the plant material can be identified; ✸ Alternatively, the removed plants can be buried in a trench of at least 1 m deep. Grow-back will need to be controlled in this area, preferably with herbicides. ✸ Logs or wood can be donated to the landowner or community; ✸ Non-seeding woody aliens can be retained and used for dust control purposes (i.e. act as windbreakers) or soil stabilisers; ✸ Cut plant material should be removed from site within three days, to lower fire potential; and ✸ Burning of dried alien vegetation should not be allowed on site.	✸ Preferably a contractor should be appointed for this aspect.	**Stage 4:** The proponent should seek a contractor to oversee this phase. ✸ Time frame: Throughout control phase when deemed necessary, or at least monthly. ✸ Record keeping: ✘ There should be a record of the dates the disposal truck collects the plant waste material; ✘ License for the disposal site; and ✘ License for the company tasked with collecting and disposing of the plant waste material.

5. EARLY DETECTION AND RAPID RESPONSE (EDRR)

Table 2: *Alien invader plants control plan to be implemented by site management*

ALIEN INVASIVE PLANTS CONTROL PLAN		
Method / Procedures	**Equipment**	**Responsibility**
✸ This aims to allow site management to detect and respond to new alien infestation before it escalates; ✸ A monthly inspection should be established to monitor AIP infestation in areas that were re-vegetated. ✸ Seedlings should be removed as explained under heading 2 before they establish and start to produce seeds; ✸ EDRR should be applied in all the project areas and mostly in areas that are newly disturbed; and ✸ AIPs should not be allowed to establish and mature as the bigger they become they more expensive it becomes to control.	✸ GPS; ✸ Camera; and ✸ Garden fork and gloves for loosening the soil and removing the seedlings.	**Stage 5:** Site management is responsible to ensure that the prospecting area is protected from alien invasion. ✸ Time frame: Operational-, and decommissioning phases as well as the 12 months after care period of the prospecting area.

8. SITE SPECIFIC CONDITIONS

(Information extracted from the Terrestrial Biodiversity Impact Assessment attached as Appendix K2)

As per the Terrestrial Impact Assessment (Appendix K2) the PAOI falls within the Nama Karroo Biome as well as the Desert Biome and also includes a small portion of Azonal vegetation.

The Nama Karoo biome is found in the central plateau of the western half of South Africa. The geology underlying the biome is varied, as the distribution of this biome is determined primarily by rainfall. The rain falls in summer, and varies between 100 and 520 mm per year. This also determines the predominant soil type - over 80% of the area is covered by a lime-rich, weakly developed soil over rock. Although less than 5% of rain reaches the rivers, the high erodibility of soils poses a major problem where overgrazing occurs (SANBI, 2019).

The dominant vegetation is a grassy, dwarf shrubland. Grasses tend to be more common in depressions and on sandy soils, and less abundant on clayey soils. Grazing rapidly increases the relative abundance of shrubs. Most of the grasses are of the C4 type and, like the shrubs, are deciduous in response to rainfall events (SANBI, 2019).

The Desert Biome presents incredibly harsh environmental conditions, surpassing even those of the Succulent Karoo and Nama-Karoo Biomes (SANBI 2019). Its climate is marked by summer rainfall but experiences high levels of aridity during the summer months. Annual rainfall varies widely, ranging from around 10 mm in the west to 70 or 80 mm towards the desert's inland boundaries, with significant year-to-year variability. Most of southern Africa's true desert lies in Namibia, though a small portion extends into South Africa, notably in the Springbokvlakte area of the Richtersveld within the lower Orange River valley (SANBI, 2019).

Vegetation in the Desert Biome is characterized by the prevalence of annual plants, particularly annual grasses (SANBI 2019). Following seasons of sporadic abundant rains, the desert plains can be blanketed by a profusion of short-lived annual grasses. In typical years, however, the plains may appear barren, with annual plants enduring in the form of seeds. Perennial plants are usually found in specialized habitats linked to localized water concentrations, such as broad drainage lines or washes. Examples include the well-known shrub Welwitschia mirabilis in the Namib Desert and the perennial grass *Stipagrostis sabulicola*, which sporadically grows on large dunes with significant water reserves. Along the Namibian coast, coastal fog influences the distribution of certain species commonly associated with the desert (SANBI 2019).

Azonal vegetation is formed in and around flowing and stagnant freshwater bodies. Habitats with high levels of salt concentration form a highly stressed environment for most plants and often markedly affect the composition of plant communities. Invariably, both waterlogged and salt-laden habitats appear as 'special', deviating strongly from the typical surrounding zonal vegetation. They are considered to be of azonal character.

The Project Area is situated in the Bushmanland Arid Grassland (NKb 3), Eastern Gariep Plains Desert (Dg 9), Eastern Gariep Rocky Desert (Dg 10) and Lower Gariep Alluvial Vegetation (Aza 3) vegetation types according to SANBI (2018). Descriptions of the vegetation types are taken directly from Mucina & Rutherford (2006).

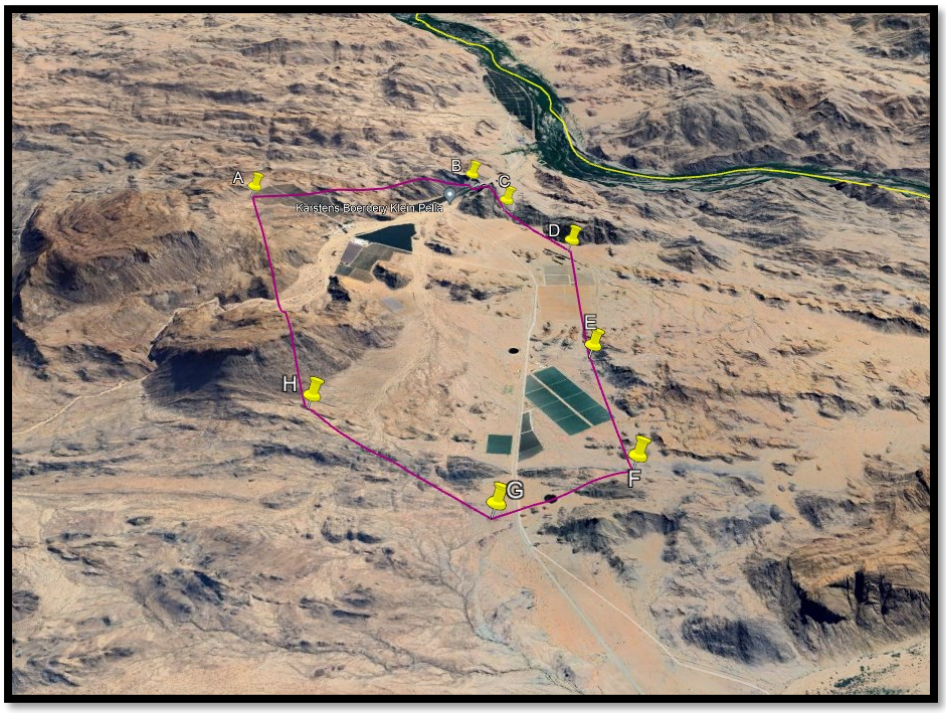

Figure 1: Satellite view of the proposed prospecting right area of African Exploration Mining and Finance Corporation SOC Ltd (image obtained from Google Earth).

Five (5) alien invasive species and weeds were recorded from the application area and surrounds (and therefore likely to invade as a result of disturbance). Three (3) NEMBA category 1b AIP species were recorded from the Project Area.

Considering that the application area includes desert habitats which likely support a variety of sensitive indigenous species, it is recommended that any AIP species that may colonise the area in the future be controlled by implementing the AIP Management Programme in compliance of section 75 of the Act as stated above. This is also pertinent to the development as invasive species are linked to enhanced fire effects and risk (Aslan & Dickson, 2020). The AIP Management Programme must implement the following monitoring framework must be

implemented to ensure that AIPs are continually monitored, and progress pertaining to their control is recorded. The monitoring of the application area throughout the process is crucial in order to prevent AIPs growing and spreading out of control, thereby threatening the wellbeing of indigenous flora and fauna. It is also important to note that while herbicide application has been recommended for control, herbicides should not be applied adjacent to the aquatic ecosystems within the site area and herbicide application should not be used during windy days to prevent drift.

Table 3: Table presenting the Alien Invasive Species and weeds recorded for the Project Area. (Information extracted from the Terrestrial Biodiversity Impact Assessment attached as Appendix K2)

Family	Scientific name	Common name	NEM:BA
Casuarinaceae	*Casuarina cunninghamiana*	Beefwood	**2**
Fabaceae	*Neltumia glandulosa (Prosopis glandulosa)*	Honey Mesquite	3
Solanaceae	*Datura ferox*	Large thorn apple	1b
Solanaceae	*Datura innoxia*	Downy thorn apple	1b
Solanaceae	*Nicotiana glauca*	Tree tobacco	1b

As everyone isn't familiar with the identification of plant species, photographs of the most important species to be controlled at the prospecting site are included below for ease of reference. Site management can refer to the table below as well as species listed in Appendix 1 of this document for the proposed management/control methods to be applied.

Figure 2 Photograph illustrating a portion of the alien invasive species recorded from the project area. A: Nicotiana glauca, B) Neltumia glandulosa, C) Datura ferox and D) Datura innoxia.(Information extracted from the Terrestrial Biodiversity Impact Assessment attached as Appendix K2)

Table 4: Proposed monitoring framework for the control of alien invasive plants within the Project Area (Information extracted from the Terrestrial Biodiversity Impact Assessment attached as Appendix K2).

Metric	Frequency	Method	Response
How effective are the control methods?	4-6 months after every operation	Survey the cleared areas and look for regrowth. Before and after photographs are effective for this. Observe for non-target effects of herbicide application.	If the survey reveals that the control methods are effective, e.g., low levels of re-sprouting, continue following the herbicide mixtures and control methods. If non-target plants are dying off where herbicides were applied, ensure appropriate training for herbicide applicators, demonstrate the off-target effects to herbicide applicators to ensure they are using the correct methods and herbicides. (If the results show that the control methods are not effective, adapt by e.g., cutting lower above ground or changing herbicides or timing of herbicide application.
Do the infestation levels decrease?	Annually	Survey the cleared areas and record species, densities and size. Before and after pictures are very effective.	If the infestation levels are not decreasing, reconsider clearing intervals and look at clearing methods. If infestation levels are decreasing, then continue current control method.
Quantity of herbicides used	During every operation	Keep track of cost and ensure no wastage. Record herbicide usage	Track usage over time, it will reveal a certain trend in quantities for different infestation levels. Less herbicides should be used when the infestation levels are lower. Record herbicide cost.
Does the indigenous vegetation recover in the cleared areas?	Annually	Survey the cleared areas and look out for indigenous species variety and presence. Before and after pictures are effective.	If there is recovery of indigenous vegetation, then continue current control method. If there is no recovery, consider rehabilitation with local indigenous species.
How many jobs were created?	After every operation	Timesheets	Job creation figures are useful when asking for landowner assistance from WFW or to demonstrate contributions to jobs and socio-economic conditions
How many person days (PD) were spent per operations?	After every operation	Timesheets	Keep track of cost and assist with planning and budgeting. Determine cost per person per day (PD)

9. REHABILITATION OF RECLAIMED AREA

Monitoring and maintenance of reclaimed areas are important to establish the necessity of follow-up operations. It is preferable to follow up on a reclaimed area and remove all seedlings or treat re-sprouting plants prior to the treatment of a new area.

Denuded areas where eradication of weeds/invader species was done needs to be rehabilitated to ensure soil conservation and prevent erosion. Denuded areas also have a much higher potential of re-infestation than areas that has been vegetated with indigenous plant species.

As invasive plant species can lay dormant until favourable conditions arise, monitoring of re-vegetated areas is of extreme importance and should be implemented at least quarterly. Accurate records of monitoring and maintenance actions and associated costs should be compiled to assist with future planning.

10. REFERENCES

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Terrestrial Biodiversity Impact Assessment attached as Appendix K2 May 2024.The Biodiversity Company.

APPENDIX 1

PROPOSED MANAGEMENT/CONTROL METHODS FOR THE MOST COMMON ALIEN INVADER PLANT SPECIES

Artiplex inflata (*Australian saltbush*)



Category:	NEMBA Category 1b
Distribution:	Western Cape, Eastern Cape, Northern Cape
Impact:	It forms dense stands particularly in overgrazed land. Competes with and replaces indigenous
Spread By:	Wind water ,wildlife and humans
Uses:	Cultivated for fodder and animals also uses the plant as fodder.
Form:	Shrub
General Description:	Leaves: Alternate – Silver – grey to bluish-green, scaly, about 2x longer than broad, margins smooth or slightly wavy and toothed. Flowers: Cream to yellow, minute, in tight axillary clusters at the ends of leafy stems. Fruit/seeds: Utricle, grey-green turning pink or straw-coloured, spongy and inflated, sub-globose, upper surface flattened, up to 10 mm long and wide, one seeded.
Control Measures:	Biological control: Various insect agents are being tested. Chemical: Herbicides containing picloram are affective against seedlings. Mechanical: Physical removal of plants prior to seeding. Removal of seed heads prior to seeding. Light tillage can destroy seedlings.
Monitoring Measures:	Photographic evidence should be kept and photographs taken on each site visit in areas of heavy infestation. Sites will need to be revisited monthly (more frequent if necessary) to cut back stems that are starting to flower and for any re-growth. With the removal of plants soils may become exposed and should be re-vegetated with grasses or indigenous.

Prosopis glandulosa (Fabaceae) (Mesquite)

Category:	CARA 2002 – Category 2 NEMBA – a. 1b in Eastern Cape, Free State, North-West and Western Cape. b. 3 in Northern Cape. c. The utilisation of the pods for fodder is not listen in the Northern Cape, Eastern Cape, Free State, North-West and Western Cape. d. Not listed elsewhere.
Distribution:	Limpopo, North West, Free State, Eastern Cape, and Western Cape
Spread By:	Spread by seeds
Uses:	Fodder, shade, fuel and as a honey source
Impact:	Prosopis trees are extravagant users of readily available ground-water and dense stands could seriously affect the hydrology of the ecosystems they invade. Dense stands compete with and replace indigenous woody and grassland species. Dense stands produce few pods and thus replace natural pasturage without providing pods in return. Dense stands are virtually impenetrable, restricting the movement of domestic and wild animals and causing injuries
Description:	General description: Multi-stemmed acacia-like shrub or small tree up to 10m high with paired, straight spines and reddish-brown branchlets. Leaves: Dark green leaves with leaflets 10-25mm long. Flowers: Yellow flower spikes from June to November. Fruit/Seeds: Yellowish to purplish, slender, straight, woody pods. Pods poisonous and pollen is a respiratory tract irritant
Form:	Shrub
Control Measures:	Mechanical: Seedlings & saplings: Hand pull. All plants: Cut close to ground.
Monitoring Measures:	Photographic records should be kept of infested areas and should be taken at each visit. Re-growth should be monitored 2 and 4 months after chemical application and treated as required. Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.

Salsola kali (Tumbleweed)


Category:	NEMBA category 1b
Alternative Common Names:	Broad-leaf arrowhead, delta duck-potato.
Spread by:	Mature plants break off at the ground, forming "tumbleweeds" rolling along the ground during windy conditions, scattering seeds..
Description:	Leaves:- Leaves are alternate; blades linear, 1-2 mm wide, fleshy, usually not swollen at base, apex acuminate, forming a rather firm spine, 1-1.5(-2.2) mm long. Flowers: - Inconspicuous, white, yellowish or greenish, cup shaped, in the leaf axils. Fruit/seeds: - Capsule - Small, brownish capsules, usually with five spreading membranous, veined wings. A single plant can produce up to 200,000 seeds.
Form:	Weed
Distribution:	Western Cape, Northern Cape
Origin & Problem:	It's a highly problematic, tough, unpalatable plant that clogs up storm water channels and competes with native species. It can rapidly colonise new areas, especially overgrazed, bare and eroded soil. The plants are unpalatable leading to selective grazing by domestic stock which exacerbates existing overgrazing and opens the way for further tumbleweed invasion.
Uses:	It has been cultivated as an ornamental.
Control Measures:	Mechanical: Hand pull. Remove underground parts preferably when not seeding. Remove seed heads carefully and dispose of. Chemical: Susceptible to a range of soil and foliar herbicides available for agricultural markets.
Monitoring Measures:	Photographic records should be kept of infested areas and should be taken at each visit. Re-growth should be monitored 2 and 4 months after treatment. Heavily infested areas should be revisited and treated if and as necessary every 6 months.