



**NALA**

**ENVIRONMENTAL**

CONSULTING FIRM

**FINAL ENVIRONMENTAL MANAGEMENT PROGRAMME  
FOR THE 140MW MSENGE EMOYENI WIND ENERGY FACILITY  
AND ASSOCIATED INFRASTRUCTURE, EASTERN CAPE  
PROVINCE**

**JUNE 2022**

**DOCUMENT DETAILS**

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<b>Applicant</b>	:	Amakhala Emoyeni Renewable Energy (Pty) Ltd
<b>Title</b>	:	Final Environmental Management Programme for the Msenge Emoyeni Wind Energy Facility and associated Infrastructure, Eastern Cape Province
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<b>Purpose of Report</b>	:	Final Environmental Management Programme to be submitted for public participation and to DFFE for approval.
<b>Date</b>	:	June 2022

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## DEFINITIONS AND TERMINOLOGY

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The following definitions and terminology may be applicable to this project and may occur in the report below:

**Alien species:** A species that is not indigenous to the area or out of its natural distribution range.

**Alternatives:** Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

**Ambient sound level:** The reading on an integrating impulse sound level meter taken at a measuring point in the absence of any alleged disturbing noise at the end of a total period of at least 10 minutes after such meter was put into operation.

**Assessment:** The process of collecting, organising, analysing, interpreting and communicating information which is relevant.

**Biological diversity:** The variables among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes they belong to.

**Commence:** The start of any physical activity, including site preparation and any other activity on site furtherance of a listed activity or specified activity, but does not include any activity required for the purposes of an investigation or feasibility study as long as such investigation or feasibility study does not constitute a listed activity or specified activity.

**Construction:** Construction means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity as per the EIA Regulations. Construction begins with any activity which requires Environmental Authorisation.

**Cumulative impacts:** The impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

**Decommissioning:** To take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned. This usually occurs at the end of the life of a facility.

**Development area:** the identified area (located within the study area) where the supporting infrastructure is planned to be located.

**Development footprint:** the defined area (located within the development area) where the various supporting infrastructure is planned to be constructed. This is the actual footprint of the infrastructure, and the area which would be disturbed.

**Direct impacts:** Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g., noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation, or maintenance of an activity and are generally obvious and quantifiable.

**Disturbing noise:** A noise level that exceeds the ambient sound level measured continuously at the same measuring point by 7 dB or more.

**'Do nothing' alternative:** The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

**Ecosystem:** A dynamic system of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

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**Endangered species:** Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

**Endemic:** An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

**Environment:** the surroundings within which humans exist and that is made up of:

- i. The land, water and atmosphere of the earth;
- ii. Micro-organisms, plant and animal life;
- iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and
- iv. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

**Environmental Authorisation (EA):** means the authorisation issued by a competent authority (Department of Environmental Affairs) of a listed activity or specified activity in terms of the National Environmental Management Act (No 107 of 1998) and the EIA Regulations promulgated under the Act.

**Environmental Assessment Practitioner (EAP):** An individual responsible for the planning, management and coordinating of environmental management plan or any other appropriate environmental instruments introduced by legislation.

**Environmental Control Officer (ECO):** An individual appointed by the Owner prior to the commencement of any authorised activities, responsible for monitoring, reviewing and verifying compliance by the EPC Contractor with the environmental specifications of the EMPr and the conditions of the Environmental Authorisation

**Environmental impact:** An action or series of actions that have an effect on the environment.

**Environmental impact assessment:** Environmental Impact Assessment, as defined in the NEMA EIA Regulations, is a systematic process of identifying, assessing and reporting environmental impacts associated with an activity.

**Environmental management:** Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

**Environmental Management Programme (EMPr):** A plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a project or facility and its ongoing maintenance after implementation.

**Environmental Officer (EO):** The Environmental Officer (EO), employed by the Contractor, is responsible for managing the day-to-day on-site implementation of this EMPr, and for the compilation of regular (usually weekly) Monitoring Reports. The EO must act as liaison and advisor on all environmental and related issues and ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager and Contractor.

**Habitat:** The place in which a species or ecological community occurs naturally.

**Hazardous waste:** Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment.

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**Indigenous:** All biological organisms that occurred naturally within the study area prior to 1800.

**Incident:** An unplanned occurrence that has caused, or has the potential to cause, environmental damage.

**Indirect impacts:** Indirect or induced changes that may occur because of the activity (e.g., the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken, or which occur at a different place because of the activity.

**Interested and affected party:** Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups, and the public.

**Method Statement:** a written submission by the Contractor in response to the environmental specification or a request by the Site Manager, setting out the plant, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Site Manager is able to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications.

**Pre-construction:** The period prior to the commencement of construction, which may include activities which do not require Environmental Authorisation (e.g. geotechnical surveys).

**Pollution:** A change in the environment caused by substances (radio-active or other waves, noise, odours, dust or heat emitted from any activity, including the storage or treatment or waste or substances).

**Rare species:** Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare."

**Red Data Species:** Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

**Riparian:** The area of land adjacent to a stream or river that is influenced by stream-induced or related processes. Riparian areas which are saturated or flooded for prolonged periods would be considered wetlands and could be described as riparian wetlands. However, some riparian areas are not wetlands (e.g. an area where alluvium is periodically deposited by a stream during floods but which is well drained).

**Significant impact:** An impact that by its magnitude, duration, intensity, or probability of occurrence may have a notable effect on one or more aspects of the environment.

**Study area:** Portion 2 Of The Farm No. 222, Portion 1 Of The Farm Brakfontein No. 220, The Farm No. 225, The Farm Leeuwfontein No.221.

**Vulnerable species:** A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future.

**Waste:** as per the NEM: Waste Amendment Act, 2014 (Act No. 26 of 2014)

- (a) any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3.
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- (b) any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the *Gazette*,
- but any waste or portion of waste, referred to in paragraph (a) and (b), ceases to be a waste –
- (i) once an application for its re-use, recycling or recovery has been approved or, after such approval, once it is, or has been re-used, recycled or recovered;
  - (ii) where approval is not required, once a waste is, or has been re-used, recycled or recovered;
  - (iii) where the Minister has, in terms of section 74, exempted any waste or a portion of waste generated by a particular process from the definition of waste; or
  - (iv) where the Minister has, in the prescribed manner, excluded any waste stream or a portion of a waste stream from the definition of waste.

**Watercourse:** as per the National Water Act means –

- (a) a river or spring;
  - (b) a natural channel in which water flows regularly or intermittently;
  - (c) a wetland, lake or dam into which, or from which, water flows; and
  - (d) any collection of water which the Minister may, by notice in the *Gazette*, declare
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## ABBREVIATIONS

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The following abbreviations may be applicable to this project and may occur in the report below:

BGIS	Biodiversity Geographic Information System
CDSM	Chief Directorate Surveys and Mapping
CEMP	Construction Environmental Management Plan
DFFE	Department of Forestry, Fisheries and the Environment
EC DEDEAT	Eastern Cape Department of Economic Development, Environmental Affairs & Tourism
DMRE	Department of Mineral Resources and Energy
EAP	Environmental Assessment Practitioner
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMPr	Environmental Management Programme
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
KOP	Key Observation Point
kV	Kilo Volt
LLRC	Low Level River Crossing
LUDS	Land Use Decision Support
LUPD	Land Use Planning Ordinance
MW	Mega Watt
NEMA	National Environmental Management Act
NEMAA	National Environmental Management Amendment Act
NEMBA	National Environmental Management: Biodiversity Act
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act
NSBA	National Spatial Biodiversity Assessment
NWA	National Water Act
PIA	Paleontological Impact Assessment
PM	Post Meridiem; "Afternoon"
SACAA	South African Civil Aviation Authority
SAHRA	South African National Heritage Resources Agency
SANBI	South Africa National Biodiversity Institute
SANS	South Africa National Standards
SDF	Spatial Development Framework
SMME	Small, Medium and Micro Enterprise
SAPD	South Africa Police Department

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#### Specialist Final Walkthrough Reports:

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Appendix C1: Bat Pre- Construction Walkthrough
Appendix D1: Heritage and Palaeontological Pre-Construction Walkthrough

## SECTION 1: PURPOSE & OBJECTIVES OF THE EMP

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An Environmental Management Programme (EMPr) is defined as “an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented or mitigated, and that the positive benefits of the projects are enhanced”. The purpose of an EMPr is to help ensure continuous improvement of environmental performance, reducing negative impacts and enhancing positive effects during the construction and operation of the facility. An effective EMPr is concerned with both the immediate outcome as well as the long-term impacts of the project.

The EMPr provides specific environmental guidance for the construction and operation phases of a project and is intended to manage and mitigate construction and operation activities so that unnecessary or preventable environmental impacts do not result. These impacts range from those incurred during start up (site clearing and site establishment) through those incurred during the construction activities themselves (erosion, noise, dust) to those incurred during site remediation (soil stabilisation, revegetation) and operation

This EMPr has been adopted in the format as per the Savannah Environmental original EMP rev.1 (2018) undertaken for the 140MW Msenge Emoyeni Wind Energy Facility to maintain consistency and so that all mitigation measures as originally recommended by the relevant specialists and subsequent amendments have been included accordingly.

The objective of this EMPr is to provide consistent information and guidance for implementing the management and monitoring measures established in the permitting process and help achieve environmental policy goals. Amakhala Emoyeni Renewable Energy (Pty) Ltd, obtained the Environmental Authorisation, from the National Department of Environmental Affairs (DEA), (now Department of Forestry, Fisheries and the Environment, DFFE) for the 140MW Msenge Emoyeni WEF (previously known as Amakhala Emoyeni Phase 2 Wind Energy Facility) on 28 August 2012 (DFFE Ref: 12/12/20/1754/2). The WEF is authorised for a contracted capacity of up to 140MW. Several amendments to the EA have been undertaken for the Msenge WEF dated, 02 July 2015, 18 May 2016, 04 October 2016, 15 November 2018 and the latest 02 June 2021.

It is noted that one Environmental Authorisation was applied for and issued for the 140MW Msenge Emoyeni Wind Energy infrastructure and grid infrastructure. The Msenge Emoyeni Wind Energy Facility has been selected as a Preferred Bidder project via a private offtaker and is currently finalizing the required layouts and documentation and is set to commence with the development of the WEF in phases in the latter half of 2022 in order to meet financial close requirements. Upon liaison with Eskom technical it was determined that authorised grid connection infrastructure would not be viable to evacuate electricity generated from the wind energy facility to the National Grid, therefore a separate Basic Assessment process has been undertaken to assess the proposed new grid connection infrastructure. In this regard this Final Environmental Management Programme is related to the authorised Msenge Wind Energy Facility and associated infrastructure excluding the grid connection infrastructure.

This EMPr focuses on the 140MW Msenge Emoyeni Wind Energy Facility and associated infrastructure and has been developed as a set of environmental specifications (i.e. principles of environmental management for the authorised Msenge Emoyeni Wind Energy Facility), which are appropriately contextualised to provide clear guidance in terms of the on-site implementation of these specifications (i.e. on-site contextualisation is provided through the inclusion of various monitoring and implementation tools for assisted use of the EMPr by the project implementer as well as compliance monitors). During its lifecycle, the project will journey through four distinctive phases, i.e. planning, construction, operation and decommissioning. This EMPr is accordingly separated into measures dealing with the various project phases.

The EMPr has the following objectives:

- » To outline mitigation measures and environmental specifications which are required to be implemented for the planning, construction, rehabilitation and operation phases of the project in order to minimise the extent of environmental impacts, and to manage environmental impacts associated with the wind energy facility.

- » To ensure that the construction and operation phases do not result in undue or reasonably avoidable adverse environmental impacts and ensure that any potential environmental benefits are enhanced.
- » To identify entities who will be responsible for the implementation of the measures and outline functions and responsibilities.
- » To propose mechanisms and frequency for monitoring compliance and preventing long-term or permanent environmental degradation.
- » To facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that was not considered in the EIA process.
- » To outline additional recommendations and mitigation measures as outlined by the relevant specialist that have undertaken the final pre-construction walkthroughs in relation to the final layout.

The mitigation measures identified within the Environmental Impact Assessment process (2010), Part 2 Amendment (2018) and as per the final walkthroughs (Appendix AI- DI) are systematically addressed in this EMPr, ensuring the minimisation of adverse environmental impacts to an acceptable level.

Amakhala Emoyeni Renewable Energy (Pty) Ltd must ensure that the implementation of the project complies with the requirements of any and all environmental authorisations and permits, and obligations emanating from other relevant environmental legislation. This obligation is partly met through the development and the implementation of this EMPr through its integration into the contract documentation. Since this EMPr was part of the EIA process (2012) and Part 2 Amendment process (2018) undertaken for the proposed Msenge Emoyeni Wind Energy Facility, and the final specialist walkthrough's in relation to the final layout, it is important that this document be read in conjunction with the Scoping Report (June 2010) and Split EIA Report (May 2012), Environmental Authorisation issued on 28 August 2012 (DFFE Ref: 12/12/20/1754/2), the Motivation report associated with the Part 2 Amendment undertaken in 2018 (DFFE Ref: 12/12/20/1754/2/AM5) and relevant preconstruction walkthrough report ( Appendix AI – DI). This will contextualise the EMPr and enable a thorough understanding of its role and purpose in the integrated environmental management process. This EMPr for construction and operation activities has been compiled in accordance with Section 34 of the EIA Regulations and will be further developed in terms of specific requirements listed in any authorisations issued for the proposed project.

To achieve effective environmental management, it is important that Contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMPr. The Contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The Contractor's obligations in this regard include the following:

- » Ensuring that employees have a basic understanding of the key environmental features of the construction site and the surrounding environment.
- » Ensuring that a copy of the EMPr is readily available on-site, and that all site staff are aware of the location and have access to the document.
- » Employees will be familiar with the requirements of the EMPr and the environmental specifications as they apply to the construction of the facility.
- » Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training course. The course must provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
- » Providing basic training in the identification of archaeological sites/objects, and protected flora and fauna that may be encountered on the site.
- » Ensuring awareness of any other environmental matters, which are deemed to be necessary by the ECO.

This EMPr is an update of the revision 1 EMPr 2012 submitted with the Environmental Impact Assessment (EIA) (2012) for the project, and includes additional mitigation recommended by the specialist consultants as identified through a Part 2 Amendment Process in which an amendment of the turbine specifications were requested (Savannah Environmental, 2018). Changes made have been underlined for ease of reference.

### Compliance of this EMPr with the NEMA and EIA Regulations

This EMPr satisfies the requirements of Section 24N of the National Environmental Management Act (NEMA) (Act 107 of 1998) as well as Appendix 4 of the 2014 NEMA Environmental Impact Assessment (EIA) Regulations (GN R326), as amended in 2017. An overview of where these requirements are met in this EMPr is presented in Table 3.1 below:

**Table 1.1: Requirements of an EMPr as defined in terms of NEMA (Act 107 of 1998) and Appendix 4 of the 2014 EIA Regulations (GN R326).**

Appendix 4 of the EIA Regulations	Requirements for a EMPr in terms of Appendix 4 of the 2014 NEMA EIA Regulations (GN R982)	Location in this EMPr
(l) (a)	Details of – (3) the EAP who prepared the EMPr; and (ii) the expertise of the EAP to prepare an EMPr, including a curriculum vitae;	Section 3.1
(l) (b)	a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description	Section 2
(l) l	a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers;	Section 2
(l) (d)	A description of the impact management objectives, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including: (i) planning and design; (ii) pre-construction activities; (iii) construction activities (iv) rehabilitation of the environment after construction and where applicable post closure; and (v) where relevant, operation activities;	Section 5-9
(l) (e)	a description and identification of impact management outcomes required for the aspects contemplated in paragraph (d);	Section 5-9

(l) (f)	a description of proposed impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (d) a(e) will be achieved, and must, where applicable, include actions to – (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) comply with any prescribed environmental management standards or practices; (iii) comply with any applicable provisions of the Act regarding closure, where applicable (3) (iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;	Section 5-9
(l) (g)	the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 5-9
(l) (h)	the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 5-9
(l) (i)	an indication of the persons who will be responsible for the implementation of the impact management actions;	Section 5-9
(l) (j)	the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	Section 5-9
(l) (k)	the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	Section 5-9
(l) (l)	a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;	Section 5-9
(l) (m)	an environmental awareness plan describing the manner in which(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the	Section 6

	environment; and	
(l) (n)	any specific information that may be required by the competent authority.	Table 1.2 Section 5 Appendix A-D

### Compliance to the requirements of the relevant Environmental Authorisations

The EA, issued on 28 August 2012 (DFFE Ref: 12/12/20/1754/2), indicated in Condition 3 that the applicable management plans must be included within the proposed Msenge Emoyeni WEF EMPr. The table below details the requirement as contained within the EA as well as a cross reference to where this is included within this EMPr.

**Table 1.2: Content requirements of the EMPr as contained in the EA and subsequent amendments.**

Condition	Requirements for a the EMPr as per the conditions of the EA, 2012	Location in this EMPr
3.1	The Environmental Management Plan (EMP) must be submitted to the department for written approval prior to commencement of the activity.	The Final EMPr will be subject to a public participation process and is to be submitted to the DFFE for approval.
3.1.1	The EMP must include comprehensive rescue and storage in a suitable constructed nursery and storage area of plants deemed to be requiring either rescue for replanting and plants that will be useful during rehabilitation.	Appendix F
3.1.2	Include detailed Revegetation and Rehabilitation Plan to be conducted during construction and operation;	Appendix G
3.1.3	A Rehabilitation Plan must be established to minimise adverse environmental impacts whilst maximising the future utilisation of the property;	Appendix G
3.1.4	An Open Space Management Plan must be incorporated in the EMP	Appendix E
10.1.1	A bird and bat monitoring programme must be implemented to document the effect of the operation of the wind energy facility on avifauna and bats. This should commence prior to construction, and continue during operation of the wind energy facility.	Appendix B Appendix D  Bats construction monitoring is not required according to the latest guidelines. Bat operation monitoring is included for implementation Appendix D.
10.2.5	A Plant Rescue and Protection plan which allows for the maximum transplant of conservation important species from areas to	Appendix F

	be transformed must be compiled by a vegetation specialist familiar with the site in consultation with the ECO. This plan must be implanted prior to commencement of the construction phase.	
10.2.8	A comprehensive habitat rehabilitation plan must be developed for the site. Restoration must be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.	Appendix G
10.3.2	A transportation plan must be developed, particularly for the transport of turbine components, main assembly cranes and other large pieces of equipment. A permit must be obtained from the relevant transport department for the transportation of all components (abnormal loads) to the sites.	Appendix N
10.3.3	A traffic management plan must be prepared for the site access roads to ensure that no hazards would result from the increase truck traffic and that traffic flow would not be adversely impacted.	Appendix N
10.6.1	A health and safety programme must be developed to protect both workers and the general public during construction, operation and decommissioning of the wind energy facility. The programme must establish a safety zone for wind turbines from residences and occupied buildings, roads, right of ways and other public access areas that is sufficient to prevent accidents resulting from the operation of the wind turbines.	Programme must be produced by appointed contractor/ site engineer prior to commencement of construction as per the Occupational Health and Safety Act to avoid work related injury or incidents.
10.7.4	An effective monitoring system must be put in place during the construction phase of the development to detect any leakage or spillage of all hazardous substances during their transportation, handling use and storage. The applicant must ensure that precautionary measures are in place to limit the possibility of oil and other toxic liquids from entering the soil or stormwater system.	Appendix K Section 3.1

10.11.2	A comprehensive storm water management plan must be developed for the site to ensure compliance with applicable regulations and to prevent off-site migration of contaminated storm water or increased soil erosion. The comprehensive storm water management plan should form part of the EMP.	Appendix I
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## SECTION 2: PROJECT DETAILS

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Amakhala Emoyeni Renewable Energy (Pty) Ltd is proposing to establish the 140MW Msenge Emoyeni Wind Energy Facility and associated infrastructure EA. The Msenge Emoyeni Wind Energy Facility and associated infrastructure is located between the towns of Cookhouse and Bedford in the Eastern Cape Province and is located within the Cookhouse REDZ. The total development footprint will be approximately 4 177 hectares.

The project would include:

- » Up to 21 turbines with a hub height of up to 135m and rotor diameter (including nacelle) of up to 160m (i.e. each blade up to 80m in length);
- » Underground cables (where practical) between the turbines;
- » Foundations (of up to 20 x 20 x 2 m) to support the turbine towers
- » Internal access roads to each turbine (4 - 6 m wide during construction, reduced to 3 - 4 m wide during operation).

The following properties have been identified for the Msenge Emoyeni Wind Energy Facility and associated infrastructure

- Portion 2 Of The Farm No. 222,
- Portion 1 Of The Farm Brakfontein No. 220,
- Farm 225 No. 225,
- Farm Leeuwfontein No.221

In terms of the findings of the EIA Report in 2012 various planning, construction and operation-related environmental impacts were identified, including:

- » Disturbance of ecological environment (flora fauna, and habitats (including wetlands and watercourses))
- » Impacts on avifauna (birds)
- » Disturbance to sense of place, visual aesthetics
- » Noise pollution
- » Soil disturbance and erosion
- » Impacts on heritage and fossil resources
- » Social impacts

No absolute no go areas were identified to be associated with the proposed wind energy facility. Potentially sensitive areas in the project area identified through the EIA report (2012) include:

- » Areas of high ecological sensitivity
- » Heritage sites
- » Potentially sensitive noise receptors

These areas of sensitivity are indicated on the project sensitivity map included within Figure 2.2. Figure 2.2 indicates an area of medium-high sensitivity and recommended buffer zones as identified by the terrestrial, aquatic, avifauna, bat, heritage and palaeontological specialists. The final turbine layout has taken into consideration these sensitivities when micro-siting infrastructure. The Msenge Emoyeni site footprint has been drastically reduced since the project was authorised in 2012. Therefore the footprint occupied by the infrastructure is limited, thereby limiting the impact. Should mitigation measures be adhered to, impacts can be adequately managed. The primary reason for the high significance score is the fact that the impact will definitely occur. If the mitigation measures proposed in the ecological EIA study (2010) are implemented and those as per the recommendations from the specialists that have undertaken the walkthroughs, the impacts in these areas will be reduced to an acceptable medium significance.

As per the conditions of the Environmental Authorisation, several specialist pre-construction walkthroughs were undertaken to inform the final layout of the Msenge Emoyeni WEF in 2022. The results of the terrestrial, aquatic, bat, avifauna, heritage and palaeontological walkthroughs have informed the sensitivity mapping related to the turbine layout with a 200m radius around each turbine base, access roads and medium voltage cables were surveyed 150m either side of the centre line to allow for appropriate micro-siting infrastructure. Refer to Figure 2.1 for the sensitivity map related to the final Msenge Emoyeni Wind Energy Facility Layout and Appendix AI – DI for the details and recommendations made by the various specialist that have undertaken the pre-construction surveys.

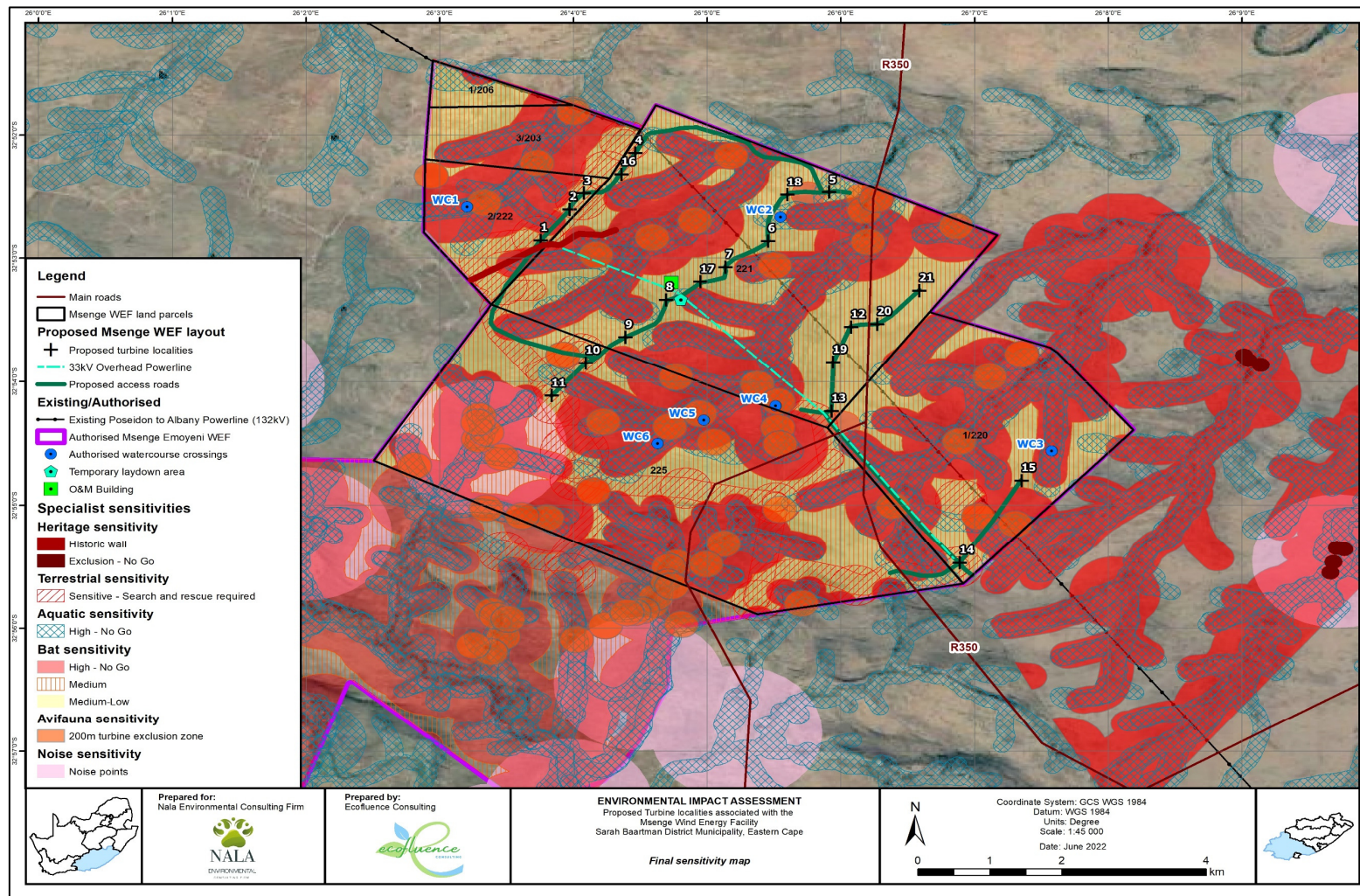


Figure 2.1 Sensitivity showing the final wind turbine layout, for the 140MW Msenge Emoyeni Wind Energy Facility and associated infrastructure

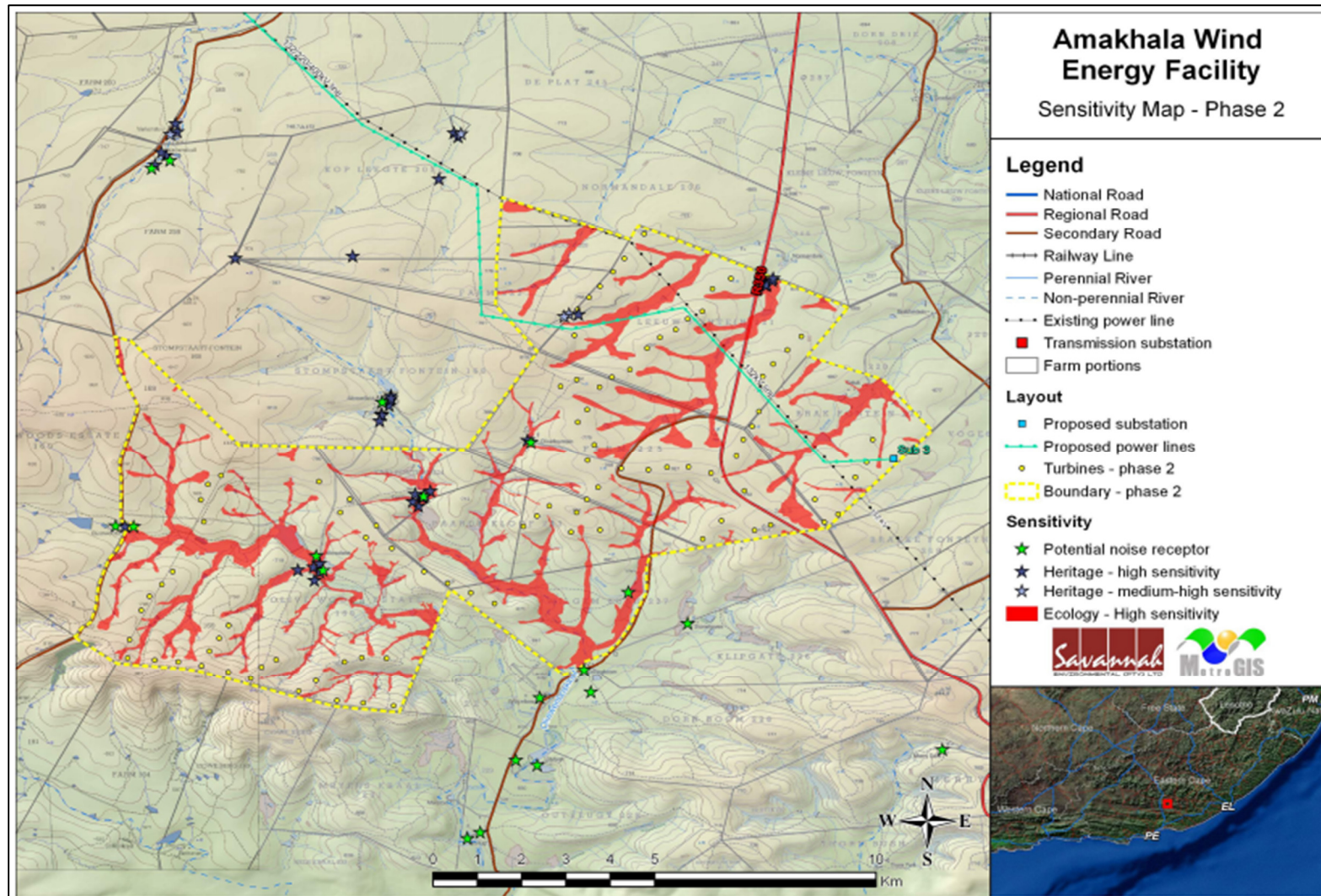


Figure 2.2 Areas of potential sensitivity identified through the EIA process (2012) for the 140MW Msenge Emoyeni Wind Energy Facility and associated infrastructure.

The EMPr has been developed on the basis of the findings of the EIA study (2012) subsequent amendments and the part 1 amendment process in 2022, and must be implemented to protect sensitive on-site and off-site features through controlling construction and operation activities that could have a detrimental effect on the environment, and through avoiding or minimising potential impacts.

## **2.1 Activities and Components associated with the Msenge Emoyeni Wind Energy Facility and associated infrastructure**

The main activities/components associated with the Msenge Emoyeni Wind Energy Facility and associated infrastructure are detailed in Table 2.1.

**Table 2.1:** Activities Associated with Planning, Construction, Operation and Decommissioning

Main Activity/Project Component	Components of Activity	Details
<i>Planning</i>		
Conduct technical surveys	<ul style="list-style-type: none"> <li>» Geotechnical survey by geotechnical engineer:</li> <li>» Site survey and confirmation of the turbine micro-siting footprint</li> </ul>	All surveys are to be undertaken prior to initiating construction.
<i>Construction</i>		
Establishment of access roads to the site	<ul style="list-style-type: none"> <li>» Upgrade access/haul roads to the site, as required (this only refers to the main access roads leading directly to site itself). Amakhala Emoyeni Renewable Energy (Pty) Ltd Renewable Energy would not be responsible for upgrading / maintaining any national or regional roads.</li> <li>» Establish internal access roads: 4-8m wide permanent roadway within the site between the turbines for use during construction and reduce them to 3-4m wide during operation phase.</li> <li>» Temporary track (adjacent to and utilising part of the permanent road) of ~11 m in width for use by the crawler crane during construction phase only.</li> </ul>	<ul style="list-style-type: none"> <li>» Access roads will be constructed/upgraded in advance of any components being delivered to site and will remain in place after completion for future access and possibly access for replacement of parts if necessary.</li> <li>» Existing access roads to the site will be utilised and upgraded where required. Special haul roads may need to be constructed to and within the site to accommodate abnormally loaded vehicle access and circulation.</li> <li>» The internal service road alignment is informed by the final micro-siting/positioning of the wind turbines (as well as specialist surveys). To accommodate the large crawler crane required for turbine assembly, a track of up to 13m in width is required to be established on the site.</li> </ul>
Undertake site preparation	<ul style="list-style-type: none"> <li>» Site establishment of offices / workshop with ablutions and stores, contractors' yards</li> <li>» Establishment of internal access roads (permanent and temporary roads)</li> <li>» Clearance of vegetation at the footprint of each turbine</li> <li>» Excavations for foundations</li> </ul>	These activities will require the stripping of topsoil, which will need to be appropriately stockpiled for use in rehabilitation.

Establishment of lay down areas on site	<ul style="list-style-type: none"> <li>» Lay down areas (temporary footprint 60m x 60m) at each turbine position for the storage of wind turbine components and accommodation of construction and crane lifting equipment.</li> <li>» Temporary lay down area for crane assembly.</li> </ul>	<ul style="list-style-type: none"> <li>» Each turbine needs a flat and hardened lay down area of up to 60 m x 60 m during the construction process.</li> <li>» This area can be rehabilitated after construction.</li> <li>» The lay down area will need to accommodate the cranes required in tower/turbine assembly. Lay down and storage areas will be required to be established for the normal civil engineering construction equipment which will be required on site. A large lay down area will be required at each position where the main lifting crawler crane may be required to be erected and/or disassembled. This area would be required to be compacted and levelled to accommodate the assembly crane, which would need to access the crawler crane from all sides.</li> <li>» Such areas to make use of already compacted areas as far as possible, such as roadways or other laydown areas.</li> </ul>
Construct wind turbine foundations	<ul style="list-style-type: none"> <li>» Concrete foundations of approximately of up to 20 x 20m x 2m depth at each turbine location (final dimensions to be defined by geotechnical survey of the site)</li> </ul>	<ul style="list-style-type: none"> <li>» Foundation holes will be mechanically excavated.</li> <li>» Shoring and safety barriers will be erected.</li> <li>» Aggregate and cement to be transported from the closest centre to the development, with the establishment of a small concrete batching plant close to the activities.</li> </ul>
Transport of components and equipment to site	<ul style="list-style-type: none"> <li>» Flatbed trucks will be used to transport all components to site: <ul style="list-style-type: none"> <li>* Turbine units consist of a tower comprised of 4 segments, a nacelle, and three rotor blades (each of up to 80 m in length).</li> <li>* Components of various specialised construction, lifting equipment and counterweights etc. are required on site (e.g. mobile assembly crane and main lift crawler crane) to erect the wind turbines.</li> <li>* The normal civil engineering construction equipment for the civil works (e.g. excavators, trucks, graders, compaction equipment, cement mixers, etc.).</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>» The Port of Coega has been identified as the as most suitable port for ease of access and storage facilities for wind turbine components. The route identified as most favourable is as follows: <ul style="list-style-type: none"> <li>○ Coega to N2 National Road</li> <li>○ N2 to Cookhouse Via N10</li> <li>○ Cookhouse to Bedford (Via R63)</li> <li>○ Bedford to site</li> </ul> </li> <li>» Turbine units consist of a tower comprised of 4 segments, a nacelle, and three rotor blades. Components of various specialised construction, lifting equipment and counterweights etc. are required on site (e.g. 200 ton mobile assembly crane and a 750 ton main lift crawler crane) to erect the wind turbines.</li> <li>» The wind turbine, including tower, will be brought to site by the supplier in sections. The individual components are defined as abnormal loads in terms of the Road Traffic Act (Act No 29 of 1989)</li> </ul>

	* Ready-mix cement trucks for turbine and visitors centre foundations	by virtue of the dimensional limitations (abnormal length of the blades) and load limitations (i.e. the nacelle). The dimensional requirements of the load during the construction phase (length/height) may require alterations to the existing road infrastructure (widening on corners, removal of traffic islands), accommodation of street furniture (electricity, street lighting, traffic signals, telephone lines etc.) and protection of road-related structures (bridges, culverts, portal culverts, retaining walls etc.) as a result of abnormal loading. The equipment will be transported to the site using appropriate National and Provincial routes, and the dedicated access/haul road to the site itself.
Erect turbines	<ul style="list-style-type: none"> <li>» Large lifting crane used for lifting of large, heavy components</li> <li>» A small crane for the assembly of the rotor.</li> </ul>	<ul style="list-style-type: none"> <li>» The large lifting crane will lift the tower sections into place.</li> <li>» The nacelle, which contains the gearbox, generator and yawing mechanism, will then be placed onto the top of the assembled tower.</li> <li>» The rotor (i.e. the blades of the turbine) will then be assembled or partially assembled on the ground. It will then be lifted to the nacelle and bolted in place.</li> <li>» It will take approximately 2 days to erect each turbine, although this will depend on the climatic conditions as a relatively wind-free day will be required for the installation of the rotor.</li> </ul>
Commissioning of the facility	» Wind energy facility commissioning	<ul style="list-style-type: none"> <li>» Prior to the start-up of a wind turbine, a series of checks and tests will be carried out, including both static and dynamic tests to make sure the turbine is working within appropriate limits.</li> <li>» Grid interconnection and unit synchronisation will be undertaken to confirm the turbine and unit performance. Physical adjustments may be needed such as changing the pitch of the blades.</li> </ul>
Undertake site remediation	<ul style="list-style-type: none"> <li>» Remove all construction equipment from the site</li> <li>» Rehabilitation of temporarily disturbed areas where practical and reasonable</li> </ul>	» On full commissioning of the facility, any access points to the site which are not required during the operation phase will be closed and prepared for rehabilitation.
<b><i>Operation</i></b>		



Operation	Operation of turbines within the wind energy facility	<ul style="list-style-type: none"> <li>» Once operational, the wind energy facility will be monitored remotely. It is estimated that the operational phase of the complete project (i.e. all three phases) will provide employment for approximately 10 full-time employees.</li> <li>» No permanent staff will be required on site for any extended period of time. It is anticipated that there will be full time security, maintenance and control room staff required on site.</li> <li>» Each turbine in the facility will be operational, except under circumstances of mechanical breakdown, extreme weather conditions or maintenance activities.</li> </ul>
Maintenance	<ul style="list-style-type: none"> <li>» Oil and grease – turbines</li> <li>» Waste product disposal</li> </ul>	<ul style="list-style-type: none"> <li>» The wind turbines will be subject to periodic maintenance and inspection. Periodic oil changes will be required and any waste products (e.g. oil) will be disposed of in accordance with relevant waste management legislation. (National Environmental Management: Waste Act 59 Of 2008 as amended)</li> <li>» The turbine infrastructure is expected to have a lifespan of approximately 20-30 years, with adequate maintenance.</li> </ul>
<b><i>Decommissioning</i></b>		
Site preparation	<ul style="list-style-type: none"> <li>» Confirming the integrity of the access to the site to accommodate required equipment and lifting cranes.</li> <li>» Preparation of the site (e.g. lay down areas, construction platform)</li> <li>» Mobilisation of construction equipment</li> </ul>	<ul style="list-style-type: none"> <li>» Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the facility would comprise the disassembly and replacement of the turbines with more appropriate technology/infrastructure available at that time.</li> </ul>
Disassemble and replace existing turbines	<ul style="list-style-type: none"> <li>» A large crane will be used to disassemble the turbine and tower sections.</li> </ul>	<ul style="list-style-type: none"> <li>» Turbine components would be reused, recycled or disposed of in accordance with regulatory requirements.</li> <li>» The hours of operation for noisy construction activities are guided by the Environment Conservation Act (noise control regulations). If the project requires construction work outside of the designated hours, regulatory authorities and affected stakeholders will be consulted and subsequent negotiations will be made to ensure the suitability of the revised activities.</li> </ul>

## SECTION 3: STRUCTURE OF THIS EMPR

The first two SECTIONS provide background to the EMPr and the proposed project. The sections which follow consider the:

- » Planning and design activities
- » Construction activities
- » Operation activities
- » Decommissioning activities

These sections set out the procedures necessary for Amakhala Emoyeni Renewable Energy (Pty) Ltd to achieve environmental compliance. For each of the phases of implementation for the wind energy facility project, an over-arching environmental **goal** is stated. In order to meet this goal, a number of **objectives** are listed. The management programme has been structured in table format in order to show the links between the goals for each phase of the project and their associated objectives, activities/risk sources, mitigation actions monitoring requirements and performance indicators. A specific environmental management programme table has been established for each environmental objective. The information provided within the EMPr table for each objective is illustrated below:

**OBJECTIVE: Description of the objective, which is necessary in order to meet the overall goals; these take into account the findings of the environmental impact assessment specialist studies (2010)**

<b>Project component/s</b>	List of project components affecting the objective, i.e.: <ul style="list-style-type: none"> <li>» wind turbines</li> <li>» access roads</li> </ul>
<b>Potential Impact</b>	Brief description of potential environmental impact if objective is not met
<b>Activity/risk source</b>	Description of activities which could impact on achieving objective
<b>Mitigation: Target/Objective</b>	Description of the target; include quantitative measures and/or dates of completion

Mitigation: Action/control	Responsibility	Timeframe
List specific action(s) required to meet the mitigation target/objective described above.	Who is responsible for the measures	Time periods for implementation of measures

<b>Performance Indicator</b>	Description of key indicator(s) that track progress/indicate the effectiveness of the management plan.
<b>Monitoring</b>	Mechanisms for monitoring compliance; the key monitoring actions required to check whether the objectives are being achieved, taking into consideration responsibility, frequency, methods and reporting

The objectives and EMPr tables are required to be reviewed and possibly modified whenever changes, such as the following, occur:

- » Planned activities change (i.e. in terms of the components and/or layout of the facility).
- » Modification to or addition to environmental objectives and targets.
- » Relevant legal or other requirements are changed or introduced.

- » Significant progress has been made on achieving an objective or target such that it should be re-examined to determine if it is still relevant, should be modified, etc.

### 3.1. Project Team

This EMPr was updated for the Msenge Emoyeni Wind Energy Facility by:

Name	Organisation	Role/Specialist Study
<b>Environmental Assessment Practitioners</b>		
Arlene Singh	Nala Environmental (Pty) Ltd	Environmental Assessment Practitioner (SACNASP) (EAPASA)
Norman Chetsanga	Nala Environmental (Pty) Ltd	Environmental Assessment Practitioner (SACNASP)
<b>Specialists related to the FEIR (2012) and Subsequent Amendments</b>		
<b>Specialists</b>		
Lourens du Plessis	MetroGIS/LOGIS	Visual Impact Assessments
David Hoare	David Hoare Consulting cc	Ecological Assessment
Dr Andrew Jenkins	Avisense Consulting	Ornithologist /Avifaunal Impact Assessment
Dave Halkett	Archaeology Contracts Office, Department of Archaeology: University of Cape Town	Archaeological and heritage Impact Assessment
Iain Paton	Duteniqua Geotechnical Services	Soils and Erosion Potential Assessment
Johan Binneman	Albany Museum	Palaeontological Impact Assessment
Tony Barbour	Tony Barbour Consultants	Social Impact Assessment
Billy de Klerk	Independent Specialist	Paleontological Impact Assessment
Gerhard Botha	Nkurenkuru Ecology and Biodiversity	Ecological Assessment
Kate MacEwan	Inkululeko Wildlife Services	Bats Assessment
Dr Johan Binneman	Eastern Cape Heritage Consultants	Archaeology and Heritage
Morne de Jagger	MENCO (M2 Environmental Connections cc) /Enviro Acoustic Research	Noise Impact Assessments
<b>Specialists related to the Final Walkthrough Specialists (2022)</b>		
Dr Patsy Scherman	Scherman Environmental Aquatic & Environmental Management Consulting	Terrestrial Ecology Pre-construction Walkthrough Assessment (Fauna and Flora) (Appendix A1)
Dr Patsy Scherman	Scherman Environmental Aquatic & Environmental Management Consulting	Aquatic Pre-construction Walkthrough Assessment (Appendix A1)
Chris van Rooyen and Albert Froneman	Chris van Rooyen consulting	Avifauna Pre-construction Walkthrough Assessment (Appendix B1)
Dr. Caroline Lötter	Inkululeko Wildlife Services	Bat Pre-construction Walkthrough Assessment (Appendix C1)
Jenna Lavin	CTS Heritage	Heritage and Palaeontological Pre-construction Walkthrough Assessments (Appendix D1)

This EMPr was originally compiled by Savannah Environmental in 2012 for the FEIR and updated to Revision 1 in 2018 following the submission of a Part 2 Amendment Application. This has been finalised in 2022 by Nala Environmental (Pty) Ltd.

Nala Environmental is an environmental consultancy firm established in December 2020. The main line of business is the compilation of environmental impact assessments for a variety of industries. The Nala Environmental management team has a broad client base from both the private and government sectors which has developed over the past 10 years. Nala Environmental is experience in undertaking environmental impact assessments spans across South Africa, with significant experience in the Northern Cape, Western Cape, Eastern Cape, Mpumalanga and Kwa-Zulu Natal Provinces. The Environmental Assessment Practitioners (EAPs) for this project are Arlene Singh who is registered with the Environmental Assessment Practitioner's Association of South Africa (EAPASA) and the South African Council for Natural Scientific Professions (SACNASP), Norman Chetsanga who is registered with the South African Council for Natural Scientific Professions (SACNASP) and Justin Jacobs. Refer to Appendix A for a Company Profile and condensed Curriculum Vitae of the EAP.

## SECTION 4: LEGISLATIVE OVERVIEW

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### 4.1 GENERAL

The construction phase activities included as part of the EMPr are in respect of any future construction, upgrades, or expansions at the site. Construction and operation shall be according to the best industry practices, as identified in the project documents. This EMPr, which forms an integral part of the contract documents, informs the contractor and operator as to their duties in the fulfilment of the project objectives, with particular reference to the prevention and mitigation of environmental impacts caused by construction activities associated with the project. The contractor should note that obligations imposed by the EMP are legally binding in terms of this contract.

### 4.2 STATUTORY AND OTHER APPLICABLE LEGISLATION

The contractor and operator are deemed to have made themselves conversant with all legislation pertaining to the environment, including provincial and local government ordinances, which may be applicable to the contract. Major environmental legislation, as amended from time to time, includes but is not limited to the following:

#### 4.2.1 The Constitution (No. 6 of 1996)

The Constitution 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 through reasonable legislative and other measures to prevent pollution and ecological degradation; promote conservation and ensure ecologically sustainable development and use of natural resources.

#### 4.2.2 Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA)

This act provides for control over the utilisation of the natural agricultural resources of South Africa in order to promote the conservation of soil, water sources and vegetation, as well as combating weeds and invader plants.

#### 4.2.3 Mineral and Petroleum Resources Development Act (No. 28 of 2002)

This act makes provision for equitable access to, and sustainable development of, minerals and petroleum resources.

#### 4.2.4 National Environmental Management Act (NEMA), (No. 107 of 1998)

This act supports the Bill of Rights within the Constitution and highlights principles of sustainable development including preservation of ecosystems and biological diversity and avoidance, minimisation and remediation of pollution and environmental degradation. It also sets the stage for the control of listed activities and the procedural requirements for authorisation thereof through the Environmental Impact Assessment Regulations, 2014. Environmental authorisation must be obtained prior to the commencement of any activities listed in the EIA Regulation Listing Notices, 2014.

#### 4.2.5 National Environmental Management: Air Quality Act (No. 39 of 2004)

This act provides reasonable measures for the prevention of pollution and ecological degradation from activities with emissions to atmosphere; and provides for specific air quality measures; for national norms and standards regulating air quality monitoring, management, and control by all spheres of government.

#### 4.2.6 National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEMBA)

This act makes provisions to accomplish the objectives of the United Nations' Convention on Biological Diversity. CDM may be required to apply for permits to conduct certain listed activities which, together with the listed threatened or protected species, may be identified by the Minister. Section 73 (3) of this act empowers a competent authority to direct a person to take steps to remedy any harm to biodiversity resulting from the actions of that person or as a result of occurrence of listed invasive species occurring on land on which that person is the owner.

#### **4.2.7 National Environmental Management: Protected Areas Act (No. 57 of 2003)**

This act provides for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity, natural landscapes, and seascapes.

#### **4.2.8 National Environmental Management: Waste Act (No. 59 of 2008)**

This act aims to regulate waste management practices through provision of national norms and standards, specific waste measures, licensing and control of waste activities, remediation of contaminated land as well as providing for compliance and law enforcement. It sets the stage for the control of listed waste management activities and the procedural requirements for authorisation thereof through the Environmental Impact Assessment Regulations, 2014.

#### **4.2.9 National Forests Act (No. 84 of 1998)**

This act makes provision for promoting the sustainable management and development of forests, and for the protection of certain forests and trees for environmental, economic, educational, recreational, cultural, health and spiritual purposes.

#### **4.2.10 National Heritage Resources Act No. 25 of 1999)**

This act provides for an integrated and interactive system for identification, assessment, and management of South Africa's heritage resources, and empowers civil society to nurture and conserve their heritage resources. It provides for the control of specific activities that could impact heritage resources and for the procedural requirements for authorisation thereof from the heritage authority. Importantly, the Provincial Heritage Authority, Eastern Cape Provincial Heritage Resources Agency, must be notified immediately if any items of cultural heritage importance are noted during construction activities.

#### **4.2.11 National Water Act (Act No. 36 of 1998)**

This act makes provision for the protection of surface water and groundwater and their sustainable management for the prevention and remediation of the effects of pollution, as well as for the management of emergency situations. Authorisation is required for any activity which may compromise the water resource quality objectives.

## SECTION 5: MANAGEMENT PLAN: PLANNING & DESIGN

### 5.1. Goal for Planning and Design

Overall Goal for Planning and Design: Undertake the planning and design of the Msenge Emoyeni Wind Energy Facility in a way that:

- » Ensures that the design of the facility responds to the identified environmental constraints and opportunities.
- » Ensures that adequate regard has been taken of any landowner concerns and that these are appropriately addressed through design and planning (where appropriate).
- » Ensures that the best environmental options are selected for the project.
- » Enables the wind energy facility construction activities to be undertaken without significant disruption to other land uses in the area.

In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

### 5.2. Objectives

**OBJECTIVE: To ensure that the design of the facility corresponds to the identified environmental constraints, opportunities and health and safety requirements**

From the specialist investigations undertaken in 2010 for the FEIR (2012), other subsequent amendments and final preconstruction walkthroughs in 2022 for the proposed wind energy facility development site, all high sensitivity areas and buffers were taken into consideration for the placement of infrastructures. These areas are illustrated in Figure 2.1.

A final preconstruction walkthrough of final turbine positions and access roads was conducted by a registered professional archaeologist / heritage, palaeontological specialists, terrestrial ecologist (fauna and flora), aquatic specialist, avifaunal specialist and bat specialist consultants (Appendix AI-DI)

<b>Project component/s</b>	Project components affecting the objective: <ul style="list-style-type: none"> <li>» wind turbines</li> <li>» access roads</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Design fails to respond optimally to the identified environmental considerations</li> <li>» Health and safety protocol not implanted resulting in injury or loss of life</li> </ul>
<b>Activities/risk sources</b>	<ul style="list-style-type: none"> <li>» Positioning of turbines and access roads</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To ensure that the design of the facility responds to the identified environmental constraints, opportunities and health and safety requirements</li> </ul>

Mitigation: Action/control	Responsibility	Timeframe
Consider design level mitigation measures recommended by the specialists, especially with respect to visual aesthetics, noise, flora, aquatic ecology (i.e. wetlands and pans), avifauna, and heritage sites, as detailed within the EIA report (2012), subsequent amendments assessments and final walkthroughs conducted in May 2022 and as	Engineering Design Consultant / turbine supplier Amakhala Emoyeni Renewable Energy (Pty) Ltd	Tender Design & Design Review Stage

Mitigation: Action/control	Responsibility	Timeframe
<u>submitted with this final environmental management programme. and relevant appendices.</u>		
A lighting engineer must be consulted to assist in the planning and placement of light fixtures in order to reduce visual impacts associated with glare and light trespass.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Erection and maintenance
Financial allowance must be made in the operational budget for adaptive mitigation.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Planning and design
The turbines will be painted a pale, matt, non-reflective colour (i.e. off white, as specified) and it will be ensured that the specified paint colour is complied with before erection of the turbines.	Contractor	Erection of turbines
Obtain a permit from DWS to impact on any wetland or water resource.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Pre-construction
The moderately tall <i>Pappaea capensis</i> tree species are regarded as a valuable and important feature within the development area and are a vital element to biodiversity. As such, these larger tree species must be avoided through micro-placing of the turbines.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Design phase
The pre-construction walkthrough of the final development footprint has been undertaken by a registered ecologist (Appendix AI). Following the pre-construction walkthrough, a Search and Rescue and Rehabilitation Management Plan must be adopted as per Appendix F and G of this EMPr.	Ecologist	Pre-construction
All potential habitats, burrows, dens, nests of Conservation Important Species recorded during the walkthrough survey and shall be supplemented by the appointed Environmental Officer (EO) where necessary. Such identified burrows etc. must be monitored by the EO prior to construction and throughout the construction phase for activity/presence of animal species.  <u>Where such species or active burrows have been identified within the development footprint:</u>  <u>Micro-placing must be applied; or</u> <u>Relocation of the species from the study area, where possible will be required before being disturbed by the construction activities.</u> » In the case of Red Data Species; if such a species is detected such an animal must be removed and relocated by a qualified professional/contractor.	Ecologist EO	Pre-construction and Construction
A suitable qualified professional person/company must be appointed to undertake the plant search and rescue <u>operation if not already appointed.</u> No Red Data and Protected Plants may be disturbed/destroyed/removed and/or transplanted without the	Ecologist	Pre-construction



Mitigation: Action/control	Responsibility	Timeframe
<p>necessary permits from the relevant authority (Eastern Cape Department of Economic Development, Environmental Affairs and Tourism).</p>		
<p>Once all the areas where topsoil will be removed or areas that will be transformed have been demarcated, the contractor will be responsible to remove as many bulbous species, succulents and small indigenous shrubs from the topsoil as possible. These must be transplanted as per plant rescue targets set in the updated Search and Rescue and Rehabilitation Management Plan. Plant species that should be located and replanted as part of the rehabilitation process, include all protected plants.</p> <p>Plant species that must be located and replanted include all red data species:</p> <ul style="list-style-type: none"> <li>» <i>Crassula decidua</i></li> <li>» <i>Euphorbia globosa</i></li> <li>» <i>Euphorbia meloformis</i></li> </ul> <p>All search and rescue of the above-mentioned species must be recorded and include:</p> <ul style="list-style-type: none"> <li>» amount of species,</li> <li>» date when removed and replanted,</li> <li>» GPS coordinates of new locations,</li> <li>» Photographs as records of new location.</li> </ul> <p>None of these species may be collected for other purposes than to be reinstated outside of the development footprint.</p>	<p>Contractor Ecologist EO</p>	<p>Pre-construction</p>
<p>An Invasive Alien Plant Management Plan must be compiled with special emphasis on the management of the invasive <i>Opuntia</i> species, especially <i>O. aurantiaca</i>. Emphasis must be placed on the monitoring and management/mitigation of potential erosion.</p>	<p>Ecologist</p>	<p>Pre-construction</p>
<p>A bat ecologist must be engaged if not already appointed early in the planning and design phase by the turbine engineers in order for bat monitoring equipment to be erected onto some turbines.</p>	<p>Amakhala Emoyeni Renewable Energy (Pty) Ltd</p>	<p>Pre-construction</p>
<p>For any new river crossings, apply the following measures:</p> <ul style="list-style-type: none"> <li>» use adequate bridge or culvert structures that avoid limiting water or sediment flow through the riverbed wherever possible</li> <li>» ensure bridge structures do not cause canalization or erosion.</li> <li>» implement adequate erosion control measures below river crossings</li> <li>» obtain a permit from DWS for any infrastructure to be located within a watercourse.</li> </ul>	<p>Amakhala Emoyeni Renewable Energy (Pty) Ltd</p>	<p>Site establishment &amp; duration of contract</p>

Mitigation: Action/control	Responsibility	Timeframe
Access roads to be carefully planned to minimise the impacted area and prevent unnecessary over compaction of soil.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Design phase
Where access roads cross natural drainage lines, culverts must be designed to allow free flow. Regular maintenance must be carried out.	Contractor	Design Pre-construction and Construction
The noise emission specifications of wind turbine generators should be considered when selecting the equipment.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Design phase
Noise modelling should play a role in the design of the layout of the facility. An appropriate buffer zone must be developed around all potentially sensitive receptors (proposed to be 1000m), if turbines are within this buffer, noise modelling would need to be redone to determine if the impact is acceptable or not.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Design phase
A monitoring programme must be implemented to document the effect of the wind turbines on birds. (refer to Appendix B) This must take place before construction (to provide a benchmark) and continue during construction and during operation.	Amakhala Emoyeni Renewable Energy (Pty) Ltd in consultation with specialist	Pre-construction, Construction and Operation
Align underground cables and internal access roads along existing infrastructure as far as possible.	Amakhala Emoyeni Renewable Energy (Pty) Ltd Contractor	Design; Construction
For any new construction, cross watercourses perpendicularly to minimise disturbance footprints.	Amakhala Emoyeni Renewable Energy (Pty) Ltd Contractor	Design; Construction
Implement an environmentally responsive planning approach to roads and infrastructure to limit cut and fill requirements.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Planning
A detailed geotechnical investigation is required for the design phase.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Design phase
Compile a comprehensive stormwater management plan for hard surfaces as part of the final design of the project (Appendix I).	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Design phase
Identify construction areas and restrict construction activity to these areas	Contractor	Pre-construction and Construction
Access roads must be carefully planned and constructed to minimise the impacted area and prevent unnecessary excavation, placement and compaction of soil. Roads must be laid out along the contour wherever possible and must never traverse steep slopes at 90 degrees.	Engineer	Pre-construction and Construction
Undertake pre-construction heritage surveys. (Refer to Appendix DI) Inspection of all proposed road alignments and turbine sites through	Specialists	Design stage. Once layout is finalized.

Mitigation: Action/control	Responsibility	Timeframe
site inspections to determine if any adjustments are necessary to mitigate impacts on heritage resources.		
Compile plan of action if graves of any nature are disturbed and compile plan of action to safeguard fittings and materials in heritage buildings on the site. Compile final listing of heritage sites that will potentially be affected by developments. There is a standard procedure which should be followed for graves. This plan of action must be in accordance with the legal requirements in this regard.	Specialists	Pre-construction
Amakhala Emoyeni Renewable Energy (Pty) Ltd, in consultation with the Blue Crane Development Agency and other stakeholders, must investigate the opportunities for establishing a Community Trust.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Pre-construction, Construction and Operation
The terms of this EMPr and the Environmental Authorisation must be included in all tender documentation and Contractors contracts.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Tender process
An ECO must be appointed prior to the commencement of construction and must be permanently on site throughout the road construction, cable laying, and turbine foundation excavation periods, and at other times must visit the site at least once a week.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Duration of construction
<u>Workers should be thoroughly trained in using potentially dangerous equipment.</u>	<u>Site engineer/ Contractor</u>	<u>Design phase</u>
<u>Contractors must ensure that all equipment is maintained in a safe operating condition</u>	<u>Site engineer/ Contractor</u>	<u>Design phase</u>
<u>A safety officer must be appointed</u>	<u>Site engineer/ Contractor</u>	<u>Design phase</u>
<u>A record of health and safety incidents must be kept on site</u>	<u>Site engineer/ Contractor</u>	<u>Design phase</u>
<u>Any health and safety incidents must be reported to the project manager immediately.</u>	<u>Site engineer/ Contractor</u>	<u>Design phase</u>
<u>First aid facilities must be available on site at all times.</u>	<u>Site engineer/ Contractor</u>	<u>Design phase</u>
<u>The contractor must ensure that all construction workers are well educated about HIV/ AIDS and the risks surrounding this disease. The location of the local clinic where more information and counselling are offered must be indicated to workers.</u>	<u>Site engineer/ Contractor</u>	<u>Design phase</u>
<u>Material stockpiles or stacks, such as, pipes must be stable and well secured to avoid collapse and possible injury to site workers / local residents.</u>	<u>Site engineer/ Contractor</u>	<u>Design phase</u>
<u>Personal Protective Equipment (PPE) must be made available to all construction staff and their usage must be compulsory. Hard hats and safety shoes must be worn at all times and other PPE worn were necessary i.e., dust / masks, ear plugs etc.</u>	<u>Site engineer/ Contractor</u>	<u>Design phase</u>

**Performance Indicator**

» Design meets objectives and does not degrade the environment

	<ul style="list-style-type: none"> <li>» Selected alignments and turbine layout minimises any negative environmental impacts and maximises any benefits.</li> <li>» Design and layouts etc respond to the mitigation measures and recommendations in the EIA report.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Ensure that the design implemented meets the objectives and mitigation measures in the EIA report (2012) and findings of the Final Walkthrough's through review of the design by the Project Manager, and Environmental Control Officer (ECO) prior to the commencement of construction.</li> <li>» Maintain register of work related incidents</li> </ul>

### OBJECTIVE: Initiate Bird Monitoring Programme

A monitoring programme must be implemented by Amakhala Emoyeni Renewable Energy (Pty) Ltd (in consultation with an avifauna specialist) to document the effect of the wind energy facility on birds. This must take place before construction (to provide a benchmark), during construction and during operation. This is seen as critical to furthering the understanding of avifaunal impacts and wind energy facilities on the site and in South Africa. Further details are included in Appendix BI of this EMP as submitted with revision I of the EMP (Savannah Environmental, 2018) and updated with the current May 2022 avifaunal pre-construction walkthrough (Appendix BI). As per the recommendations of the avifaunal specialist, a 200m turbine exclusion zone has been implemented around all sources of surface water at the project site, as a pre-cautionary measure against Cape Vulture and other SCC collisions. The current 21 turbine lay-out has taken this into account. It is recommended that shutdown on demand (SDoD) be implemented for Cape Vultures at all turbines during daylight hours for a trial period of two years in the operational phase, once the wind farm commences with operations, to reduce the risk of collisions of Cape Vultures with the turbines. The need for SDoD must be evaluated by the avifaunal specialist after the two year period to see if it is necessary to continue, based on the number of shutdown events in the preceding two years. If, alternative proven mitigation measures become available during the two year trial period or anytime thereafter, the SDoD can be suspended and replaced by alternative mitigation measures, on the recommendation of the avifaunal specialist.

<b>Project component/s</b>	List of project components affecting the objective <ul style="list-style-type: none"> <li>» wind turbines</li> </ul>
<b>Potential Impact</b>	» Mortality of birds due to collision with turbines and power line infrastructure.
<b>Activity/risk source</b>	» Turbines
<b>Mitigation: Target/Objective</b>	» The delivery of an effective impact mitigation scheme for the facility, informed initially by influence of pre-construction monitoring on final construction plans, and refined by post-construction monitoring of actual impacts, and resulting adjustments in management practices and mitigation measures applied.

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Appoint advising scientist and agency to conduct pre- and post-construction monitoring.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Pre-construction
Implement monitoring programme.	Monitoring agency	Pre-construction, construction, operation
Refine monitoring protocol and determine the extent of radar deployment if required.	Advising scientist	Pre-construction, construction, operation
Periodically collate and analyse pre-construction monitoring data. Review report on the full year of pre-construction		

Mitigation: Action/control	Responsibility	Timeframe
monitoring, and integrate findings into construction EMPr and broader mitigation scheme.		
Possibly exclude development from certain high-lying areas where Cape Vultures and other soaring species might be most likely to fly. <u>It is recommended that a 200m turbine exclusion zone is implemented around all sources of surface water at the project site, as a pre-cautionary measure against Cape Vulture and other SCC collisions</u>	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Pre-construction
The applicant should co-fund and cooperate with the Endangered Wildlife Trust's (EWT) Cape Vulture tracking work and build the findings and recommendations of this work into all future development plans and decisions. (Appendix B2)	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Pre-construction
The applicant must ensure that the results of applicable monitoring work are applied to project-specific impact mitigation in a way that allows for the potentially considerable cumulative effects on the local/regional avifauna of any other wind energy projects that may be proposed for this area.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Pre-construction

<b>Performance Indicator</b>	» Clear and logical recommendations on why, how and when to institute mitigation measures to reduce avian impacts of the development, from pre-construction to operational phase.
<b>Monitoring</b>	» An incident reporting system must be used to record non-conformances to the EMPr.

## SECTION 6: MANAGEMENT PLAN: CONSTRUCTION

### 6.1. Overall Goal for Construction

Overall Goals for Construction: Undertake the construction phase of the wind energy facility in a way that:

- » Ensures that construction activities are properly managed in respect of environmental aspects and impacts.
- » Enables the wind energy facility construction activities to be undertaken without significant disruption to other land uses in the area, in particular with regards to noise impacts, farming practices, traffic and road use, and effects on local residents, tourism industry and surrounding game farms.
- » Minimises the impact on the vegetation and habitats value of the site and where possible adds to the botanical record of this area.
- » Minimises the impact on the archaeological and historical value of the site and where possible adds to the archaeological record of this area.
- » Minimises impacts on birds and other fauna using the site.
- » Establishes an environmental baseline during construction activities on the site, where possible, particularly with regard to priority bird species using the site.

### 6.2. Institutional Arrangements: Roles and Responsibilities for the Construction Phase of the Wind Energy Facility

As the Proponent, Amakhala Emoyeni Renewable Energy (Pty) Ltd must ensure that the implementation of the wind energy facility complies with the requirements of any and all environmental authorisations and permits, and obligations emanating from other relevant environmental legislation. This obligation is partly met through the development of the EMPr, and the implementation of the EMPr through its integration into the contract documentation Amakhala Emoyeni Renewable Energy (Pty) Ltd will retain various key roles and responsibilities during the construction of the wind energy facility. These are outlined below.

**OBJECTIVE: To establish clear reporting, communication and responsibilities in relation to environmental incident**

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Project Manager; Site Manager; Safety, Health and Environment Representative; Environmental Control Officer and Contractor for the construction phase of this project are as detailed below.

#### The Project Manager will:

- » Ensure that all specifications and legal constraints specifically with regards to the environment are highlighted to the Contractor(s) so that they are aware of these.
- » Ensure that Amakhala Emoyeni Renewable Energy (Pty) Ltd and its Contractor(s) are made aware of all stipulations within the EMPr.
- » Ensure that the EMPr is correctly implemented throughout the project by means of site inspections and meetings. This will be documented as part of the site meeting minutes.
- » Be fully conversant with the Environmental Impact Assessment for the project, and all reports associated with the subsequent amendments of the WEF, the EMPr, the conditions of the Environmental Authorisation and its amendments, and all relevant environmental legislation.

#### The Site Manager (Amakhala Emoyeni Renewable Energy (Pty) Ltd's On-site Representative) will:

- » Be fully knowledgeable with the contents of the Environmental Impact Assessment.
- » Be fully knowledgeable with the contents and conditions of the Environmental Authorisation and its subsequent amendments.

- » Be fully knowledgeable with the contents of the Environmental Management Programme.
- » Be fully knowledgeable with the contents of all relevant environmental legislation and ensure compliance with these.
- » Have overall responsibility of the EMPr and its implementation.
- » Conduct periodic and scheduled audits to ensure compliance to the EMPr.
- » Ensure there is communication with the Project Manager, the Environmental Control Officer and relevant discipline Engineers on matters concerning the environment.
- » Ensure that no actions are taken which will harm or may indirectly cause harm to the environment and take steps to prevent pollution on the site.
- » Confine activities to the demarcated construction site.

**The Environmental Control Officer (ECO) will** be responsible for monitoring, reviewing and verifying compliance by the Contractor with the environmental specification. Accordingly, the ECO will:

- » Be fully knowledgeable with the contents of the Environmental Impact Assessment Report and all related reports.
- » Be fully knowledgeable with the conditions of the Environmental Authorisation (once issued).
- » Be fully knowledgeable with the contents with the Environmental Management Programme and all updated versions thereof.
- » Be fully knowledgeable on all relevant environmental legislation and ensure compliance with them.
- » Ensure that the contents of this document are communicated to the Contractor site staff and that the Site Manager and Contractor are constantly made aware of the contents through discussion and meetings.
- » Ensure that the compliance of the EMPr is monitored through regular and comprehensive inspection of the site and surrounding areas.
- » Ensure that if the EMPr conditions or specifications are not followed then appropriate measures are undertaken to address this.
- » Monitoring and verification must be implemented to ensure that environmental impacts are kept to a minimum, as far as possible.
- » Ensure that the Site Manager has input into the review and acceptance of construction methods and method statements.
- » Ensure that activities on site comply with all relevant environmental legislation.
- » Ensure that a removal is ordered of any person(s) and/or equipment responsible for any contravention of the specifications of the EMPr.
- » Ensure that the compilation of progress reports for submission to the Project Manager, with input from the Site Manager, takes place on a regular basis, including a final post-construction audit.
- » Ensure that there is communication with the Site Manager regarding the monitoring of the site.
- » Ensure that any non-compliance or remedial measures that need to be applied are reported.

**Contractors and Service Providers:** All contractors (including sub-contractors and staff) and service providers are ultimately responsible for:

- » Ensuring adherence to the environmental management specifications.
- » Ensuring that Method Statements are submitted to the Site Manager (and ECO) for approval before any work is undertaken. Any lack of adherence to this will be considered as non-compliance to the specifications of the EMPr.
- » Ensuring that any instructions issued by the Site Manager on the advice of the ECO are adhered to.
- » Ensuring that a report is tabled at each site meeting, which will document all incidents that have occurred during the period before the site meeting.
- » Ensuring that a register is kept in the site office, which lists all non-compliances issued by the ECO.
- » Ensuring that a register of all public complaints is maintained.
- » Ensuring that all employees, including those of sub-contractors receive environmental awareness training before the commencement of construction in order that they can constructively contribute towards the successful implementation of the EMPr (i.e. ensure their staff are appropriately trained as to the environmental obligations).

**Contractor's Safety, Health and Environment Representative:**

The Contractor's Safety, Health and Environment (SHE) Representative, employed by the Contractor, is responsible for managing the day-to-day on-site implementation of this EMP, and for the compilation of regular (usually weekly) Monitoring Reports. In addition, the SHE must act as liaison and advisor on all environmental and related issues and ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager and Contractor. In some instances, a separate Environmental Officer (EO) may be appointed to support this function.

The Contractor's Safety, Health and Environment Representative and/or Environmental Officer must:

- » Be well versed in environmental matters.
- » Understand the relevant environmental legislation and processes.
- » Understand the hierarchy of Environmental Compliance Reporting, and the implications of Non-Compliance.
- » Know the background of the project and understand the implementation programme.
- » Be able to resolve conflicts and make recommendations on site in terms of the requirements of this Specification.
- » Keep accurate and detailed records of all EMP-related activities on site.

**6.3. Objectives**

In order to meet this overall goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

***OBJECTIVE: Site establishment and securing the site***

Site establishment is the first activity which is to be undertaken within the construction phase. The Contractor must take all reasonable measures to ensure the safety of the public in the surrounding area. Where the public could be exposed to danger by any of the works or site activities, the Contractor must, as appropriate, provide suitable flagmen, barriers and/or warning signs in English, Afrikaans, and any other relevant local languages, all to the approval of the Project Manager.

<b>Project component/s</b>	Project components affecting the objective: » wind turbines » access roads
<b>Potential Impact</b>	» Hazards to landowners and public » Security of materials » Substantially increased damage to sensitive vegetation
<b>Activities/risk sources</b>	» Open excavations (foundations and cable trenches) » Movement of construction vehicles in the area and on-site
<b>Mitigation: Target/Objective</b>	» To secure the site against unauthorised entry » To protect members of the public/landowners/residents

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Secure site, working areas and excavations in an appropriate manner, as agreed with the ECO.	Contractor	Erection: during site establishment Maintenance: for duration of Contract
Where necessary to control access, fence and secure area.	Contractor	Erection: during site establishment Maintenance: for duration of Contract



Mitigation: Action/control	Responsibility	Timeframe
All staff employed during construction must sign a daily register to ensure no collection of animal species occur.	Contractor	Construction
Fence and secure Contractor's equipment camp.	Contractor	Erection: during site establishment Maintenance: for duration of Contract
Minimise natural or semi-natural vegetation clearance associated with site establishment activities	Contractor	Site establishment
Restrict construction activities to post-dawn and pre-dusk.	Contractor	Site establishment and Construction
Construction must be undertaken in the shortest time practical.	Contractor	Construction
All development footprints for roads, buildings, underground cables, laydown areas and turbine footings must be appropriately fenced off and clearly indicated with flags and/or danger tape strips. There is to be no disturbance outside these demarcated areas.	Contractor	Erection: during site establishment Maintenance: for duration of Contract
Establish the necessary ablution facilities with chemical toilets. Provide adequate sanitary facilities and ablutions for construction workers (1 toilet per every 15 workers) at appropriate locations on site.	Contractor	Erection: during site establishment Maintenance: for duration of Contract
Ablution or sanitary facilities must not be located within 100 m from a 1:100-year flood line including water courses, wetlands or within a horizontal distance of less than 100 m, whichever is applicable	Contractor	During site establishment, construction and maintenance
Supply adequate waste collection bins at site where construction is being undertaken.	Contractor	Erection: during site establishment Maintenance: for duration of Contract within a particular area

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No unnecessary environmental impacts associated with site established</li> <li>» Site is secure and there is no unauthorised entry</li> <li>» No members of the public/ landowners injured</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» An incident reporting system will be used to record non-conformances to the EMP</li> <li>» ECO to monitor all construction areas on a continuous basis until all construction is completed; immediate report backs to site manager in terms of non-conformances recorded.</li> </ul>

***OBJECTIVE: Avoid the potential impacts on family structures and social networks associated with presence of construction workers from outside the area***

The presence of construction workers poses a potential risk to family structures and social networks. While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on local communities. The most significant negative impact is associated with the disruption of existing family structures and social networks. This risk is linked to potentially risky behaviour of male construction workers, including:

- » An increase in alcohol and drug use
- » An increase in crime levels
- » An increase in teenage and unwanted pregnancies
- » An increase in prostitution

- » An increase in sexually transmitted diseases (STDs)

<b>Project component/s</b>	Construction and establishment activities associated with the establishment of the wind energy facility, including infrastructure etc.
<b>Potential Impact</b>	The presence of construction workers who live outside the area and who are housed in local towns can impact on family structures and social networks.
<b>Activities/risk sources</b>	Construction workers can impact negatively on family structures and social networks, especially in small, rural communities.
<b>Mitigation: Target/Objective</b>	To avoid and or minimise the potential impact of construction workers on the local community. This can be achieved by maximising the number of locals employed during the construction phase and minimising the number of workers housed on the site.

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Identify local contractors who are qualified to undertake the required work	Amakhala Renewable Energy (Pty) Ltd	Tender stage Pre-construction
Tender documents for contractors must include conditions set out in the Social Impact Assessment (SIA), including transport of workers home over weekends, transportation of workers home on completion of construction phase, establishment of Monitoring forum etc.	Amakhala Renewable Energy (Pty) Ltd	Tender stage Pre-construction
Ensure that 80% of the low-skilled workers are sourced from the local area where possible and reasonable (there are practical constraints such as the amount of suitable work force that is available in the area). This must be included in the tender documents. Construction workers should be recruited from the local area in and around the towns of Cookhouse, Bedford and Somerset East. Construction workers (of the local workers comprising the proposed quota) must be able to provide proof of having lived in the area for five years or longer.	Amakhala Renewable Energy (Pty) Ltd and Contractors	Pre-construction
Establish a Monitoring Forum consisting of representatives from the local community, local police, local farming community and the contractor prior to the commencement of the construction phase	Amakhala Renewable Energy (Pty) Ltd	Prior to commencement of construction
Develop a Code of Conduct to cover the activities of the construction workers housed on the site. Ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct. Construction workers must attend a brief session before they commence activities. The aim of the briefing session is to inform them of the rules and regulations governing activities on the site as set out in the Code of Conduct.	Amakhala Renewable Energy (Pty) Ltd / Contractors	Prior to commencement of construction

<b>Performance Indicator</b>	» Employment policy and tender documents that sets out local employment and targets completed before construction phase commences.
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	<ul style="list-style-type: none"> <li>» 80% of semi and unskilled labour locally sourced where possible / practical.</li> <li>» Construction workers (of the local workers comprising the proposed quota) employed have proof that they have lived in the area for five years or longer.</li> <li>» Monitoring Forum set up prior to implementation of construction phase.</li> <li>» Code of Conduct drafted before commencement of construction phase</li> <li>» Briefing session with construction workers held at outset of construction phase.</li> </ul>
<b>Monitoring</b>	» ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

***OBJECTIVE: Maximise local employment and business opportunities associated with the construction phase***

The construction phase is expected to extend over a period of 12-18 months and create approximately 200 employment opportunities. The work associated with the construction phase will be undertaken by contractors and will include the establishment of the access roads, water course crossings and services and the erection of the wind turbines. A separate EA and EMPr (approved) for the water crossings is available with its EMPR. It is anticipated that approximately 25% of opportunities will be available to skilled personnel (engineers, technicians, management and supervisory), 35% to semi-skilled personnel (drivers, equipment operators), and 40% to low skilled personnel (construction labourers, security staff etc). Due to the low education and skills levels in the area, the majority of opportunities for residents in the local towns of Cookhouse, Bedford and Somerset East are likely to be limited to the low skilled category. The majority of the employment opportunities are likely to be associated with the contractors appointed to construct the facility and associated infrastructure. In this regard the majority of contractors use their own staff and this will limit the potential for direct employment opportunities for locals during the construction phase.

<b>Project component/s</b>	Construction and establishment activities associated with the establishment of the wind energy facility, including infrastructure etc.
<b>Potential Impact</b>	The opportunities and benefits associated with the creation of local employment and business should be maximised.
<b>Activities/risk sources</b>	The employment of outside contractors to undertake the work and who make use of their own labour will reduce the employment and business opportunities for locals. Employment of local labour will maximise local employment opportunities.
<b>Mitigation: Target/Objective</b>	Amakhala Emoyeni Renewable Energy (Pty) Ltd, in discussions with various stakeholders should aim to employ a minimum of 80% of the low-skilled workers from the local area where possible and reasonable. This should also be made a requirement for all contractors. Amakhala Emoyeni Renewable Energy (Pty) Ltd must also develop a database of local BEE service providers

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Ensure that a minimum of 80% of the low-skilled workers are sourced from the local area as far as possible.	Amakhala Emoyeni Renewable Energy (Pty) Ltd and Contractors	Before construction phase commences.
Where required, implement appropriate training and skills development programmes prior to the initiation of the construction phase to ensure that 80% target is met.	Amakhala Emoyeni Renewable Energy (Pty) Ltd and Contractors	Prior to the initiation of the construction phase.
Develop a database of local BEE service providers and ensure that they are informed of tenders and job opportunities.	Amakhala Emoyeni Renewable Energy	Before construction phase commences.

Mitigation: Action/control	Responsibility	Timeframe
	(Pty) Ltd and Contractors	
Identify potential opportunities for local businesses in terms of involvement with construction activities.	Amakhala Emoyeni Renewable Energy (Pty) Ltd and Contractors	Tender Design and Review stage

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Employment and business policy document that sets out local employment and targets completed before construction phase commences.</li> <li>» 80% of semi and unskilled labour locally sourced where possible / practical.</li> <li>» Database of potential local BEE services providers in place before construction phase commences.</li> <li>» Skills audit to determine need for training and skills development programme undertaken within 1 month of commencement of construction phase.</li> </ul>
<b>Monitoring</b>	» Appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

***OBJECTIVE: To avoid and/or minimise the potential impact of the activities during the construction on the safety of local communities and the potential loss of stock and damage to farm infrastructure***

The presence of construction workers poses a potential risk to family structures and social networks in the area (both on farms and in the local towns of Cookhouse and Bedford). While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on the local community. In this regard the most significant negative impact is associated with the disruption of existing family structures and social networks.

<b>Project component/s</b>	Construction and establishment activities associated with the establishment of the wind energy facility, including infrastructure etc.
<b>Potential Impact</b>	Impact on safety of farmers and communities (increased crime etc) and potential loss of livestock due to stock theft by construction workers and also damage to farm infrastructure, such as gates and fences.
<b>Activities/risk sources</b>	The presence of construction workers on the site can pose a potential safety risk to local farmers and communities and may also result in stock thefts. The activities of construction workers may also result in damage to farm infrastructure.
<b>Mitigation: Target/Objective</b>	To avoid and or minimise the potential impact on local communities and their livelihoods.

Mitigation: Action/control	Responsibility	Timeframe
Housing of workers on site limited to the use of existing and available serviced facilities/infrastructure.	Amakhala Emoyeni Renewable Energy (Pty) Ltd and Contractors	Duration of construction

Mitigation: Action/control	Responsibility	Timeframe
Establish a Monitoring Forum with the adjacent farmers and develop a Code of Conduct for construction workers.	Amakhala Emojeni Renewable Energy (Pty) Ltd and Contractors	Duration of construction
Ensure that construction workers who are found guilty of breaching the Code of Conduct are dismissed. All dismissals must be in accordance with South African labour legislation.	Contractors	Construction phase
On completion of the construction phase, all construction workers must be transported back to their place of origin within two days of their contract ending. The costs of transportation must be borne by the contractor.	Contractor	Conclusion of construction
Compensate farmers / community members at full market related replacement cost for any proven losses, such as livestock, damage to infrastructure etc associated with the construction of the facility.	Contractors	Duration of construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Community Monitoring Forum in place before construction phase commences.</li> <li>» Code of Conduct developed and approved prior to commencement of construction phase.</li> <li>» All construction workers made aware of Code of Conduct within first week of being employed.</li> <li>» Compensation claims settled within 90 days of claim being verified by Community Monitoring Forum.</li> </ul>
<b>Monitoring</b>	» Appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

***OBJECTIVE: To avoid and or minimise the potential impact on current and future farming activities during the construction phase***

The final footprint of disturbance associated with the facility is a small percentage of the farmland where turbines will be located and is linked to the foundation of the individual wind turbines, services roads. The impact on farmland associated with the construction phase can be mitigated by minimising the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase.

<b>Project component/s</b>	Construction phase activities associated with the establishment of the wind energy facility and associated infrastructure.
<b>Potential Impact</b>	The footprint of the wind energy facility and associated infrastructure will result in a loss of land that will impact on farming activities on the site.
<b>Activities/risk sources</b>	The footprint taken up by the wind energy facility and associated infrastructure.
<b>Mitigation: Target/Objective</b>	To minimise the loss of land taken up by the wind energy facility and associated infrastructure and to enable farming activities to continue where possible, specifically grazing.

Mitigation: Action/control	Responsibility	Timeframe
Minimise the footprint of the wind energy facility and the associated infrastructure.	Amakhala Emojeni Renewable Energy (Pty) Ltd and Contractor	Duration of construction

Mitigation: Action/control	Responsibility	Timeframe
Investigate the possibility of allowing farmers in the area to continue to use the site for their agricultural activities	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Duration of construction
Compile and implement a rehabilitation plan to ensure rehabilitation of disturbed areas on completion of the construction phase.	Amakhala Emoyeni Renewable Energy (Pty) Ltd and specialist	Construction and post-construction

<b>Performance Indicator</b>	» No complaints regarding impacts on farming activities.
<b>Monitoring</b>	» ECO to monitor indicators listed above to ensure that they have been met for the construction phase.

### **OBJECTIVE: Noise control**

Projected noise levels during construction of the Wind Energy Facility were modelled using the methodology as proposed by SANS 10357:2004. The resulting future noise projections indicated that the construction activities as modelled for the worst-case scenario would not comply with both the Noise Control Regulations (GN R154) as well as the SANS 10103:2004 guidelines (projected noise levels higher than the acceptable night rating level).

Various construction activities would be taking place during the development of the facility and there exists a risk that some of these activities could have a noise impact on surrounding residents. The significance of this noise impact was defined to be of a medium significance. However, mitigation measures were proposed that would reduce the significance to a more acceptable low level.

<b>Project component/s</b>	Construction of infrastructure, including but not limited to: <ul style="list-style-type: none"> <li>» turbine system (foundation, tower, nacelle and rotor).</li> <li>» access roads and</li> <li>» electrical power cabling.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Increased noise levels at potentially sensitive receptors</li> <li>» Potentially changing the acceptable land use capability</li> </ul>
<b>Activity/risk source</b>	Any construction activities taking place within 500 meters from potentially sensitive receptors (PSR)
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Ensure equivalent A-weighted noise levels below 45 dBA at potentially sensitive receptors.</li> <li>» Ensure that maximum noise levels at potentially sensitive receptors be less than 65 dBA.</li> <li>» Ensure acceptable noise levels at surrounding stakeholders and potentially sensitive receptors.</li> <li>» Ensuring compliance with the Noise Control Regulations</li> </ul>

Mitigation: Action/control	Responsibility	Timeframe
Establish a line of communication and notify all stakeholders and potentially sensitive receptors of the means of registering any issues, complaints or comments.	Environmental Officer or Community Liaison Officer	All phases of project
Notify potentially sensitive receptors about work to take place at least 2 days before the activity in the vicinity (within 500) of the potentially	Contractor Environmental Officer	Duration of construction

Mitigation: Action/control	Responsibility	Timeframe
sensitive receptors is to start. The following information to be presented in writing: » Description of Activity to take place » Estimated duration of activity » Working hours » Contact details of responsible party		At least 2 days, but not more than 5 days before activity is to commence
Ensure that all construction equipment is maintained and fitted with the required noise abatement equipment.	Environmental Officer	Weekly inspection
The construction crew must abide by the local by-laws regarding noise.	Contractor Environmental Officer	Duration of construction phase
Where possible construction work must be undertaken during normal working hours (06H00 – 18H00), from Monday to Saturday. If agreements can be reached (in writing) with the surrounding (within a 500 m distance) potentially sensitive receptors, these working hours can be extended.	Contractor	As required

<b>Performance Indicator</b>	» Equivalent A-weighted noise levels below 45 dBA at potentially sensitive receptors (8 hours). » Ensure that maximum noise levels at potentially sensitive receptors are less than 65 dBA. » No noise complaints are registered.
<b>Monitoring</b>	» Quarterly noise monitoring by an Approved Noise Inspection Authority. Noise monitoring to be conducted 500 meters downwind from all noisy activities, or at potentially sensitive receptors when work is taking place within 500 meters from a potentially sensitive receptor. Monitoring to take place every time that a noise complaint is registered.

### ***OBJECTIVE: Management of dust and emissions to air***

During the construction phase, limited gaseous or particulate emissions are anticipated from exhaust emissions from construction vehicles and equipment on-site, as well as vehicle entrained dust from the movement of vehicles on the main and internal access roads.

<b>Project component/s</b>	Construction and establishment activities associated with the establishment of the wind energy facility and associated infrastructure.
<b>Potential Impact</b>	» Dust and particulates from vehicle movement to and on-site, foundation excavation, road construction activities, road maintenance activities, temporary stockpiles, and vegetation clearing affecting the surrounding residents and visibility. » Release of minor amounts of air pollutants (for example NO <sub>2</sub> , CO and SO <sub>2</sub> ) from vehicles and construction equipment.
<b>Activities/risk sources</b>	» Clearing of vegetation and topsoil » Excavation, grading, scraping » Transport of materials, equipment and components on internal access roads » Re-entrainment of deposited dust by vehicle movements » Wind erosion from topsoil and spoil stockpiles and unsealed roads and surfaces » Fuel burning vehicle engines

<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To ensure emissions from all vehicles are minimised, where possible, for the duration of the construction phase</li> <li>» To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements for the duration of the construction phase</li> </ul>
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<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Roads must be maintained to a manner that will ensure that dust from road or vehicle sources is not visibly excessive. Ensure that damage to roads is repaired on completion of construction phase.	Contractor	Site establishment; Duration of construction
Appropriate dust suppressant must be applied on all exposed areas and stockpiles as required to minimise/control airborne dust.	Contractor	Duration of contract
No stockpiling or storage may occur outside of the development footprint area and areas that have been inspected for conservation important species.	Contractor	Duration of contract
Haul vehicles moving outside the construction site carrying material that can be wind-blown must be covered with tarpaulins.	Contractor	Duration of contract
Speed of construction vehicles must be restricted. Speed limit of 30km/h for construction vehicles are recommended.	Contractor	Duration of contract
Disturbed areas must be re-vegetated as soon as practicable once construction is completed in an area.	Contractor	At completion of the construction phase
Construction vehicles and equipment must be maintained in a road-worthy condition at all times.	Contractor	Duration of contract
All construction vehicles must adhere to clearly defined and demarcated roads. No driving outside of the demarcated roads must be allowed.	Contractor	Duration of contract
If monitoring results or complaints indicate inadequate performance against the criteria indicated, then the source of the problem must be identified, and existing procedures or equipment modified to ensure the problem is rectified.	Contractor	Duration of contract

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No complaints from affected residents or community regarding dust or vehicle emissions.</li> <li>» Dust suppression measures on roads implemented for all heavy vehicles that require such measures during the construction phase commences.</li> <li>» Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed.</li> <li>» Road worthy certificates in place for all heavy vehicles at outset of construction phase and up-dated on a monthly basis.</li> </ul>
<b>Monitoring</b>	<p>Monitoring must be undertaken to ensure emissions are not exceeding the prescribed levels via the following methods:</p> <ul style="list-style-type: none"> <li>» Visual daily inspections of dust generation by construction activities throughout the construction phase.</li> <li>» Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Project Manager.</li> <li>» A complaints register must be maintained, in which any complaints from residents/the community will be logged. Complaints will be investigated and, where appropriate, acted upon.</li> <li>» An incident reporting system must be used to record non-conformances to the EMP.</li> </ul>



**OBJECTIVE: Protection of flora and fauna / Minimisation of development footprint**

Impacts on vegetation at the construction stage are expected to be mainly as a result of direct permanent loss of vegetation in development footprint areas. Impacts on fauna during construction are expected to be as a result of disturbance and habitat destruction. Although some areas of high ecological sensitivity have been identified on site, the development footprints will not impact on any ecological "no go" habitats or areas.

A number of plant species protected under the provincial legislation are located on the properties (e.g. *Tritonia strictifolia* and *Mestaklema tuberosum*). Over 180 plant species were identified during the 2022 final walkthrough fieldwork (Appendix A1). The Savannah Environmental (2010) report only list one species (*Encephalartos lehmanii*, the Karoo cycad). Many of the geophytic plant species have very short windows in their phenology (leaves, flowers, fruit) and hence were not always evident. There is a low probability of encountering the Near Threatened Karoo cycad on site. Although there is suitable habitat, the plant was last recorded in 1964 on site and, in all likelihood, has already been removed from the site by collectors.

Large areas of the property are experiencing several stages of bush encroachment (e.g. by *Vachellia karoo*) which will require a Bush Encroachment Management Plan. The excessive overgrazing has led to large areas of the property exhibiting disproportionately high % cover for the karroid bush species (*Chrysochoma ciliata*, *Pentzia incana*, *Erioccephalus* sp., *Ruschia* spp. and *Stachys scabrida*).

The Biodiversity Company (TBC, 2020), using the IUCN Red List Spatial Data (IUCN 2017) and MammalMap (Animal Demography Unit (ADU) 2020), listed 81 mammal species that could occur in the area. On a regional basis, this represents one endangered four vulnerable and six near threatened (NT) mammals (SANBI, 2016). On a global scale, one is endangered (*Redunca fulvorufula*, Mountain Reedbuck), three are vulnerable (*Felis nigripes*, Black-footed Cat; *Mystromys albicaudatus*, White-tailed Rat; *Panthera pardus*, Leopard) and five are near threatened (*Aonyx capensis*, Cape Clawless Otter; *Eidolon helvum*, African Straw-colored Fruit Bat; *Hydrictis maculicollis*, Spotted-necked Otter; *Parahyaena brunnea*, Brown Hyaena; *Pelea capreolus*, Grey Rhebok).

The area is likely to harbour as many as 70 species of reptile when you take into consideration museum records, the ADU and various other databases. Although this is more species than originally assessed, there are no species of conservation concern. Two species (*Nucras taeniolata* and *Chamaesura aenea*) that could occur on the property and that were recently assessed as near threatened (SARCA, 2014), have since been re-evaluated as least concern.

There is a single amphibian species of conservation concern that may occur in habitats within the study area, the near threatened Giant Bullfrog (*Pyxicephalus adspersus*). Likely breeding sites are the edges of small farm dams in watercourses on site. They may forage in surrounding vegetation. Although the animal has not been encountered recently in the area, it is a species that must be considered as potentially occurring in the area when it comes to building infrastructure near wetlands, drainage lines and dams (FitzPatrick Institute of African Ornithology 2022).

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» wind turbines</li> <li>» access roads</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Impacts on or loss of indigenous natural vegetation due to construction activities</li> <li>» Impacts on soil</li> <li>» Loss of topsoil</li> <li>» Loss of individuals of the protected / near threatened plant species (Karoo Cycad)</li> <li>» Loss of habitat suitable for the Giant Bullfrog</li> </ul>
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Site preparation and earthworks</li> <li>» Construction-related traffic</li> <li>» Foundations or plant equipment installation</li> </ul>

	<ul style="list-style-type: none"> <li>» Mobile construction equipment</li> <li>» Dumping or damage by construction equipment outside of demarcated construction areas.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To retain natural vegetation in the highly sensitive areas the site</li> <li>» To minimise footprints of disturbance of vegetation/habitats on-site</li> <li>» To minimise loss of indigenous vegetation</li> <li>» No alien plants within project control area</li> <li>» No loss of species of conservation concern</li> </ul>

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Construction staff must undergo an environmental induction at the start of the project to ensure that they are aware of the appropriate response to the presence of fauna at the site and do not kill or harm fauna such as snakes or other reptiles which are often feared.	Contractor	Pre-construction and Construction
Areas to be cleared must be clearly marked on-site to eliminate the potential for unnecessary clearing. Disturbance of indigenous vegetation must be kept to a minimum. Where disturbance is unavoidable, disturbed areas must be rehabilitated as quickly as possible.	Contractor in consultation with Specialist	Pre-construction
A pre-construction walk through of the final development footprint should be updated by a registered ecologist (Appendix A1)	Amakhala Emoyeni Renewable Energy (Pty) Ltd in consultation with Specialist	Pre-construction
Following the pre-construction walk through a Search and Rescue and Rehabilitation Management Plan should be updated, incorporating the findings and results obtained from the walk-through report.	Amakhala Emoyeni Renewable Energy (Pty) Ltd in consultation with Specialist	Pre-construction and Construction
Keep clearing of natural and semi-natural vegetation to a minimum.	Amakhala Emoyeni Renewable Energy (Pty) Ltd Contractor	Construction
Restrict construction activities to post-dawn and pre-dusk.	Amakhala Emoyeni Renewable Energy (Pty) Ltd Contractor	Construction
All construction vehicles should adhere to clearly defined and demarcated roads. No driving outside of the demarcated roads must be allowed.	Contractor EO	Construction
No stockpiling or storage may occur outside of the development footprint area and areas that have been inspected for conservation important species.	Contractor EO	Construction
Prior to construction, once all the areas where topsoil will be removed or areas that will be transformed have been demarcated, the contractor will be responsible to remove as many bulbous species, succulents and small	Contractor EO	Pre-construction

Mitigation: Action/control	Responsibility	Timeframe
indigenous shrubs from the topsoil as possible. These should be transplanted as per plant rescue targets set in the updated Search and Rescue and Rehabilitation Management Plan.		
Plant species that must be located and replanted include ALL RED DATA species: o Euphorbia globosa o Euphorbia meloformis	Amakhala Emoyeni Renewable Energy (Pty) Ltd in consultation with Specialist	Pre-construction and Construction
All search and rescue of the above mentioned species should be recorded and include: o amount of species o date when removed and replanted o GPS coordinates of new locations o Photographs as records of new location. None of these species may be collected for other purposes than to be reinstated outside of the development footprint.	Amakhala Emoyeni Renewable Energy (Pty) Ltd in consultation with Specialist	Pre-construction and Construction
Plant species that should be located and replanted as part of the rehabilitation process, include All PROTECTED PLANTS.	Amakhala Emoyeni Renewable Energy (Pty) Ltd in consultation with Specialist	Pre-construction
Due to the nature of many of the plants, especially Red Data species, a suitable qualified professional person/company must be appointed to undertake the plant search and rescue operation. No Red Data and Protected Plants may be disturbed/destroyed/removed and/or transplanted without the necessary permits from the relevant authority (Eastern Cape Department of Economic Development, Environmental Affairs and Tourism).	Amakhala Emoyeni Renewable Energy (Pty) Ltd in consultation with Specialist	Pre-construction
The moderately tall Pappia capensis tree species are regarded as a valuable and important feature within the development area and are a vital element to biodiversity. As such, these larger tree species should be avoided through micro-placing of the turbines.	Amakhala Emoyeni Renewable Energy (Pty) Ltd in consultation with Specialist	Pre-construction
An Invasive Alien Plant Management Plan should be compiled with special emphasis on the management of the invasive Opuntia species, especially O. aurantiaca.	Amakhala Emoyeni Renewable Energy (Pty) Ltd in consultation with Specialist	Pre-construction
Measures to avoid the import and export of reproductive/regenerative material includes: Vehicle/machinery and footwear inspections- o Ideally, a strict inspection regime should be implemented before and	Contractor EO	Construction

Mitigation: Action/control	Responsibility	Timeframe
<p>after all travel, especially when travelling to and from areas known to be infested with weeds.</p> <p>o Risks from alien invasives does not only arise from invasives present within the footprint area, but also from alien invasives along the verges of the major transport routes, especially invasive grasses and smaller weeds.</p> <p>o Checklist to follow before entering the project area and again before leaving an area with alien invasive plants should be compiled and implemented.</p>		
<p>Checklist to follow before entering the project area and again before leaving an area with alien invasive plants should be compiled and implemented.</p>	Contractor EO	Construction
<p>Areas to be cleared must be clearly marked on-site to eliminate the potential for unnecessary clearing. Disturbance of indigenous vegetation must be kept to a minimum. Where disturbance is unavoidable, disturbed areas must be rehabilitated as quickly as possible.</p>	Contractor consultation Specialist	in with Pre-construction
<p>All staff employed during construction must sign a daily register to ensure no collection of animal species occur.</p>		
<p>No construction residence may be set up on site</p>		
<p>If any cycads are found by personnel on site, the position must be reported to the conservation authorities and steps taken to avoid damaging any plants. If damage to plants is unavoidable, then a reputable organisation must be contacted to remove the plants to safety and record relevant information about the plant and the habitat in which it was found. A permit will be required for removal of the plant.</p>	EO	Site establishment & duration of contract
<p>Determine densities and localities of Karoo Cycad within the project area before and after construction. Record losses of individual plants.</p>	Amakhala Renewable Energy (Pty) Ltd in consultation with Specialist	Pre-construction / post construction
<p><u>Where footprints cannot be moved, all protected species and species of conservation concern need to be spatially identified and relocated (e.g. E. meloformis). Areas must be demarcated There may be a need for to prevent vehicle traffic and storage of materials to protect identified species of conservation concern.</u></p>	Contractor EO	Site establishment & duration of contract
<p>Avoid impacts on dams and wetland habitat identified as being suitable for the Giant Bullfrog.</p>	Contractor EO	Site establishment & duration of contract
<p>No personnel on site may cause harm to any individual Giant Bullfrog <u>when spotted</u>. Environmental orientation of personnel must include information on identifying this species.</p>	Contractor EO	Site establishment & duration of contract

Mitigation: Action/control	Responsibility	Timeframe
Map extent of suitable habitat for Giant Bullfrog before construction. Identify project components that infringe on giant Bullfrog habitat. After construction, record any disturbance to habitat in terms of extent and potential effects on remaining habitat. <u>Although the animal has not been encountered recently in the area, it is a species that must be considered as potentially occurring in the area when it comes to building infrastructure near wetlands, drainage lines and dams</u>	Amakhala Emoeyeni Renewable Energy (Pty) Ltd in consultation with Specialist	Pre-construction / post construction
Tortoises, girdled lizards etc. are especially prone to illegal collection and the appointed environmental control officer (ECO) / environmental officer (EO) as well as site managers should be aware of this potential threat and monitor all personnel moving in and out of the development area. No collection of tortoises and lizards may be allowed.	ECO EO Site Manager	Site establishment & duration of contract
<u>Where possible, existing road networks should be utilised to ensure that least possible damage is being made to the environment.</u> Where possible, locate any crossings at sites where there are existing road crossings.	Contractor	Site establishment & duration of contract
<u>Wherever possible, roads and turbines should avoid bushclumps and rocky outcrops. In many cases the use of the existing tracks (close by) will save a 3m width of biodiversity along all the areas where old roads are proposed for use.</u>	Contractor EO	Site establishment & duration of contract
The extent of clearing and disturbance to the native vegetation must be kept to a minimum so that impact on flora and fauna is restricted.	Contractor	Site establishment & duration of contract
Construction activities must be restricted to demarcated areas so that impact on flora and fauna is restricted.	Contractor	Site establishment & duration of contract
Unnecessary impacts on surrounding natural vegetation must be avoided, e.g. driving around in the veld. Use access roads only	Contractor	Site establishment & duration of contract
Roads must be aligned away from steep slopes and drainage lines as far as possible.	Contractor	Design; Duration of construction
Avoid creating conditions in which alien plants may become established: <ul style="list-style-type: none"> <li>» Keep disturbance of indigenous vegetation to a minimum</li> <li>» Rehabilitate disturbed areas as quickly as possible once construction in an area is complete</li> <li>» Do not import soil from areas with alien plants</li> <li>» Undertake vehicle/machinery and footwear inspection: <ul style="list-style-type: none"> <li>○ Ideally, a strict inspection regime must be implemented before and after all travel, especially when travelling to and from areas known to be infested with weeds.</li> <li>○ Risk from alien invasives does not only arise from invasives present within the footprint area, but also from alien invasives along the verges of the major transport routes, especially invasive grasses and smaller weeds.</li> </ul> </li> </ul>	Construction team, management (environmental officer)	Construction & Operation

Mitigation: Action/control	Responsibility	Timeframe
<ul style="list-style-type: none"> <li>○ Checklist to follow before entering the project area and again before leaving an area with alien invasive plants should be compiled and implemented.</li> </ul>		
Establish an ongoing monitoring programme to detect and quantify any alien species that may become established and identify the problem species (as per Conservation of Agricultural Resources Act)	Construction team, management (environmental officer)	Construction & Operation
If any alien invasive species are detected then the distribution of these should be mapped (GPS co-ordinates of plants or concentrations of plants), number of individuals (whole site or per unit area), age and/or size classes of plants and aerial cover of plants. The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the project area.	Construction team, management (environmental officer)	Construction & Operation
Immediately control any alien plants that become established using registered control methods.	Construction team, management (environmental officer)	Construction & Operation
A site rehabilitation programme must be developed and implemented.	Contractor in consultation with Specialist	Duration of contract
<u>During the construction process, every effort should be made to reduce the destruction to termite mounds. Where this is not possible termite mounds must be dismantled in a way that does not damage the animals inside so that they can be recovered and moved clear of the construction site. This can be done with the snakes, lizards, rodents, and frogs that often frequent termite mounds for shelter. Termite mounds that contain burrows for larger mammals such as meerkats should be avoided as the destruction of these termite mounds could result in the demise of large family units.</u>	<u>Contractor</u>	<u>Pre-construction and Construction</u>
<u>Animal densities are highest in the rocky outcrops and drainage lines, meaning that every effort should be made to minimize impact to these areas.</u>	<u>Construction team, management (environmental officer)</u>	<u>Pre-construction and Construction</u>
<u>During design and planning of the road network, the use of contours to minimise traversing steep slopes must be considered to decrease runoff and storm water management (likely to increase with climate change predictions), but also limit ecological impact. Some roads need to take slight detours to minimise damage to the biodiversity-rich rock outcrops. A summary of the field ecological findings for the roads for Msenge WEF is attached in the <b>Terrestrial Pre-construction walkthrough report. ( Appendix A1- Table 2.13)</b></u>	<u>Construction team, management (environmental officer)</u>	<u>Pre-construction and Construction</u>
<u>The alien invader <i>D. megalotamica</i> appears to be concentrating at the base of the existing Eskom pylons ( <b> Appendix A1 - Figure 2.12 of the Terrestrial Pre-construction walkthrough report )</b> and is likely to</u>	<u>Construction team, management (environmental officer)</u>	<u>Pre-construction and Construction</u>

Mitigation: Action/control	Responsibility	Timeframe
spread quickly with the increased vehicle traffic during construction. These populations are isolated and should be treated as soon as possible.		

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Zero disturbance outside of designated work areas</li> <li>» Minimised clearing of existing/natural vegetation</li> <li>» Loss of natural vegetation equivalent to the exact footprint of the proposed project</li> <li>» Number of plants and aerial cover of plants within project area and immediate surroundings</li> <li>» No loss of habitat suitable for or individuals of the protected Giant Bullfrog</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Observation of vegetation clearing and soil management activities by ECO throughout construction phase</li> <li>» The environmental manager should be responsible for driving alien monitoring process.</li> <li>» Before construction, determine required number of hectares to accommodate footprint of proposed infrastructure and demarcate construction areas.</li> <li>» Annual audit during construction of project area and immediate surroundings by qualified ecologist. An incident reporting system will be used to record non-conformances to the EMP.</li> </ul>

### **OBJECTIVE: Protection of avifauna**

As per the final avifaunal walkthrough report (Appendix B1), the project site is classified as very high sensitivity for avifauna according to the Wind Theme. The classification is linked to the following: Within 50 km of Cape Vulture colonies, within 40 km of known Cape Vulture roosts sites, areas where susceptible large terrestrial birds were found to be present.

The Animal Species Theme classifies the project site as high and medium. These classifications are linked to the potential occurrence of Denham's Bustard *Neotis denhami* (Regionally Vulnerable), Black Harrier *Circus maurus* (Globally and Regionally Endangered) and Southern Black Korhaan *Afrotis afra* (Globally and Regionally Vulnerable).

The project site contains confirmed habitat for SCC as defined in the Protocol for the specialist assessment and minimum report content requirements for environmental impacts on avifaunal species by onshore wind energy generation facilities where the electricity output is 20MW or more (Government Gazette No. 43110 – 20 March 2020). It is important to note that Black Harrier *C. maurus* was only marginally recorded during the SABAP 2 atlassing period to date for the broader area (<https://sabap2.birdmap.africa>), and not during the field survey in March 2022. However, this species was recorded during vantage point monitoring conducted in 2010-2011 at the project site. It was identified as a locally resident or visiting raptor, foraging in or moving through the broader area, that will be vulnerable to collision and displacement impacts associated with a development of this kind. Both Ludwig's Bustard *N. ludwigii* and Denham's Bustard *N. denhami* have been recorded during the SABAP 2 surveys, the latter also observed during the field surveys in March 2022. Based on these, and observations of Blue Crane *Grus paradisea*, Secretary bird *Sagittarius serpentarius*, Cape Vulture *Gyps coprotheres*, Verreaux's Eagle *Aquila verreauxii* and Martial Eagle *Polemaetus bellicosus* made during the March 2022 surveys, the classification of high sensitivity for avifauna in the Animal Species Theme seems to be the most appropriate for the site.

The proposed facility is likely to have a moderate, long-term impact on the avifauna of the area, and may negatively affect key rare, red-listed and/or endemic species. The only confirmed priority species nest recorded is an active Secretary bird nest. The nest is 8.5km from the closest turbine and will therefore not impact on the lay-out. The most important negative impacts are likely to be on Cape Vultures, Denham's Bustards and Blue Cranes. These birds (and other priority species) may be disturbed by construction of the facility or lose foraging habitat to the construction footprint.

<b>Project component/s</b>	» wind energy facility (turbines)
<b>Potential Impact</b>	» Disturbance to or loss of birds as a result of collision with the turbine blades »
<b>Activity/risk source</b>	» Spinning turbine blades
<b>Mitigation: Target/Objective</b>	» More accurately determine the impact of the operating wind energy facility on priority bird species » Minimise impacts associated with collisions and electrocutions

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Carefully monitor the local avifauna pre- and post-construction, and implement appropriate additional mitigation as and when significant changes are recorded in the number, distribution or breeding behaviour of any of the priority species, or when collision or electrocution mortalities are recorded for any of the priority species.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Pre construction - Operation
Refine post-construction monitoring protocol in terms of results pre-construction. Periodically collate and analyse post-construction monitoring data. Review report on the full year of post-construction monitoring, and integrate findings into operational EMPr and broader mitigation scheme.	Amakhala Emoyeni Renewable Energy (Pty) Ltd / specialist	Construction and post construction
Minimise habitat destruction caused by the construction of the facility by keeping the lay-down areas as small as possible, building as few temporary roads as possible, and reducing the final extent of developed area to a minimum.	Amakhala Emoyeni Renewable Energy (Pty) Ltd; Environmental Manager	Construction
Minimising the disturbance impacts associated with the construction of the facility, by abbreviating construction time, scheduling activities around avian breeding and/or movement schedules, and lowering levels of associated noise.	Amakhala Emoyeni Renewable Energy (Pty) Ltd Environmental Manager	Construction
<u>It is recommended that a 200m turbine exclusion zone is implemented around all sources of surface water at the project site, as a precautionary measure against Cape Vultures and other SCC collisions</u>	<u>Amakhala Emoyeni Renewable Energy (Pty) Ltd</u>	<u>Pre construction - Operation</u>
<u>It is recommended that all internal medium voltage cables are buried if technically possible. Those sections where the medium voltage cable should preferably not be trenched due to technical or environmental reasons, but needs run on overhead poles, the proposed pole designs must be approved by the avifaunal specialist, to ensure that the designs are raptor friendly.</u>	<u>Amakhala Emoyeni Renewable Energy (Pty) Ltd / Avifaunal specialist</u>	<u>Construction</u>
<u>It is recommended that bird flight diverters are fitted to all internal overhead lines.</u>	<u>Amakhala Emoyeni Renewable Energy (Pty) Ltd</u>	<u>Construction - Operation</u>

<b>Performance Indicator</b>	» Minimal disturbance to avifaunal populations on the wind energy facility site
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	<ul style="list-style-type: none"> <li>» Regular provision of clearly worded, logical and objective information on the interface between the local avifauna and the authorised/operating wind energy facility</li> <li>» Clear and logical recommendations on why, how and when to institute mitigation measures to reduce avian impacts of the development, from pre-construction to operational phase</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Observation of avifaunal populations and incidence of injuries/death from collisions from turbine blades.</li> </ul>

### OBJECTIVE: Protection of bat species

The initial pre-construction bat monitoring for the proposed Msenge WEF was performed by IWS team members between December 2011 and April 2013 (NSS 2013, 2014). The project subsequently underwent an amendment, for which IWS performed a brief site survey / walkthrough during 21-22 May 2018. For the latest project amendment, IWS completed six additional months of pre-construction bat monitoring between 9 February and 10 June 2021 and between 28 September and 24 November 2021.

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» wind energy facility (turbines)</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Disturbance to or loss of bats as a result of collision with turbines and/or barotrauma.</li> <li>» Bat mortality and destruction of habitat / roosts.</li> </ul>
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Spinning turbine blades</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Minimise impacts associated with the turbines.</li> </ul>

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Minimize road impacts. Minimize the length and breadth of proposed roads, and thus minimize the clearing and disturbance of natural areas (including potential bat roosting habitat). Obtain a water use licence for each watercourse crossing	Amakhala Emoyeni Renewable Energy (Pty) Ltd Bat Specialist	Preconstruction - Construction
Minimize degradation of terrestrial habitat and water resources (potential bat roosting and foraging habitat). Implement and maintain effective invasive alien plant, stormwater, erosion, sediment, and dust control measures	Amakhala Emoyeni Renewable Energy (Pty) Ltd Bat Specialist	Construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Minimal additional disturbance on bat populations on the wind energy facility site.</li> <li>» Continued improvement of bat protection devices, as informed by the operational monitoring.</li> <li>» Regular provision of clearly worded, logical and objective information on the interface between the local bats and the proposed/ operating wind energy facility.</li> <li>» Clear and logical recommendations on why, how and when to institute mitigation measures to reduce bat impacts of the development, from pre-construction to operational phase.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Environmental manager to monitor turbine field for fatalities.</li> </ul>

### OBJECTIVE: To avoid and or minimise the potential risk of increased veld fires during the construction phase

The vegetation in the study area is known to be at risk of fire. The increased presence of people on the site could increase the risk of veld fires, particularly in the dry season.

<b>Project component/s</b>	Construction and establishment activities associated with the establishment of the wind energy facility and associated infrastructure
<b>Potential Impact</b>	Veld fires can pose a personal safety risk to local farmers and communities, and their homes, crops, livestock and farm infrastructure, such as gates and fences.
<b>Activities/risk sources</b>	The presence of construction workers and their activities on the site can increase the risk of veld fires.
<b>Mitigation: Target/Objective</b>	To avoid and or minimise the potential risk of veld fires on local communities and their livelihoods.

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Ensure that open fires on the site for cooking or heating are not allowed except in designated areas.	Contractor	Duration of construction
Provide adequate fire fighting equipment onsite.	Contractor	Duration of construction
Provide fire-fighting training to selected construction staff.	Contractor	Duration of construction
Compensate farmers / community members at full market related replacement cost for any losses, such as livestock, damage to infrastructure etc for losses associated with fires resulting from negligence or non-compliance.	Contractor	As required

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Designated areas for fires identified on site at the outset of the construction phase.</li> <li>» Fire fighting equipment and training provided before the construction phase commences.</li> <li>» Compensation claims settled within 1 month of claim being verified by Community Monitoring Forum.</li> <li>» Zero to minimal cases of veld fires recorded on site</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Amakhala Emoyeni Renewable Energy (Pty) Ltd and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.</li> </ul>

### **OBJECTIVE: Limit Damage to Watercourses**

The study area is dominated by undulating hills, found within the middle portions of the Great Fish River catchment in quaternary catchment Q91A draining south into the Oliewenboskloof and Riet rivers; and Q92F, draining north into the Biesiesleegte and eNyara rivers. These are located within Water Management Area (WMA) 7, i.e. the Mzimvubu to Tsitsikamma WMA. The ecological state of both systems is a C category, i.e. moderately modified.

A number of watercourses have been identified on the site. These areas provide habitat to many of the identified sensitive plant and animal species identified to be associated with the site. Therefore, avoidance of these areas as far as possible is recommended.

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» Wind turbines</li> <li>» Access roads</li> </ul>
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<b>Potential Impact</b>	» Damage to wetland areas by any means that will result in hydrological changes (includes erosion, siltation, dust, direct removal of soil vegetation, dumping of material within wetlands). The focus should be on the functioning of the wetland as a natural system.
<b>Activity/risk source</b>	» Construction & operation of facility
<b>Mitigation: Target/Objective</b>	» No damage to watercourse areas within project area

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Rehabilitate any disturbed areas as quickly as possible once construction is completed in an area.	Contractor	Construction
Compile a stormwater management plan to control stormwater and runoff water.	Contractor	Construction
Water quality monitoring to take place on a regular basis where infrastructure is to be located close to watercourses.	Contractor EO	Construction
<u>Apply 100m protection buffers around drainage lines and streams due to the highly impacted nature of most aquatic drainage features seen in the landscape. There is little functioning flowing stream habitat between the instream dams evident along the majority of streams and drainage lines across the area.</u>	Contractor EO	<u>Construction</u>
<u>Include a 500m buffer around the (not exhaustive or complete) list of natural wetlands seen in the landscape.</u>	Contractor EO	<u>Construction</u>
<u>Remove 500m buffers around artificial wetlands, but indicate them on mapping</u>		
<u>Install appropriate drainage features during construction.</u>	Contractor EO	<u>Construction</u>

<b>Performance Indicator</b>	» No impacts on water quality, water quantity, wetland vegetation, natural status of wetland
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Water quality monitoring to take place on a regular basis. This should include the water quality and quantity leaving the project area through the watercourses (should be monitored within main drainage systems that exit site).</li> <li>» Habitat loss in watercourses should be monitored before and after construction.</li> <li>» The EO should be responsible for driving this process.</li> <li>» Reporting frequency depends on legal compliance framework.</li> </ul>

### ***OBJECTIVE: Control runoff and soil erosion & degradation***

The soil resource on the site needs to be conserved as far as possible to minimise the cumulative impact on the local environment.

A set of strictly adhered to mitigation measures are required to effectively limit the impact on the environment. The disturbance areas where human impact is likely are the focus of the mitigation measures laid out below.

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» Wind turbines</li> <li>» Access roads</li> <li>» Sealed surfaces (e.g. roofs, concrete surfaces, compacted road surfaces, paved roads / areas).</li> <li>» All other infrastructure</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Degradation of soil</li> <li>» Degradation of local geology</li> <li>» Soil erosion</li> <li>» Siltation of drainage lines</li> </ul>
<b>Activities/risk sources</b>	<ul style="list-style-type: none"> <li>» Water and wind erosion of cleared and excavated areas</li> <li>» Excavation, mixing, dumping, stockpiling and compaction of soil</li> <li>» Concentrated discharge of water from construction activity</li> <li>» Site preparation and earthworks</li> <li>» Foundations or plant equipment installation</li> <li>» Mobile construction equipment movement on site</li> <li>» River/stream/drainage line road crossings.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To minimise degradation of rock and soil by construction activity</li> <li>» To conserve topsoil by stockpiling and re-using in disturbance areas</li> <li>» To minimise erosion of soil from site during construction</li> <li>» To minimise deposition of soil into drainage lines</li> </ul>

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Identify construction areas and restrict construction activity to these areas	EO/Contractor	Pre-construction and Construction
Access roads to be carefully planned and constructed to minimise the impacted area and prevent unnecessary excavation, placement and compaction of soil.	Engineer/EO	Pre-construction and Construction
Dust control on construction site: implementation of appropriate dust control measures.	Contractor	Construction
Erosion features must be immediately stabilised with appropriate erosion control measures, if they develop	Contractor	Construction
Stockpile topsoil for re-use in rehabilitation phase. Maintain stockpile shape and protect from erosion. Limit the height of stockpiles as far as possible to reduce compaction.	Contractor	During site establishment and any activity related to earthworks as well as the duration of construction
Rehabilitate any disturbed areas immediately after construction in that area is complete in order to stabilise landscapes.	Contractor	Post-construction
Any stockpiles must be protected against wind erosion (e.g. surrounded by shadecloth fences or damped down on a regular basis).	Contractor	Duration of contract
Erosion control measures: Run-off attenuation on slopes (sand bags, logs), silt fences, stormwater catch-pits, shade nets or temporary mulching over denuded areas.	Contractor	Erection: Before construction Maintenance: Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
Vehicular traffic must be controlled during construction, confining access and roadways, where possible, to proposed or existing road alignments.	Contractor	Duration of contract
Internal access roads should be kept to a minimum. Use existing roads wherever possible.	Contractor	During site establishment
Movement of vehicles on-site is to be on approved and formalised access roads only, which shall be adequately maintained throughout construction. Where temporary tracks are required (e.g. for use by crawler crane) these are to be ripped and rehabilitated as soon use of the track in an area is no longer required.	Contractor	Duration of contract
Control depth of excavations and stability of cut faces/sidewalls.	Engineer/EO/ Contractor	Before construction and maintenance over duration of contract

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Minimal level of soil erosion around site</li> <li>» Minimal level of increased siltation in drainage lines as a result of the project</li> <li>» No soil degradation</li> <li>» Acceptable state of excavations</li> <li>» No activity in restricted areas</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Ongoing monitoring of area by environmental control officer during construction</li> <li>» Fortnightly inspections of sediment control devices</li> <li>» Fortnightly inspections of surroundings, including drainage lines</li> <li>» Immediate reporting of ineffective sediment control systems</li> <li>» An incident reporting system will record non-conformances</li> </ul>

### ***OBJECTIVE: Protection of sites of heritage value / fossil resources***

The main cause of impacts to archaeological sites during construction activities is physical disturbance of the material itself and its context. The heritage and scientific potential of an archaeological site is highly dependent on its geological and spatial context. This means that even though, for example a deep excavation may expose archaeological artefacts, the artefacts are relatively meaningless once removed from the area in which they were found. Large-scale excavations for foundations will damage archaeological sites, as will road construction activities. Mitigation is proposed as the heritage resources are of high significance. Mitigation should take the form of implementing no-go buffer zones around all cemeteries and graves. If unmarked burials are discovered during construction, a plan of action must be in place to deal with the situation.

As per the final walkthrough undertaken by the heritage specialist (Appendix DI), no archaeological resources of significance were identified within the area proposed for development during this field assessment. No impacts to significant archaeological heritage resources are anticipated from the proposed development on condition that the recommended mitigation measures are implemented. The proposed reticulation alignment and a proposed road run over a feature identified by Halkett (2010). This feature is reflected by Sites 36106, 36097 and 36107 which reflect an historic dry stone wall that does not correspond with current cadastral boundaries. The dry stone walling degenerates into a line of intermittent alocs in places. This wall/line of alocs is visible as an ephemeral feature on satellite imagery. Although the heritage significance of this feature is unknown, it is recommended that where the dry stone walling is still visible, that impact to this feature be avoided. As such, a no-impact buffer of 10m is recommended around the mapped feature. A proposed road runs through this feature. There is no objection to the road passing through this feature on condition that the road

is limited to aspects of the wall that are marked only by the line of aloes. A 30m no-development buffer is recommended around instances where the dry stone walling is visible. No observations of palaeontological significance were noted within the area proposed for development. However, the geology underlying the development area remains sensitive for impacts to significant palaeontological heritage. A list of heritage sites, their significance and location is included in Appendix C of this EMP.

It is extremely unlikely that any fossils would be preserved in the overlying soils and sands of the Quaternary. There is a very small chance that fossils may occur below the ground surface in the mudstones of the Middleton Formation so a Fossil Chance Find Protocol is included in Appendix M

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» Wind turbines</li> <li>» Access roads</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Heritage objects or artefacts found on site are inappropriately managed or destroyed</li> <li>» Disturbance to fossil resources</li> </ul>
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Site preparation and earthworks</li> <li>» Foundations or plant equipment installation</li> <li>» Mobile construction equipment movement on site</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To ensure that any heritage objects found on site are treated appropriately and in accordance with the relevant legislation</li> </ul>

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Areas required to be cleared during construction must be clearly marked in the field to avoid unnecessary disturbance of adjacent areas (which will not be surveyed in detail by a heritage specialist).	Contractor in consultation with Specialist	Pre-construction
<u>A no-go buffer of 10m is implemented around the wall feature mapped in figure 9.2 and 9.3 of the final heritage walkthrough report. (Appendix D1)</u>	Amakhala Emoyeni Renewable Energy (Pty) Ltd in consultation with specialist	Pre-construction and Construction
<u>A no-go buffer of 30m is implemented around Sites 36106, 36097 and 36107 as mapped in Figures 9.2 and 9.3 of the final walkthrough report. (Appendix D1). The proposed reticulation can pass over the identified feature. There is no objection to the road passing through this feature on condition that the road is limited to aspects of the wall that are marked only by the line of aloes</u>	Amakhala Emoyeni Renewable Energy (Pty) Ltd in consultation with specialist	Pre-construction and Construction
<u>All stone structures, stone kraals and enclosures within 200m from the construction area must be protected through temporary fencing. The only sites located within 200m of proposed construction are Sites 36106, 36097 and 36107. No impact to these sites is anticipated</u>	Amakhala Emoyeni Renewable Energy (Pty) Ltd in consultation with specialist	Pre-construction and Construction
<u>The attached Chance Fossil Finds Procedure (Appendix M) must be implemented for the duration of construction activities for this project</u>	Contractor and ECO	Duration of contract
A heritage practitioner must undertake periodic inspection during construction and operational phases to determine compliance.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Construction (visits to be determined based on scheduling of activities)

Mitigation: Action/control	Responsibility	Timeframe
	in consultation with specialist	
If a heritage object is found, work in that area must be stopped immediately, and appropriate specialists brought in to assess the site, notify the administering authority of the item/site, and undertake due/required processes.	Amakhala Emoyeni Renewable Energy (Pty) Ltd /Contractor in consultation with Specialist	Duration of contract
Should any archaeological material be exposed during construction, all work must cease in the immediate area and reported to the archaeologist at the Albany Museum in Grahamstown (Tel: 046 622 2312) or to the Eastern Cape Provincial Heritage Resources Authority (Tel: 043 642 2811/ 043 745 0888), so that a systematic and professional investigation can be undertaken. Sufficient time should be allowed to investigate and to remove/collect such material.	Contractor in consultation with Specialist	Duration of contract
If at any stage during the construction phase any semblance of a fossil is observed, it would be vital to stop the work immediately and report this occurrence to SAHRA and / or a professional palaeontologist (for example the geological staff at either the Albany Museum or Rhodes University in Grahamstown) as soon as possible so that appropriate mitigation measures can be implemented. Generally fossils can be removed quickly and would therefore not delay or hinder construction operations. Apart from monitoring specific activities at specific times, the archaeologist/heritage practitioner should also regularly visit the construction site to inspect the construction routes and activities and to meet with the ECO.	Contractor in consultation with Specialist	Duration of contract

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Zero disturbance outside of designated work areas</li> <li>» All heritage items located are dealt with as per the legislative guidelines</li> <li>» A record is kept of all instances of accidental disturbance of heritage material, as well as post construction review of impacts on landscape context.</li> </ul>
<b>Monitoring</b>	» Supervision of all clearing and earthworks by ECO throughout construction phase

***OBJECTIVE: Minimisation of visual impacts associated with construction***

The construction phase of the facility should be sensitive to potential observers in the vicinity of the construction site. The placement of lay-down areas and temporary construction camps should be carefully considered in order to not negatively influence the future perception of the facility.

Secondary visual impacts associated with the construction phase, such as the sight of construction vehicles, dust and construction litter must be managed to reduce visual impacts. The use of dust-suppression techniques on the access roads (where required), timely removal of rubble and litter, and the erection of temporary screening will assist in doing this.

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» Wind turbines</li> <li>» Access roads</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Temporary visual intrusion</li> </ul>
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Transportation of wind energy facility components to the site</li> <li>» Construction activities on-site</li> <li>» The potential scarring of the landscape due to the creation of new access roads/tracks or the unnecessary removal of vegetation</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Minimise contrast with surrounding environment and visibility of the construction activities to people in the area</li> </ul>

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Adopt responsible construction practices aimed at containing the construction activities to specifically demarcated areas thereby limiting the removal of natural vegetation to the minimum.	Contractor	Duration of contract
The activities and movement of construction workers and construction site vehicles will be restricted to the immediate construction site.	Contractor	Construction
Limit access to the construction sites along existing access roads.	Contractor	Construction
The general appearance of construction activities, construction equipment camps and lay-down areas will be maintained by means of the timely removal of rubble and disused construction materials.	Contractor	Construction
Rehabilitate all disturbed areas, including cut and fill slopes to acceptable visual standards.	Contractor	Post- construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No complaints regarding visual intrusion associated with construction activities</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Ensure that mitigation measures are implemented during construction to minimise visual impacts on surrounding communities</li> <li>» An incident reporting system will be used to record non-conformances to the EMPr</li> </ul>

#### ***OBJECTIVE: Traffic management and transportation of equipment and materials to site***

The construction phase of the project will be the most significant in terms of generating traffic impacts; resulting from the transport of equipment (including turbine components) and materials and construction crews to the site and the return of the vehicles after delivery of materials. Potential impacts associated with transportation and access relate to works within the site boundary (i.e. the wind energy facility and ancillary infrastructure) and external works outside the site boundary.

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» Wind turbines</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Traffic congestion, particularly on narrow roads or on road passes where overtaking is not permitted</li> <li>» Risk of accidents</li> <li>» Deterioration of road pavement conditions (both surfaced and gravel road) due to abnormal loads</li> </ul>
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Transportation of project components to site</li> </ul>



<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To minimise impact of traffic associated with the construction of the facility on local traffic</li> <li>» To minimise potential for negative interaction between pedestrians or sensitive users and traffic associated with the facility construction</li> </ul>
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Mitigation: Action/control	Responsibility	Timeframe
All relevant permits for abnormal loads must be applied for from the relevant authority.	Contractor (or appointed transportation contractor)	Pre-construction
A designated access (or accesses) to the proposed site must be created to ensure safe entry and exit.	Contractor	Pre-construction
Appropriate road management strategies must be implemented on external and internal roads with all employees and contractors required to abide by standard road and safety procedures.	Contractor (or appointed transportation contractor)	Pre-construction
Any traffic delays as a result of construction traffic must be co-ordinated with the appropriate authorities.	Contractor	Duration of contract
Signage must be established at appropriate points warning of turning traffic and the construction site (all signage to be in accordance with prescribed standards).	Contractor	Duration of contract
Appropriate maintenance of all vehicles must be ensured.	Contractor	Duration of contract
All vehicles travelling on public roads must adhere to the specified speed limits and all drivers must be in possession of an appropriate valid driver's license.	Contractor	Duration of contract
Keep hard road surfaces as narrow as possible.	Contractor	Duration of contract

<b>Performance Indicator</b>	<p>No traffic incidents involving Amakhala Emoyeni Renewable Energy (Pty) Ltd</p> <ul style="list-style-type: none"> <li>» personnel or appointed contractors</li> <li>» Appropriate traffic signage in place</li> <li>» No complaints resulting from traffic congestion, delays or driver negligence associated with construction of the wind energy facility</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Visual monitoring of dust produced by traffic movement</li> <li>» Visual monitoring of traffic control measures to ensure they are effective</li> <li>» A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon</li> <li>» An incident reporting system will be used to record non-conformances to the EMPr</li> </ul>

***OBJECTIVE: Appropriate handling and storage of chemicals, hazardous substances and waste***

The construction phase of the wind energy facility will involve the storage and handling of a variety of chemicals including adhesives, abrasives, oils and lubricants, paints and solvents. The main wastes expected to be generated by the construction of the facility will include general solid waste, hazardous waste and liquid waste. A guideline for integrated management of construction waste is included as Appendix J of this EMPr.

<b>Project component/s</b>	Storage and handling of chemicals, hazardous substances and waste
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<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Release of contaminated water from contact with spilled chemicals</li> <li>» Generation of contaminated wastes from used chemical containers</li> <li>» Inefficient use of resources resulting in excessive waste generation</li> <li>» Pollution of the surrounding environment through inappropriate waste management practices</li> <li>» Litter or contamination of the site or water through poor waste management practices</li> <li>» Pollution of water and soil resources</li> </ul>
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Wind turbine construction activities</li> <li>» Packaging and other construction wastes</li> <li>» Hydrocarbon use and storage</li> <li>» Spoil material from excavation, earthworks and site preparation</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons</li> <li>» To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons</li> <li>» To comply with waste management guidelines developed by contractor</li> <li>» To minimise production of waste</li> <li>» To ensure appropriate waste handling, storage and disposal</li> <li>» To avoid environmental harm from waste disposal</li> </ul>

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Contractor	Duration of contract
Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance is identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures.	Contractor	Duration of contract
In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents.	Contractor	Duration of contract
Spilled cement must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.	Contractor	Duration of contract
Soil contaminated/ polluted as a result of a major spill must be removed from the site and disposed of at a licensed hazardous waste disposal facility. Soils contaminated/ polluted through minor spills can be treated on site provided they are contained and have not penetrated the soil surface.	Contractor	Duration of contract
Routine servicing and maintenance of vehicles must not take place on-site outside of designated areas (except for emergency situations or large cranes which cannot be moved off-site). If repairs of vehicles must take place on site, an appropriate drip tray must be used to contain any fuel or oils.	Contractor	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
All stored fuels to be maintained within a bunded area and on a sealed surface.	Contractor	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity and function.	Contractor	Duration of contract
Construction machinery must be stored in an appropriately sealed area.	Contractor	Duration of contract
Oily wastewater from bunds must be removed from site by licensed contractors.	Contractor	Duration of contract
The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately bunded, and stored in compliance with MSDS files.	Contractor	Duration of contract
Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be compiled with.	Contractor	Duration of contract
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations.	Contractor	Duration of contract
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	Contractor	Pre-construction
Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap) and contaminated waste. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage and vermin control.	Contractor	Duration of contract
Where possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation and storage of waste streams (such as wood, metals, general refuse etc).	Contractor	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Duration of contract
No waste may be buried or burnt on site	Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area.	Contractor	Duration of contract
Waste and surplus dangerous goods must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal.	Contractor	Duration of contract
Documentation (waste manifest) must be maintained detailing the quantity, nature and fate of any regulated waste. Waste disposal records must be available for review at any time.	Contractor	Duration of contract
Dispose of all solid waste collected at an appropriately registered waste disposal site. The disposal of waste shall be in accordance with all relevant legislation. Under no circumstances may waste be burnt on site.	Contractor	Duration of Contract

Mitigation: Action/control	Responsibility	Timeframe
Where a registered waste site is not available close to the construction site, provide a method statement with regard to waste management.	Contractor	Pre-construction
Upon the completion of construction, the area must be cleared of potentially polluting materials.	Contractor	Completion of construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No chemical spills outside of designated storage areas</li> <li>» No water or soil contamination by spills</li> <li>» No complaints received regarding waste on site or indiscriminate dumping</li> <li>» Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately</li> <li>» Provision of all appropriate waste manifests for all waste streams</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase</li> <li>» A complaints register must be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon</li> <li>» Observation and supervision of waste management practices throughout construction phase</li> <li>» Waste collection to be monitored on a regular basis</li> <li>» Waste documentation completed</li> <li>» A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon</li> <li>» An incident reporting system will be used to record non-conformances to the EMP</li> </ul>

**OBJECTIVE: Ensure disciplined conduct of on-site contractors and workers**

In order to minimise impacts on the surrounding environment, Contractors must be required to adopt a certain Code of Conduct and commit to restricting construction activities to areas within the development footprint. Contractors and their sub-contractors must be familiar with the conditions of the Environmental Authorisation and its amendments (once issued), the EIA Report, subsequent amendment reports and this EMP, as well as the requirements of all relevant environmental legislation.

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» Wind turbines</li> <li>» Access roads</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Pollution/contamination of the environment</li> <li>» Disturbance to the environment</li> </ul>
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Contractors are not aware of the requirements of the EMP, leading to unnecessary impacts on the surrounding environment</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment</li> </ul>

Mitigation: Action/control	Responsibility	Timeframe
Contractors must use chemical toilets/ablution facilities situated at designated areas of the site; no abluting will be permitted outside the	Contractor (and sub-contractor/s)	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
designated area. These facilities must be regularly serviced by appropriate contractors.		
Cooking/meals must take place in a designated area; no firewood or kindling may be gathered from the site or surrounds.	Contractor (and sub-contractor/s)	Duration of contract
All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area; particular attention needs to be paid to food waste.	Contractor (and sub-contractor/s)	Duration of contract
No one other than the ECO or personnel authorised by the ECO must disturb flora or fauna outside of the demarcated construction area/s.	Contractor (and sub-contractor/s)	Duration of contract
Contractors appointed by Amakhala Emoyeni Renewable Energy (Pty) Ltd must ensure that all workers are informed at the onset of the construction phase of the conditions contained in the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.	Contractor (and sub-contractor/s)	Construction
No construction residence may be set up on site.	Contractor (and sub-contractor/s)	Construction
On completion of the construction phase all construction workers must be transported back to their place of origin within two days of their contract ending. The costs of transportation must be borne by the contractor	Contractor (and sub-contractor/s)	Construction

Performance Indicator	<ul style="list-style-type: none"> <li>» Compliance with specified conditions of Environmental Authorisation and its amendments, EIA report &amp; subsequent amendment reports and this EMPr</li> <li>» No complaints regarding contractor behaviour or habits</li> <li>» Code of Conduct drafted before commencement of construction phase.</li> <li>» Briefing session with construction workers held at outset of construction phase</li> </ul>
Monitoring	<ul style="list-style-type: none"> <li>» Observation and supervision of Contractor practices throughout construction phase.</li> <li>» A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon</li> <li>» An incident reporting system will be used to record non-conformances to the EMPr</li> </ul>

#### 6.4. Detailing Method Statements

**OBJECTIVE: To ensure all construction activities/practices/procedures are undertaken with the appropriate level of environmental awareness to minimise environmental risk, in line with the specifications of the EMPr.**

The environmental specifications are required to be underpinned by a series of Method Statements, within which the Contractors and Service Providers are required to outline how any identified environmental risks will practically be mitigated and managed for the duration of the contract, and how specifications within this EMPr will be met. That is, the Contractor will be required to describe how specified requirements will be achieved through the submission of written Method Statements to the Site Manager (and ECO).

A Method Statement is defined as “a written submission by the Contractor in response to the environmental specification or a request by the Site Manager, setting out the plant, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Site Manager is able to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications”. The Method Statement must cover applicable details with regard to:

- » Responsible person
- » Construction procedures
- » Materials and equipment to be used
- » Getting the equipment to and from site
- » How the equipment/material will be moved while on-site
- » How and where material will be stored
- » The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur
- » Timing and location of activities
- » Compliance/non-compliance with the Specifications, and
- » Any other information deemed necessary by the Site Manager.

The Contractor may not commence the activity covered by the Method Statement until it has been approved by the Site Manager, except in the case of emergency activities and then only with the consent of the Site Manager. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract.

#### **6.5. Awareness and Competence: Construction Phase of the Wind Energy Facility**

***OBJECTIVE: To ensure all construction personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm.***

To achieve effective environmental management, it is important that Contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMP. The Contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The Contractors obligations in this regard include the following:

- » Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment.
- » Ensuring that a copy of the EMP is readily available on-site, and that all site staff are aware of the location and have access to the document. Employees will be familiar with the requirements of the EMP and the environmental specifications as they apply to the construction of the facility.
- » Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training course. The course must provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
- » Basic training in the identification of archaeological sites/objects, paleontological sites, and protected flora and fauna that may be encountered on the site.
- » Awareness of any other environmental matters, which are deemed to be necessary by the ECO.
- » Ensuring that appropriate communication tools are used to outline the environmental “do’s” and “don’ts” (as per the environmental awareness training course) to employees.
- » Records must be kept of those that have completed the relevant training.

- » Refresher sessions must be held to ensure the contractor's staff are aware of their environmental obligations.

## 6.6. Monitoring Programme: Construction Phase of the Wind Energy Facility

**OBJECTIVE: To monitor the performance of the control strategies employed against environmental objectives and standards.**

A monitoring programme must be in place not only to ensure conformance with the EMPr, but also to monitor any environmental issues and impacts which have not been accounted for in the EMPr that are or could result in significant environmental impacts for which corrective action is required. The period and frequency of monitoring is stipulated by the Environmental Authorisation and its amendments. Where this is not clearly dictated, Amakhala Emoyeni Renewable Energy (Pty) Ltd will determine and stipulate the period and frequency of monitoring required in consultation with relevant stakeholders and authorities. The Project Manager will ensure that the monitoring is conducted and reported.

The aim of the monitoring and auditing process would be to routinely monitor the implementation of the specified environmental specifications, in order to:

- » Monitor and audit compliance with the prescriptive and procedural terms of the environmental specifications
- » Ensure adequate and appropriate interventions to address non-compliance
- » Ensure adequate and appropriate interventions to address environmental degradation
- » Provide a mechanism for the lodging and resolution of public complaints
- » Ensure appropriate and adequate record keeping related to environmental compliance
- » Determine the effectiveness of the environmental specifications and recommend the requisite changes and updates based on audit outcomes, in order to enhance the efficacy of environmental management on site
- » Aid communication and feedback to authorities and stakeholders.

## SECTION 7 MANAGEMENT PLAN: REHABILITATION OF DISTURBED AREAS

### 7.1 Overall Goal for the Rehabilitation of Disturbed Areas

Overall Goal for the Rehabilitation of Disturbed Areas: Undertake the rehabilitation measures in a way that:

- » Ensures rehabilitation of disturbed areas following the execution of the works, such that residual environmental impacts are remediated or curtailed

### 7.2 Objectives

In order to meet this overall goal, the following objective, actions and monitoring requirements are relevant:

**OBJECTIVE: To ensure appropriate rehabilitation of disturbed areas following the execution of the works, such that residual environmental impacts are remediated or curtailed**

Areas requiring rehabilitation will include all areas disturbed during the construction phase and that are not required for regular maintenance operations. Rehabilitation must be undertaken in an area as soon as possible after the completion of construction activities within that area.

The main areas requiring rehabilitation will be the laydown areas adjacent to the turbines, the crane tracks alongside the permanent access roads, any cable routings where these fall outside the above-mentioned areas, and disturbed areas around the maintenance building, and disturbed areas associated with the access roads.

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» Wind energy facility (including and laydown areas)</li> <li>» Access roads not required for operation and maintenance</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention</li> </ul>
<b>Activity/risk source</b>	<ul style="list-style-type: none"> <li>» Temporary laydown areas</li> <li>» Temporary access roads/tracks</li> <li>» Other disturbed areas/footprints</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To ensure and encourage site rehabilitation of disturbed areas</li> <li>» To ensure that the site is appropriately rehabilitated following the execution of the works, such that residual environmental impacts (including erosion) are remediated or curtailed</li> </ul>

Mitigation: Action/control	Responsibility	Timeframe
All temporary facilities, equipment and waste materials must be removed from site as soon as practically possible after construction is complete.	Contractor	Following execution of the works
All temporary fencing and danger tape must be removed once the construction phase has been completed.	Contractor	Following completion of construction activities in an area



Mitigation: Action/control	Responsibility	Timeframe
Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion.	Contractor	Following completion of construction activities in an area
Disturbed areas must be rehabilitated/re-vegetated with appropriate natural vegetation and/or local seed mix. Re-use of native/indigenous plant species removed from disturbance areas in the rehabilitation phase.	Contractor in consultation with rehabilitation specialist	Following completion of construction activities in an area
Re-vegetated areas may have to be protected from wind erosion and maintained until an acceptable plant cover has been achieved.	Amakhala Emoyeni Renewable Energy (Pty) Ltd in consultation with rehabilitation specialist	Post-rehabilitation
Ongoing alien plant monitoring and removal must be undertaken on all areas of natural vegetation on an annual basis.	Amakhala Emoyeni Renewable Energy (Pty) Ltd in consultation with rehabilitation specialist	Post-rehabilitation
Disturbed areas containing no infrastructure or hard surfaces must be monitored on a weekly basis, by the appointed EO, throughout the construction phase and on a monthly basis thereafter and to the point where the area has been rehabilitated to a satisfactory level.	Contractor EO	Construction and following completion of construction activities in an area

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» All portions of site, including construction equipment camp and working areas, cleared of equipment and temporary facilities</li> <li>» Topsoil replaced on all areas and stabilised</li> <li>» Disturbed areas rehabilitated and acceptable plant cover achieved on rehabilitated sites</li> <li>» Completed site free of erosion and alien invasive plants</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» On-going inspection of rehabilitated areas in order to determine effectiveness of rehabilitation measures implemented</li> <li>» On-going alien plant monitoring and removal must be undertaken on an annual basis for the life of facility</li> </ul>

## SECTION 8 MANAGEMENT PLAN: OPERATION

### 8.1 Overall Goal for Operation

Overall Goal for Operation: To ensure that the operation of the wind energy facility does not have unforeseen impacts on the environment and to ensure that all impacts are monitored and the necessary corrective action taken in all cases. In order to address this goal, it is necessary to operate the wind energy facility in a way that:

- » Ensures that operation activities are properly managed in respect of environmental aspects and impacts.
- » Enables the wind energy facility operation activities to be undertaken without significant disruption to other land uses in the area, in particular with regard to noise impacts, farming practices, traffic and road use, and effects on local residents.
- » Minimises impacts on birds and other fauna using the site.
- » Monitors and evaluates the impacts of the wind energy facility on birds that frequent the area, in particular monitoring of bird strikes, bird nesting activities and water bird uses of the wetlands/ephemeral pans on the site.
- » Monitors the actual noise impacts of the wind energy facility.
- » Establishes an environmental baseline for wind energy facility sites in South Africa, particularly with regard to priority bird species using the site.

### 8.2 Objectives

In order to meet this overall Operation goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

#### OBJECTIVE: Protection of vegetation

Indirect impacts on vegetation during operation could result from maintenance activities and the movement of people and vehicles on site.

<b>Project component/s</b>	» Wind energy facility (including access roads)
<b>Potential Impact</b>	» Disturbance to or loss of vegetation and/or habitat
<b>Activity/risk source</b>	» Movement of employee vehicles within and around site
<b>Mitigation:</b>	» To maintain minimised footprints of disturbance of vegetation/habitats on-site
<b>Target/Objective</b>	» To ensure and encourage plant regrowth in areas of post-construction rehabilitation

Mitigation: Action/control	Responsibility	Timeframe
Vehicle movements must be restricted to designated roadways.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Operation
Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Operation
An on-going alien plant monitoring and eradication programme must be implemented, where necessary.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Operation

<b>Performance Indicator</b>	» No further disturbance to vegetation » Continued improvement of rehabilitation efforts
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	» No colonisation of the site by alien vegetation
<b>Monitoring</b>	» Regular inspections to monitor plant regrowth/performance of rehabilitation efforts and weed infestation compared to natural/undisturbed areas

### OBJECTIVE: Maintenance of rehabilitated areas

In order to ensure the long-term environmental integrity of the site following construction, maintenance the areas rehabilitated post-construction must be undertaken until these areas have successfully re-established. Fire breaks must be established, where appropriate, to limit both incoming and outgoing veld fires.

<b>Project component/s</b>	» Wind energy facility (including access roads and laydown areas)
<b>Potential Impact</b>	» Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention
<b>Activity/risk source</b>	» Laydown areas » Access roads » Other disturbed areas
<b>Mitigation: Target/Objective</b>	» To ensure and encourage site rehabilitation of disturbed areas

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
A botanist familiar with the vegetation of the area should monitor the rehabilitation success and alien plant removal on an annual basis.	Amakhala Emoyeni Renewable Energy (Pty) Ltd / Specialist	Annual monitoring until successful re-establishment of vegetation in an area
Fire breaks must be established, where appropriate.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Duration of contract
Appoint an independent environmental manager during operation whose duty it will be to minimise impacts on surrounding sensitive habitats.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Operation

<b>Performance Indicator</b>	» Successful rehabilitation of disturbed areas
<b>Monitoring</b>	» On-going alien plant monitoring and removal must be undertaken on an annual basis for the life of the facility

### OBJECTIVE: Minimisation of visual impacts

The primary visual impact, namely the appearance and dimensions of the wind energy facility (mainly the wind turbines) is not possible to mitigate to any significant extent within this landscape. The functional design of the structures and the dimensions of the facility cannot be changed in order to reduce visual impacts. Alternative colour schemes (i.e. painting the turbines sky-blue, grey or darker shades of white) are not permissible as the Civil Aviation Authority (CAA)'s Marking of Obstacles expressly states, "Wind turbines shall be painted bright white to provide the maximum daytime conspicuousness". Failure to adhere to the prescribed colour specifications will result in the fitting of supplementary daytime lighting to the wind turbines, once again aggravating the visual impact. The potential for mitigation is therefore low or non-existent. Due to the nature of the area within which the facility is planned, there are only a few potentially sensitive receptors.

Other impacts include impacts associated with the aircraft warning lights mounted on top of the hub of the wind turbines. The regulations for the CAA's *Marking of Obstacles* must be strictly adhered to, as the failure of complying with these guidelines may result in the developer being required to fit additional light fixtures at closer intervals thereby aggravating the visual impact.

<b>Project component/s</b>	» Wind energy facility (including turbines and access roads)
<b>Potential Impact</b>	» Risk to aircraft in terms of the potential for collision » Enhanced visual intrusion » Impact on ambient lighting conditions
<b>Activity/risk source</b>	» Size/scale of turbines » Aviation lighting » Access roads » Other associated infrastructure
<b>Mitigation: Target/Objective</b>	» To minimise potential for visual impact » To ensure that the facility complies with Civil Aviation Authority requirements for turbine visibility to aircraft » Minimise contrast with surrounding environment and visibility of the turbines to humans

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Aviation warning lights must be mounted on turbine hub or such measures required by the Civil Aviation Authority. Indications are that the facility may not be required to fit a light to each turbine, but rather place synchronous flashing lights on the turbines representing the outer perimeter of the facility.	Amakhala Renewable Energy (Pty) Ltd Emoyeni	Erection and maintenance
Maintain the general appearance of the facility in an aesthetically pleasing way.	Amakhala Renewable Energy (Pty) Ltd Emoyeni	Operation and maintenance
Undertake regular maintenance of light fixtures.	Amakhala Renewable Energy (Pty) Ltd Emoyeni	Operation and maintenance
Limit access to the wind energy facility site, to along existing access roads.	Amakhala Renewable Energy (Pty) Ltd Emoyeni	Operation and maintenance
Mitigation of lighting impacts includes the pro-active design, planning and specification lighting for the facility by a lighting engineer. The correct specification and placement of lighting and light fixtures for both the turbines and the ancillary infrastructure will go far to contain rather than spread the light. Additional measures include the following: » Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself); » Limiting mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights; » Making use of minimum lumen or wattage in fixtures; » Making use of down-lighters, or shielded fixtures;	Amakhala Renewable Energy (Pty) Ltd Emoyeni / lighting engineer	Operation and maintenance

Mitigation: Action/control	Responsibility	Timeframe
<ul style="list-style-type: none"> <li>» Making use of Low Pressure Sodium lighting or other types of low impact lighting.</li> <li>» Making use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.</li> </ul>		
<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Minimised visual intrusion on surrounding areas</li> <li>» Appropriate visibility of infrastructure to aircraft</li> <li>» No visual intrusion complaints received</li> </ul>	
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Ensure that aviation warning lights or other measures are installed before construction is completed</li> <li>» Ensure that Aviation warning lights or other measures are functional at all times</li> <li>» The monitoring of the condition and functioning of the light fixtures during the operational phase of the project.</li> </ul>	

### OBJECTIVE: Protection of avifauna

During operation of the facility, the threat of collision of avifauna with the turbine blades is the most concerning issue. However, the real extent of this threat is not currently well understood within the South African context due to the limited numbers of turbines in South Africa with which bird interactions have been monitored. Lighting of turbines and other infrastructure has the potential to attract birds, thereby increasing the risk of collisions with turbines. Infrastructure associated with the facility often also impacts on birds.

<b>Project component/s</b>	» wind energy facility (turbines)
<b>Potential Impact</b>	» Disturbance to or loss of birds as a result of collision with the turbine blades
<b>Activity/risk source</b>	» Spinning turbine blades
<b>Mitigation: Target/Objective</b>	» Minimise impacts associated with collisions and electrocutions

Mitigation: Action/control	Responsibility	Timeframe
<u>It is recommended that shutdown on demand (SDoD) be implemented for Cape Vultures at all turbines during daylight hours for a trial period of two years in the operational phase, once the wind farm commences with operations, to reduce the risk of collisions of Cape Vultures with the turbines. The need for SDoD must be evaluated by the avifaunal specialist after the two year period to see if it is necessary to continue, based on the number of shutdown events in the preceding two years. If, alternative proven mitigation measures become available during the two year trial period or anytime thereafter, the SDoD can be suspended and replaced by alternative mitigation measures, on the recommendation of the avifaunal specialist.</u>	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Operation
Ensure that all dead stock are removed from the land as soon as possible (and perhaps relocated to safe 'restaurant' area for vultures at least 20 km from the site, and that all landowners within a wide radius (>10 km) of the facility are asked to do the same. This must reduce the numbers of vultures attracted to the area and lower collision risk.	Amakhala Emoyeni Renewable Energy (Pty) Ltd Environmental Manager	Construction - Operation

Mitigation: Action/control	Responsibility	Timeframe
Ensuring that all new lines are marked with bird flight diverters (Jenkins et al. 2010) from origin to destination (with marker and fitting standards as per the industry standard),	Amakhala Emoyeni Renewable Energy (Pty) Ltd Environmental Manager	Construction - Operation
<u>Surface water is crucially important for priority avifauna including many SCC. It is important to leave open space with no obstructions for birds to access and leave the surface water area unhindered. Vultures in particular often congregate in large groups around dams to bath and drink.</u>	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Construction - Operation

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Reduced impacts on avifauna from operation of the facility</li> <li>» Reduced mortality of avifauna</li> </ul>
<b>Monitoring</b>	» Observation of avifaunal populations and incidence of injuries/death from collisions from turbine blades.

### OBJECTIVE: Protection of bat species

As per the final bat walkthrough report undertaken in 2022 (Appendix C1) for the final layout of the wind energy facility, curtailment is not required at any of the proposed turbine positions. However, as previously advised by IWS (2022a), initial mitigation should be measured against the bat fatality threshold guidelines (MacEwan et al. 2018). Adaptive mitigation should take place if fatalities exceed the calculated bat fatality threshold for the Msenge WEF, and bat fatality monitoring must continue to monitor the efficacy of adaptive mitigation.

<b>Project component/s</b>	» wind energy facility (turbines)
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Disturbance to or loss of bats as a result of collision with turbines and/or barotrauma.</li> <li>» Bat mortality and destruction of habitat / roosts.</li> </ul>
<b>Activity/risk source</b>	» Spinning turbine blades
<b>Mitigation: Target/Objective</b>	» Minimise impacts associated with the turbines.

Mitigation: Action/control	Responsibility	Timeframe
Post-construction/ operational bat monitoring must be performed according to the applicable South African Good Practise Guidelines for Operational Monitoring for Bats at Wind Energy Facilities, valid at the time of monitoring. It is recommended that monitoring be undertaken during the initial 2 years and then the frequency thereafter to be informed by the specialist conducting the operational monitoring.	Amakhala Emoyeni Renewable Energy (Pty) Ltd Bat Specialist	Operation
<u>The South African Bat Fatality Threshold Guidelines Edition 2 (MacEwan et al. 2018) has introduced a way to calculate a bat fatality threshold for development projects that could help reduce the possibility of population level declines. If applying this method to the Msenge Emoyeni Wind Energy Facility, the fatality threshold per bat species (excluding those listed as conservation important) is 37.32 bat fatalities of a particular species per annum (fatality number adjusted for scavenger</u>	Amakhala Emoyeni Renewable Energy (Pty) Ltd Bat Specialist	Operation

Mitigation: Action/control	Responsibility	Timeframe
<p><u>removal and searcher inefficiency biases). This was based on a 1866 ha site area and the site being situated in the Drakensberg Montane Grasslands, Woodlands and Forest Ecoregion i.e. O2. Bat fatalities for every 10ha x 1866 ha /10ha = 37.32 bat fatalities per annum.</u></p> <p><u>The threshold may only be re-calculated if there is a change in the turbine layout and/or the turbine blade length, and/or when newer threshold guidance is published.</u></p> <p><u>Should adjusted bat fatalities (adjusted for biases such as searcher efficiency and carcass persistence) equal or exceed 37.32 bat fatalities per annum per species (excluding the criteria for conservation important species) after Year 1 of monitoring, then operational mitigation specific to high fatality turbines must be adapted according to MacEwan et al (2018) and Aronson et al (2018).</u></p>		
<p><u>One or more fatalities during a 12 month period of any frugivorous bats, conservation important or rare/ range-restricted bats listed in Table 3 (Appendix C1) should trigger mitigation.</u></p>	<p><u>Amakhala Emoyeni Renewable Energy (Pty) Ltd Bat Specialist</u></p>	<p><u>Operation</u></p>
<p><u>A second year of monitoring should take place to assess whether the mitigation measures were effective. If the annual fatalities were reduced to below 37.32 bats, then operational monitoring should only be performed every 3rd year thereafter, with adaptive mitigation based on these results if needed. If the 2nd year results were not reduced to below 37.32 bat fatalities per species (excluding the criteria for conservation important species), then monitoring should continue every year until adaptive mitigation becomes effective.</u></p> <p><u>There are only ultrasonic deterrent devices available for Siemens turbines and these are still in the experimental phase. Should such devices prove effective in mitigating bat fatalities at wind turbines and the correct technology is available for the type of turbine that will be utilised at the Msenge Emoyeni Wind Energy Facility), the developer and/or operator should consider this as a possible mitigation measure at potentially problematic turbines.</u></p>	<p><u>Amakhala Emoyeni Renewable Energy (Pty) Ltd Bat Specialist</u></p>	<p><u>Operation</u></p>
<p><u>Ensure that turbines can be fitted with bat detectors and deterrent devices. Turbine engineers must consult with bat specialists to incorporate the necessary turbine adaptations for this during the design phase, so there are no unexpected surprises or concerns after the turbines are built.</u></p>	<p><u>Amakhala Emoyeni Renewable Energy (Pty) Ltd</u></p>	<p><u>Construction - Operation</u></p>
<p><u>Should the calculated bat fatality threshold for the Msenge WEF be exceeded, turbine curtailment must be implemented as described by IWS (2022a). "Curtailment will require implementation of an initial cut-in speed of 7m/s (measured at 60m above ground level) during</u></p>	<p><u>Amakhala Emoyeni Renewable Energy (Pty) Ltd Avifauna Specialist</u></p>	<p><u>Operation</u></p>

Mitigation: Action/control	Responsibility	Timeframe
<u>temperatures above 10 °C (measured at 10 m above ground level) for three hours after sunset in March, April, and May, and from sunset until midnight (00h00, but ideally 01h00) in November, December, January, and February."</u>		
<u>Minimize artificial lighting on site. Apart from compulsory civil aviation lighting, minimize artificial lighting - especially high-intensity, steady-burning, sodium vapour, quartz, halogen, and other bright lights at sub-stations, offices and turbines. All non-aviation lights should be hooded downward and directed to minimise horizontal and skyward illumination. Where possible, solar-powered motion sensitive lights should be used.</u>	<u>Amakhala Emoyeni Renewable Energy (Pty) Ltd</u>	
<u>Rehabilitate disturbed terrestrial habitat and water resources (bat foraging habitat). Implement effective rehabilitation of disturbed terrestrial habitat and water resources based on consultation with an appropriate experienced specialist(s). Carefully manage alien vegetation, livestock grazing, and water points.</u>	<u>Amakhala Emoyeni Renewable Energy (Pty) Ltd</u>	<u>Operation</u>
<u>Perform operational bat monitoring as soon as the first turbine is operational - as per the latest SABAA guideline for this (Aronson et al. 2020 or later). The quality of the operational monitoring and data analysis are to be conducted to a high standard so that there is confidence in the data and the fatality estimate results.</u>	<u>Amakhala Emoyeni Renewable Energy (Pty) Ltd</u> <u>Bat Specialist</u>	<u>Operation</u>
<u>Submit quarterly progress and annual bat fatality monitoring reports to SABAAP (the South African Bat Assessment Association Panel), EWT (the Endangered Wildlife Trust), and the DFFE (the national Department of Environment, Forestry and Fisheries)</u>	<u>Amakhala Emoyeni Renewable Energy (Pty) Ltd</u> <u>Bat Specialist</u>	<u>Operation</u>
<u>Forward all (live and fatality) bat monitoring data to the database recommended by SABAA to expand the scientific knowledge base for more informed decision making and mitigation</u>	<u>Amakhala Emoyeni Renewable Energy (Pty) Ltd</u> <u>Bat Specialist</u>	<u>Operation</u>

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Minimal additional disturbance on bat populations on the wind energy facility site.</li> <li>» Continued improvement of bat protection devices, as informed by the operational monitoring.</li> <li>» Regular provision of clearly worded, logical and objective information on the interface between the local bats and the proposed/ operating wind energy facility.</li> <li>» Clear and logical recommendations on why, how and when to institute mitigation measures to reduce bat impacts of the development, from pre-construction to operational phase.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Environmental manager to monitor turbine field for fatalities.</li> </ul>

### **OBJECTIVE: Appropriate handling and management of hazardous substances and waste**

The operation of the wind energy facility will involve the generation of limited waste products. The main wastes expected to be generated by the operation activities includes general solid waste, hazardous waste and liquid waste.



<b>Project component/s</b>	» Wind turbines
<b>Potential Impact</b>	» Inefficient use of resources resulting in excessive waste generation » Litter or contamination of the site or water through poor waste management practices
<b>Activity/risk source</b>	» Generators and gearbox - turbines » Water storage tank » Fuel and oil storage » Maintenance building
<b>Mitigation: Target/Objective</b>	» To comply with waste management guidelines » To minimise production of waste » To ensure appropriate waste disposal » To avoid environmental harm from waste disposal

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Hazardous substances must be stored in sealed containers within a clearly demarcated designated area.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Operation
Storage areas for hazardous substances must be appropriately sealed and banded.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Operation
All structures and/or components replaced during maintenance activities must be appropriately disposed of at an appropriately licensed waste disposal site or sold to a recycling merchant for recycling.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Operation
Care must be taken to ensure that spillage of oils and other hazardous substances are limited during maintenance. Handling of these materials must take place within an appropriately sealed and banded area. Should any accidental spillage take place, it will be cleaned up according to specified standards regarding bioremediation.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Operation and maintenance
Waste handling, collection and disposal operations must be managed and controlled by a waste management contractor.	Amakhala Emoyeni Renewable Energy (Pty) Ltd /waste management contractor	Operation
Used oils and chemicals: » Appropriate disposal must be arranged with a licensed facility in consultation with the administering authority. » Waste must be stored and handled according to the relevant legislation and regulations.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Operation
It must be ensured that volumes of any hazardous waste stored on site do not exceed 30m <sup>3</sup> . Should this volume be exceeded, a waste license will be required to be obtained.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Operation
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Operation
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Operation
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Operation

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No complaints received regarding waste on site or indiscriminate dumping</li> <li>» Internal site audits identifying that waste segregation recycling and reuse is occurring appropriately</li> <li>» Provision of all appropriate waste manifests</li> <li>» No contamination of soil or water</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Waste collection must be monitored on a regular basis</li> <li>» Waste documentation must be completed and available for inspection on request</li> <li>» An incidents/complaints register must be maintained, in which any complaints from the community must be logged. Complaints must be investigated and, if appropriate, acted upon</li> <li>» Regular reports on exact quantities of all waste streams exiting the site must be compiled by the waste management contractor and monitored by the SHE Representative. All appropriate waste disposal certificates accompany the monthly reports.</li> </ul>

### **OBJECTIVE: Noise control**

Projected noise levels during operation of the Wind Energy Facility were modelled using the methodology as proposed by SANS 10357:2004. The resulting future noise projections indicated that the operation of the facility would comply with the Noise Control Regulations (GN R154) yet would not comply with the guidelines as proposed by SANS 10103:2004. The significance of this noise impact was determined to be medium. Mitigation measures were proposed that would reduce the significance to a more acceptable low level.

When considering the potential cumulative effects when the proposed Msenge Wind Energy Facility is added indicates non-compliance with both the Noise Control Regulations as well as the SANS 10103:2004 guidelines. It becomes critical that both developers implement appropriate mitigation measures, especially for the boundary area between the two facilities.

The following measures are recommended to define the performance of the developer in mitigating the projected impacts and reducing the significance of the noise impact.

<b>Project component/s</b>	Operation of the wind energy facility
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Increased noise levels at potentially sensitive receptors</li> <li>» Changing ambient sound levels could change the acceptable land use capability</li> <li>» Disturbing character of sound</li> </ul>
<b>Activity/risk source</b>	» Simultaneous operation of a number of wind turbines close to a sensitive receptor
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Ensure that the change in ambient sound levels as experienced by Potentially Sensitive Receptors is less than 5 dBA through appropriate placement of turbines during the final design phase.</li> <li>» Ensure acceptable noise levels at surrounding stakeholders and potentially sensitive receptors.</li> </ul>

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Define the ambient sound levels over a 24-hour period before the operational phase begins inside and outside of the dwellings of at least 3 Potentially Sensitive Receptors.	Acoustical Consultant / Approved Noise Inspection Authority	Before operational phase commences
Design and implement a noise monitoring programme.	Acoustical Consultant / Approved Noise Inspection Authority	Before operational phase commences

Mitigation: Action/control	Responsibility	Timeframe
Add additional noise monitoring points at any complainants that registered a noise complaint relating to the operation of the wind energy facility.	Acoustical Consultant / Approved Noise Inspection Authority	With quarterly monitoring

<b>Performance Indicator</b>	Ensure that the change in ambient sound levels as experienced by Potentially Sensitive Receptors is less than 7 dBA.
<b>Monitoring</b>	Quarterly noise monitoring by an Acoustic Consultant or Approved Noise Inspection Authority. Noise monitoring programme to be developed and implemented at the start of operation and continue for 1 year.

***OBJECTIVE: Maximise local employment and business opportunities associated with the operational phase***

<b>Project component/s</b>	Day to day operational activities associated with the wind energy facility including maintenance etc.
<b>Potential Impact</b>	» The opportunities and benefits associated with the creation of local employment and business should be maximised
<b>Activity/risk source</b>	» The operational phase of the wind energy facility will create approximately 10 full time employment opportunities.
<b>Mitigation: Target/Objective</b>	» In the medium to long term employ as many locals as possible to fill the 10 full time employment opportunities.

Mitigation: Action/control	Responsibility	Timeframe
As far as practical, the entire workforce of permanent staff should be based in local towns of Cookhouse, Bedford and or Somerset East. Amakhala Emoyeni Renewable Energy (Pty) Ltd should commit to implementing a training and skills development and training programme.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Develop programme during the construction phase
Identify local members of the community who are suitably qualified or who have the potential to be employed full time.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Identify members during the construction phase

<b>Performance Indicator</b>	» training and skills development programme developed and designed before construction phase completed » Potential local community members identified before construction phase completed.
<b>Monitoring</b>	Amakhala Emoyeni Renewable Energy (Pty) Ltd must monitor indicators listed above to ensure that they have been met for the operational phase.

***OBJECTIVE: Maximise the potential tourism opportunities during the operational phase. Highlight the benefits of renewable energy projects.***

<b>Project component/s</b>	Operational phase of the project.
<b>Potential Impact</b>	» The proposed wind energy facility has the potential to provide Blue Crane Route Municipality with an attraction that would improve its attraction to tourists. The development also has the potential to promote the benefits of renewable energy projects.

<b>Activity/risk source</b>	» The establishment of a wind energy facility has the potential to create an attraction for visitors to the area. The development also has the potential to promote the benefits of renewable energy projects.
<b>Mitigation: Target/Objective</b>	» To enhance the potential tourism and renewable energy opportunities associated with the proposed wind energy facility.

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Liaise with representatives from the Blue Crane Municipality and tourism organisations to raise awareness of the proposed wind energy facility	Amakhala Emoyeni Renewable Energy (Pty) Ltd	During the construction phase
Establish a renewable energy interpretation centre at the site. The centre must be equipped with information boards that provide visitors with information on the project and other relevant information.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	Establish centre at the outset of the construction phase. This will create an opportunity to provide tourists with information on both the construction and operational phases of the project.

<b>Performance Indicator</b>	» Meeting with Blue Crane Route Local Municipality and local tourism organisations during the construction phase. » Establishment of interpretation centre at the outset of the construction phase.
<b>Monitoring</b>	Independent monitoring to ensure that they have been met for the operational phase.

### **8.3. Monitoring Programme: Operation Phase of the Wind Energy Facility**

***OBJECTIVE : To monitor the performance of the control strategies employed against environmental objectives and standards.***

A monitoring programme must be in place not only to ensure conformance with the EMPr, but also to monitor any environmental issues and impacts which have not been accounted for in the EMPr that are, or could result in significant environmental impacts for which corrective action is required. An internal environmental audit must be conducted every 6 months and an external audit must be conducted once a year in order to confirm compliance with the requirements of all environmental permits (including the Environmental Authorisation and its amendments) for the project, this EMPr, and all relevant legislation. The results of the audit reports must be made available to the DFFE and relevant competent authority on request, and must be part of monitoring and audit reports. An annual audit report must be compiled and submitted to DFFE. The aim of the auditing process would be to routinely monitor the implementation of the specified environmental specifications, in order to:

- » Monitor and audit compliance with the prescriptive and procedural terms of the environmental specifications
- » Ensure adequate and appropriate interventions to address non-compliance
- » Ensure adequate and appropriate interventions to address environmental degradation
- » Provide a mechanism for the lodging and resolution of public complaints
- » Ensure appropriate and adequate record keeping related to environmental compliance
- » Determine the effectiveness of the environmental specifications and recommend the requisite changes and updates based on audit outcomes, in order to enhance the efficacy of environmental management on site
- » Aid communication and feedback to authorities and stakeholders

## SECTION 9 MANAGEMENT PLAN: DECOMMISSIONING

The turbine infrastructure which will be utilised for the proposed wind energy facility is expected to have a lifespan of 20 to 30 years (with maintenance). Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the facility would comprise the disassembly and replacement of the turbines with more appropriate technology/infrastructure available at that time.

### 9.1 Site Preparation

Site preparation activities will include confirming the integrity of the access to the site to accommodate required abnormal load equipment and lifting cranes, preparation of the site (e.g. lay down areas, construction platform) and the mobilisation of construction equipment.

### 9.2 Disassemble and Replace Existing Turbine

A large crane will be brought on site. It will be used to disassemble the turbine and tower sections. These components will be reused, recycled or disposed of in accordance with relevant regulatory requirements. All parts of the turbine would be considered reusable or recyclable except for the blades.

**OBJECTIVE: To avoid and or minimise the potential impacts associated with the decommissioning phase.**

<b>Project component/s</b>	» Decommissioning phase of the wind energy facility.
<b>Potential Impact</b>	» Decommissioning will result in job losses, which in turn can result in a number of social impacts, such as reduced quality of life, stress, depression etc. However, the number of people affected (~10) is relatively small. Decommissioning is also similar to the construction phase in that it will also create temporary employment opportunities.
<b>Activity/risk source</b>	» Decommissioning of the wind energy facility.
<b>Mitigation: Target/Objective</b>	» To avoid and or minimise the potential social impacts associated with decommissioning phase of the wind energy facility.

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Amakhala Emoyeni Renewable Energy (Pty) Ltd must ensure that retrenchment packages are provided for all staff who stand to lose their jobs when the facility is decommissioned. Retrenchments should comply with South African Labour legislation of the day.	Amakhala Emoyeni Renewable Energy (Pty) Ltd	At decommissioning
Amakhala Emoyeni Renewable Energy (Pty) Ltd should investigate the option of relocating employees to other wind energy facilities when the Msenge Emoyeni Wind Energy Facility is decommissioned	Amakhala Emoyeni Renewable Energy (Pty) Ltd	At decommissioning
Amakhala Emoyeni Renewable Energy (Pty) Ltd should establish an Environmental Rehabilitation Trust Fund to cover the costs of decommissioning and rehabilitation of disturbed areas. The Trust Fund must be funded by a percentage of the revenue generated from the sale of energy to the national grid over the 25-30 year	Amakhala Emoyeni Renewable Energy (Pty) Ltd	At decommissioning

Mitigation: Action/control	Responsibility	Timeframe
operational life of the facility. The rationale for the establishment of a Rehabilitation Trust Fund is linked to the experiences with the mining sector in South Africa and failure of many mining companies to allocate sufficient funds during the operational phase to cover the costs of rehabilitation and closure.		
<b>Performance Indicator</b>	South African Labour legislation at the relevant time	
<b>Monitoring</b>	Retrenchments should comply with South African Labour legislation of the day	

## APPENDICES

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<b>Appendix A:</b>	<b>Company profile &amp; Curricula Vitae of EAP</b>
<b>Appendix B:</b>	<b>Bird Monitoring</b>
<b>Appendix C:</b>	<b>Heritage Sites</b>
<b>Appendix D:</b>	<b>Grievance Mechanism for Public Complaints and Issues</b>
<b>Appendix E:</b>	<b>Alien Plant and Open Space Management Plan</b>
<b>Appendix F:</b>	<b>Plant Rescue and Protection Plan</b>
<b>Appendix G:</b>	<b>Re-vegetation and Rehabilitation Plan</b>
<b>Appendix H:</b>	<b>Erosion Management Plan</b>
<b>Appendix I:</b>	<b>Stormwater Management Plan</b>
<b>Appendix J:</b>	<b>Waste Management Plan</b>
<b>Appendix K:</b>	<b>Emergency Preparedness, Response and Fire Management Plan</b>
<b>Appendix L:</b>	<b>Key Legislation</b>
<b>Appendix M:</b>	<b>Chance Find Procedure</b>
<b>Appendix N:</b>	<b>Traffic Management Plan</b>
<b>Appendix O:</b>	<b>Bat Operational Monitoring Programme</b>

### **Specialist Final Walkthrough Reports:**

<b>Appendix A1: Terrestrial and Aquatic Pre-Construction Walkthrough</b>
<b>Appendix A1: Terrestrial and Aquatic Specialist Addendum Letter</b>
<b>Appendix B1: Avifauna Pre-Construction Walkthrough</b>
<b>Appendix B2: Endangered Wildlife Trust's (EWT) Cape Vulture tracking work</b>
<b>Appendix C1: Bat Pre- Construction Walkthrough</b>
<b>Appendix D1: Heritage and Palaeontological Pre-Construction Walkthrough</b>

## **Appendix A: Company profile & Curricula Vitae of EAP**



## **CURRICULUM VITAE OF ARLENE SINGH**

- Profession:** Environmental Assessment Practitioner (EAP) / Director
- Specialisation:** Environmental Assessments, report writing, report reviewing, development of project proposals for procuring new projects and project administration.
- Work Experience:** 9 years' experience in Environmental Assessments and 1 year in Sustainability Consulting.

### **VOCATIONAL EXPERIENCE**

Professional execution of consulting services for projects in the environmental management field, specialising in Environmental Impact Assessment studies, environmental permitting, public participation, compilation of Environmental Management Plans and Programmes, environmental policy, and integrated environmental management. Responsibilities include report writing, project management, review of specialist studies and the identification and assessment of potential negative environmental impacts and benefits. Compilation of the reports for environmental studies is in accordance with all relevant environmental legislation.

Experience in conducting environmental impact assessments for infrastructure development projects (roads, stormwater, pipelines), Mixed Use Developments and Section 24G Applications for complex projects. She has extensive experience in managing and monitoring ECO functions and compliance on relevant projects. She has gained the ability to conduct sustainability assurance audits for non-financial environmental KPI's through her experience with listed mining corporations.

### **SKILLS BASE AND CORE COMPETENCIES**

- Compilation of environmental impact assessment reports and environmental management programmes in accordance with relevant environmental legislative requirements;
- Identification and assessment of potential negative environmental impacts and benefits through the review of specialist studies;
- Key experience in the assessment of impacts associated with complex Section 24G Applications.
- Review of environmental impact assessment reports, impacts matrices and environmental management programme reports;
- Conducting of ECO audits, managing ECO staff, review of ECO reports and liaison with the client;
- Review of Carbon Footprint Analysis report and provision of recommendations for industry;
- Developing Business Development Plans, action plans and carrying out Business Development initiatives;
- Compilation of Integrated Reports in line with King IV;
- Conducting Mining Permit Applications with the DMR and the associated Basic Assessment process in line with the MPRDA;
- Extensive experience in compilation and submission of Tenders and Proposals;

## EDUCATION AND PROFESSIONAL STATUS

### Degrees:

- B.Sc. (Hons.) Environmental Management (2016), University of South Africa (UNISA);
- B.Sc. Environmental Science (2012), University of Kwa-Zulu Natal, Westville

### Short Courses:

- Official DWS Section 21 (c) and (i) Water Use Authorisation Course (2018)- Dr Wietsche Roets, Specialist Scientist: (In Stream Water Use);
- SMME Green Building Face to Face Workshop (2018)- GBCSA hosted by JP Morgan;
- ArcGISBasic 10.3 (2016)- Esri South Africa
- Energy within Environmental Constraints (2020)- Harvard (Online)
- Becoming an Entrepreneur (2020)- Massachusetts Institute of Technology (Online)

### Professional Society Affiliations:

- South African Council for Natural Scientific Professionals - Professional Natural Scientist: Environmental Scientist) – Reg No. 118872
- Environmental Assessment Practitioners Association of South Africa- Reg No: 2019/898

### Other Relevant Skills:

- Compiling and submission of invoices on projects;
- Registration of Waste Management Facilities on GWIS

## EMPLOYMENT

Date	Company	Roles and Responsibilities
16 December 2020- Current	Nala Environmental (Pty) Ltd	Environmental Assessment Practitioner / Director  <i>Tasks include:</i> <i>Compilation of Environmental Impact Assessment (EIA) reports; Basic Assessment (BA) reports and Environmental Management Programmes; Environmental Screening reports; Co-ordination of the public participation process; Project management; project proposals and tenders; Client liaison and Marketing; Process EIA Applications. Business Development, Integrated reporting. Strategy, policy and procedure</i>

Date	Company	Roles and Responsibilities
		<i>development. Planning of staff on engagements and Invoicing of clients.</i>
<b>08 April 2019- 15 December 2020:</b>	Savannah Environmental (Pty) Ltd	<p>Environmental Assessment Practitioner</p> <p><i>Tasks include:</i>  <i>Compilation of Environmental Impact Assessment (EIA) reports; Basic Assessment (BA) reports and Environmental Management Programmes; Environmental Screening reports; Co-ordination of the public participation process; Project management; project proposals and tenders; Client liaison and Marketing; Process EIA Applications.</i></p>
<b>01 January 2016- 05 April 2019</b>	Triplo4 Sustainable Solutions (Pty) Ltd	<p>Environmental Consultant/Gauteng Office Manager</p> <p><i>Tasks included:</i>  <i>Review of Basic Assessment reports, Environmental Management Programme reports, Impact Matrices. Review of Environmental Control Officer functions, report and planning of site visits. Compiling Waste Management License Applications and Section 24G Application with reports for review by company Director. Review of specialist reports. Compilation of tenders, proposals and fee proposals. Co-ordinate public participation processes. Liaison with clients, stakeholders and competent authorities. Business Development, Integrated reporting. Strategy, policy and procedure development. Planning of staff on engagements and Invoicing of clients.</i></p>
<b>01 October 2014 – 31 December 2015</b>	PricewaterHouse Coopers (PwC)	<p>Sustainability Consultant 2</p> <p><i>Tasks included:</i>  <i>Non-financial auditing of Environmental KPI's (Primary water, Total Waste, Total Electricity, Total GDP Calc, Scope 1, 2 and 3 emissions, Total CSI spend, Total Environmental incidents and Total Rock waste generated) for listed mining companies. Role included, testing of controls, applications of audit standards and guidelines, preparation and conclusions of audit papers and files, reporting to management and preparation of audit reports.</i></p>

Date	Company	Roles and Responsibilities
01 January 2013- 30 September 2014	Triplo4 Sustainable Solutions (Pty) Ltd	Junior Environmental Consultant  <i>Tasks included:</i> <i>Conducting Environmental Control Officer audits and drafting of ECO reports for review. Drafting of Basic Assessment (BA) reports, Environmental Management Programme reports for review by Environmental Consultant. Conducting public participation by liaison with competent authorities and stakeholders. Assisting with compiling of Basic Assessment documents.</i>

## PROJECT EXPERIENCE

Arlene has extensive experience in conducting environmental impact assessments for infrastructure development projects (roads, stormwater, pipelines) and renewable energy projects (solar, wind, csp and hybrid projects), Mixed Use Developments and Section 24G Applications for complex projects and housing developments. She has extensive experience in managing and monitoring ECO functions and compliance on relevant projects. She has gained the ability to conduct sustainability assurance audits for non-financial environmental KPI's through her experience with listed mining corporations. She has also been involved in undertaking Part 2 Amendment Applications and impact assessments for Renewable Energy Projects in South Africa. She currently manages staff and undertakes project planning to ensure that projects are executed within the appropriate timeframes and within budget.

## MINING SECTOR PROJECTS

### *Environmental Impact Assessments and Environmental Management Programmes*

<i>Project Name &amp; Location</i>	<i>Client Name</i>	<i>Role</i>
<i>Yzermyn Coal Mine EMP, Piet Retief, Mpumalanga</i>	<i>Atha Group</i>	<i>EAP</i>

### *Basic Assessments*

<i>Project Name &amp; Location</i>	<i>Client Name</i>	<i>Role</i>
<i>Shaya Quarry Basic Assessment process, Empangeni, Kwazulu-Natal</i>	<i>Mbavuzi Minerals</i>	<i>Project Manager</i>
<i>Umvoti River Sand Mining Basic Assessment process, Kwazulu-Natal</i>	<i>Izimpiwe Minerals Pty Ltd</i>	<i>Project Manager</i>

### *Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications*

<i>Project Name &amp; Location</i>	<i>Client Name</i>	<i>Role</i>
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<i>Shaya Quarry Mining Permit Application, Empangeni, Kwazulu-Natal</i>	<i>Mbavuza Minerals</i>	<i>Project Manager</i>
<i>Umvoti River Sand Mining Mining Permit Application, Kwazulu-Natal</i>	<i>Izimbiwe Minerals Pty Ltd</i>	<i>Project Manager</i>
<i>Newark Quarry, Ilembe Municipality, Kwazulu-Natal</i>	<i>iLembe Concrete Pty Ltd</i>	<i>Junior EAP</i>

## **INFRASTRUCTURE DEVELOPMENT PROJECTS (BRIDGES, PIPELINES, ROADS, WATER RESOURCES, STORAGE, ETC)**

### ***Basic Assessments***

<b><i>Project Name &amp; Location</i></b>	<b><i>Client Name</i></b>	<b><i>Role</i></b>
<i>Replacement of Nseleni Bridge- Empangeni, Kwazulu-Natal</i>	<i>RHDHV</i>	<i>EAP</i>
<i>Construction of the GOML Ntuzuma Reservoir, Ntuzuma, Kwazulu-Natal</i>	<i>eThekwini Metropolitan Municipality</i>	<i>Project Manager</i>
<i>Upgrade of the Nyathikazi box culvert, Darnell, Kwazulu-Natal</i>	<i>KwaDukuza Municipality</i>	<i>Junior EAP</i>
<i>Upgrade and Expansion Provincial Main Road D887, Kwazulu-Natal</i>	<i>RHDHV</i>	<i>Junior EAP</i>
<i>Expansion of LOX and Diesel Storage at the Air Products Facility in Coega, Eastern Cape</i>	<i>Air Products South Africa (Pty) Ltd</i>	<i>EAP</i>

### ***Environmental Compliance, Auditing and ECO***

<b><i>Project Name &amp; Location</i></b>	<b><i>Client Name</i></b>	<b><i>Role</i></b>
<i>ECO Monitoring for Construction of Offtake 1 Reservoir, KwaDukuza, Kwazulu-Natal</i>	<i>KwaDukuza Municipality</i>	<i>Project Manager</i>
<i>ECO Monitoring for Construction of Offtake 6A2, 6D, 8C, 8D, 9, 11D Pipelines, KwaDukuza, Kwazulu-Natal</i>	<i>KwaDukuza Municipality</i>	<i>Project Manager</i>
<i>ECO Monitoring for the Construction of the Jozini RCWSS Phase 1A, Jozini, Kwazulu-Natal</i>	<i>RHDHV</i>	<i>ECO (1 year), Project Manager</i>
<i>ECO Monitoring for the Greytown BWSS, Greytown, Kwazulu-Natal</i>	<i>RHDHV</i>	<i>Project Manager</i>
<i>ECO Monitoring for the Kranskop Water Supply Scheme, Kranskop, Kwazulu-Natal</i>	<i>RHDHV</i>	<i>ECO</i>
<i>ECO Monitoring for the Zulti South Access Road, Richards Bay, Kwazulu-Natal</i>	<i>RHDHV</i>	<i>Project Manager</i>

### ***Compliance Advice and ESAP reporting***

<b><i>Project Name &amp; Location</i></b>	<b><i>Client Name</i></b>	<b><i>Role</i></b>
<i>Ethafeni Cemetery Environmental Assessment Report, KwaDukuza, Kwazulu-Natal</i>	<i>KwaDukuza Municipality</i>	<i>EAP</i>

**Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
<i>General Authorisation for the Replacement of the Nseleni Bridge, Empangeni, Kwzulu-Natal</i>	<i>RHDHV</i>	<i>EAP</i>
<i>Water Use Licence Amendment for Country Club Johannesburg</i>	<i>Country Club Johannesburg</i>	<i>EAP</i>

**HOUSING AND URBAN PROJECTS****Environmental Impact Assessments and Environmental Management Programmes**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
<i>Ethafeni Precinct Project Section 24G Application- Groutville , Kwazulu- Natal.</i>	<i>KwaDukuza Municipality</i>	<i>Project Manager/Lead Consultant</i>
<i>Environmental Management Programme report Brettenwood Residential Development, Kwazulu-Natal.</i>	<i>Brettenwood Coastal Estate</i>	<i>EAP</i>
<i>Environmental Management Programme report for CTM Ballito, Ballito, Kwazulu-Natal</i>	<i>CTM</i>	<i>EAP</i>

**Basic Assessments**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
<i>Upgrade of residential dwelling on Colwyn Drive, Salt Rock, Kwazulu-Natal</i>	<i>Mike Graham</i>	<i>Junior EAP</i>
<i>Ethafeni Precinct Project Basic Assessment, Groutville, Kwazulu-Natal</i>	<i>KwaDukuza Municipality</i>	<i>Project Manager</i>
<i>105 Nkwazi Drive Single Residential House Basic Assessment, Zinkwazi, Kwazulu-Natal</i>	<i>Ituwiz Pty Ltd</i>	<i>Project Manager</i>

**Environmental Compliance, Auditing and ECO**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
<i>88 Compensation ECO Audits – Ballito, Kwazulu- Natal</i>	<i>Imali Corp</i>	<i>Environmental Control Officer (ECO)</i>
<i>Oceans Umhlanga Hotel &amp; Residential Development, Umhlanga, Kwazulu-Natal</i>	<i>Edison Property Group</i>	<i>Project Manager</i>
<i>Inoxa Cookware Factory Warehouse, Woodmead Estate, Shakaskraal, Kwazulu-Natal</i>	<i>Shree Property</i>	<i>Project Manager</i>
<i>Woodmead Estate Warehousing, Gauteng</i>	<i>Shree Property</i>	<i>Project Manager</i>
<i>Ridgeside Commercial Development, Umhlanga, Kwazulu-Natal</i>	<i>Shree Property</i>	<i>Project Manager</i>

<i>Construction of Jozini Shopping Centre, Jozini, Kwazulu-Natal</i>	<i>GK Projects</i>	<i>ECO</i>
<i>Birdhaven Residential Development, Ballito, Kwazulu-Natal</i>	<i>Mike Graham Trust</i>	<i>ECO</i>
<i>Foxhill Church and Residential Development, Ballito, Kwazulu-Natal</i>	<i>M&amp;C Janigh Trust</i>	<i>ECO</i>
<i>Beema Bamboo Plantation Site (Bamboo to Energy project, Kwazulu-Natal</i>	<i>Green Grid Energy</i>	<i>ECO</i>

## **OTHER PROJECTS**

### **Environmental Compliance, Auditing and ECO**

<b><i>Project Name &amp; Location</i></b>	<b><i>Client Name</i></b>	<b><i>Role</i></b>
<i>Beema Bamboo Plantation Site (Bamboo to Energy project, Kwazulu-Natal</i>	<i>Green Grid Energy</i>	<i>ECO</i>
<i>Mkondeni Medical Waste External Waste Management License Audit, Pietermaritzburg</i>	<i>Ecocycle Waste Solutions</i>	<i>Auditor</i>
<i>Dube Tradeport External Audit, eThekwini</i>	<i>Dube Tradeport Corporation</i>	<i>Junior Auditor</i>

### **Carbon Footprint Analysis**

<b><i>Project Name &amp; Location</i></b>	<b><i>Client Name</i></b>	<b><i>Role</i></b>
<i>Carbon footprint analysis of Newcastle and Sasolburg Plants, (Kwazulu Natal &amp; North West</i>	<i>Karbochem Pty Ltd</i>	<i>EAP</i>
<i>Measure Carbon Emissions and provide updated baseline that would enable DTPC to quantify, monitor and assess carbon footprint and its climate change impact for DTPC, eThekwini</i>	<i>Dube Tradeport Corporation</i>	<i>Junior EAP</i>

### **Waste Management**

<b><i>Project Name &amp; Location</i></b>	<b><i>Client Name</i></b>	<b><i>Role</i></b>
<i>Waste Classification Assessment for Karbochem Newcastle facility, Kwazulu-Natal</i>	<i>Karbochem Pty Ltd</i>	<i>EAP</i>
<i>Waste Management Licenses for Wadeville &amp; Rosslyn Waste Management Facilities, Gauteng.</i>	<i>Planet Care Pty Ltd</i>	<i>EAP</i>

### **Compliance Advice and ESAP reporting**

<b><i>Project Name &amp; Location</i></b>	<b><i>Client Name</i></b>	<b><i>Role</i></b>
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<i>Environmental Opinion and Enquiry for the Rosslyn Tyre Pyrolysis Plant, Gauteng</i>	<i>Cosmic Energy</i>	<i>EAP</i>
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## Non-Financial Auditing

<b><i>KPI'S Audited</i></b>	<b><i>Client Name &amp; Location</i></b>	<b><i>Role</i></b>
<i>Total Primary Water Use, Total Electricity Used, Total Waste Generated, Scope 1, 2 &amp; 3 Emissions and Total Number of Environmental Incidents.</i>	<i>Anglo Platinum (South Africa)</i>	<i>Sustainability Consultant</i>
<i>Total Primary Water Use, Total Waste Generate and Total Number of Environmental Incidents.</i>	<i>De Beers (Namibia)</i>	<i>Sustainability Consultant</i>
<i>Scope 1, 2 &amp; 3 Emissions, Total Electricity Purchased, Total Primary Water Used.</i>	<i>Harmony Gold (South Africa)</i>	<i>Sustainability Consultant</i>
<i>Scope 1, 2 &amp; 3 Emissions, Total Electricity Purchased, Total Primary Water Used and Total Rock Waste Generated.</i>	<i>Exxaro (South Africa, Papua New Guinea)</i>	<i>Sustainability Consultant</i>
<i>Total Corporate Social Investment fund spend by Barclays Group</i>	<i>Barclays Group</i>	<i>Sustainability Consultant</i>
<i>Audit Environmental and Social Risk Finance Projects - Equator Principles</i>	<i>MTN (South Africa &amp; Nigeria)</i>	<i>Sustainability Consultant</i>

## Renewable Energy Projects

### Part 2 Amendment Applications and Motivation Reports

<b><i>Project Name &amp; Location</i></b>	<b><i>Client Name</i></b>	<b><i>Role</i></b>
<i>Transalloys Coal-Fired Power Station near Emalahleni, Mpumalanga Province</i>	<i>Transalloys (Pty) Ltd</i>	<i>EAP</i>
<i>Zen Wind Energy Facility, Western Cape</i>	<i>Energy Team (Pty) Ltd</i>	<i>EAP</i>
<i>Hartebeest Wind Energy Facility, Western Cape</i>	<i>juwi Renewable Energies (Pty) Ltd</i>	<i>EAP</i>
<i>Khai-Ma and Korana Wind Energy Facilities</i>	<i>Mainstream Renewable Power (Pty) Ltd</i>	<i>EAP</i>
<i>Korana Solar PV facility</i>	<i>Mainstream Renewable Power (Pty) Ltd</i>	<i>EAP</i>
<i>Sutherland Wind Energy Facility</i>	<i>Mainstream Renewable Power (Pty) Ltd</i>	<i>EAP</i>
<i>Rietrug Wind Energy Facility</i>	<i>Mainstream Renewable Power (Pty) Ltd</i>	<i>EAP</i>

## Basic Assessments



<b><i>Project Name &amp; Location</i></b>	<b><i>Client Name</i></b>	<b><i>Role</i></b>
<i>Upilanga Solar Park, Northern Cape (x6 100MW PV's and x3 350MW PV Basic Assessments)</i>	<i>Emvelo Capital Projects (Pty) Ltd</i>	<i>EAP</i>
<i>Kolkies and Sadawa PV facilities and associated grid infrastructure</i>	<i>Mainstream Renewable Power South Africa (Pty) Ltd</i>	<i>EAP</i>
<i>Hyperion Overhead Powerline</i>	<i>Red Rocket (Pty) Ltd</i>	<i>EAP</i>
<i>132KkV Phinda Power underground transmission line</i>	<i>Phinda Power Producers (Pty) Ltd</i>	<i>EAP</i>
<i>Msenge Emoyeni Wind Energy Facility supporting infrastructure</i>	<i>Windlab (Pty) Ltd</i>	<i>EAP</i>
<i>Sutherland Wind Energy Facility Grid Infrastructure</i>	<i>Mainstream Renewable Power South Africa (Pty) Ltd</i>	<i>EAP</i>
<i>Rietrug Wind Energy Facility Grid Infrastructure</i>	<i>Mainstream Renewable Power South Africa (Pty) Ltd</i>	<i>EAP</i>

### **Environmental Impact Assessments**

<b><i>Project Name &amp; Location</i></b>	<b><i>Client Name</i></b>	<b><i>Role</i></b>
<i>Upilanga Solar Park, Northern Cape (350MW GSP Tower)</i>	<i>Emvelo Capital Projects (Pty) Ltd</i>	<i>EAP</i>
<i>350MW Risk Mitigation Power Plant (Gas to Power facility)</i>	<i>Phinda Power Producers (Pty) Ltd</i>	<i>EAP</i>
<i>75mw Thermal Dual Fuel Facility and associated infrastructure (Hybrid facility i.e. gas to power and solar pv)</i>	<i>Red Rocket (Pty) Ltd</i>	<i>EAP</i>
<i>Berg River Wind Energy Facility</i>	<i>Energy Team (Pty) Ltd</i>	<i>EAP</i>

### **Section 54 Audits**

<b><i>Project Name &amp; Location</i></b>	<b><i>Client Name</i></b>	<b><i>Role</i></b>
<i>Mulilo 20MW PV Facility, Prieska, Northern Cape</i>	<i>Mulilo (Pty) Ltd</i>	<i>Auditor</i>
<i>Mulilo 10MW PV Facility, De Aar, Northern Cape</i>	<i>Mulilo (Pty) Ltd</i>	<i>Auditor</i>
<i>Karashoek CSP 1 Facility/ Solar One., Upington, Northern Cape</i>	<i>Karashoek Solar One (Pty) Ltd</i>	<i>Audit</i>

## CURRICULUM VITAE OF NORMAN CHETSANGA

<b>Profession:</b>	Environmental Assessment Practitioner (EAP)
<b>Specialisation:</b>	Environmental Assessments, report writing, report reviewing, development of project proposals for procuring new projects and project administration.
<b>Work Experience:</b>	10 years' experience in Environmental Management (8 years in Environmental Regulatory Body and 2 years in Environmental Assessments and Health & Safety Consulting).

### VOCATIONAL EXPERIENCE

Well advanced in environmental auditing, ECO execution on various construction projects. Is a consultant in the environmental management field capable of drafting Environmental Management Plans, carrying out work focused on Environmental authorisation processes (Public participation, report drafting and project management of the authorisation process)

Vast experience in environmental impact assessments review, approval and associated environmental compliance inspections. Well experienced in environmental legislation interpretation and compliance thereof. Has also attained auditing skills in Health and Safety matters during his career.

### SKILLS BASE AND CORE COMPETENCIES

- Reliable experience in environmental compliance monitoring and auditing.
- Adequate environmental legislation interpretation and assessment for the purposes of policy formulation.
- Comprehensive report writing and compilation in terms of Environmental authorisation reviews and draft compilations of BAR's, and EMPs
- ECO experience in monitoring
- Water quality testing
- Air quality testing

### EDUCATION AND PROFESSIONAL STATUS

**Degrees:**

- Bachelor of Environmental Science. (Hons.) Pollution Science(2008), Bindura University of Science Education;

#### Short Courses:

- Auditor Training Course ISO 14001:2004 (April 2009) with Southern African Auditor and Training Certification Association:
- ISO 17020 IBA Conformity Assessment Awareness Certificate with Deutsche Zertifizierung in association with Fleet Consultants

#### Professional Society Affiliations:

- South African Council for Natural Scientific Professionals - Professional Natural Scientist: Environmental Scientist) – Reg No. 115364

#### Other Relevant Skills:

- Environmental quality testing (Water sampling and air quality testing)
- Report writing
- SAP

### EMPLOYMENT

Date	Company	Roles and Responsibilities
		<p>Junior Environmental Assessment Practitioner</p> <p><i>Tasks include:</i>            Play a key role in environmental permitting, environmental authorisation applications, and compliance advice and assurance. Manage the delivery of EIA report and EMPs. Execute and further develop and manage environmental permitting requirements (including, but not limited to, WUL, AEL, WML, biodiversity permits). Client liaison, networking and building on marketing strategies</p>
April 2019- July 2021	EnviroFact Consulting cc	<p>Environmental Control Officer/ Consultant.</p> <p><i>Tasks include:</i>            Conducting ECO work, inspections and reporting. Conducting HSE inspections as an independent agent for projects. Development of Environmental Management</p>

Date	Company	Roles and Responsibilities
		Plans for project sites. Monitoring and Management of environmental activities on project sites. Preliminary compilation of EIAs, BARs and WULA processes. Development and implementation of Quality, Health, Safety & Environmental Management systems for clients. Auditing QHSE management systems and operations.
October 2010- March 2019		Provincial Environmental Quality Scientist  <u>Tasks included:</u> <i>Environmental Permitting and compliance monitoring Inspections. Regulatory Environmental protection in Hazardous substances and Wastes, Air quality, Water and effluent, Solid waste sections. Environmental Impact Assessment reviews including EMPRs and all associated EAs. Coordinating a biomonitoring and surface water sampling program for seven districts. Air quality testing and analysis. Hazardous substances spill response and contaminated land remediation. Data and trend analysis. Environmental billing, report writing, departmental budgeting. Stakeholder liason as required.</i>

## PROJECT EXPERIENCE

Norman has comprehensive experience in environmental management and monitoring at all levels of industry (mining, construction, timber processing, manufacturing and small scale enterprises). ECO experience in development and construction industries with greater exposure in road construction and bridge construction. Has also gained substantial experience in environmental management systems auditing in all levels of industry and recently extended to the motor industry.

## PROJECTS

### *Environmental Impact Assessments and Environmental Management Programmes*

<i>Project Name &amp; Location</i>	<i>Client Name</i>	<i>Role</i>
<i>EMPr and maintenance management plan to conduct maintenance and repair related activities in and around the</i>	<i>Gauteng Department of Roads and Transport</i>	<i>Junior EAP</i>



Kikuyu Waterfall  
Cnr. Old Pretoria Main Road & Maxwell Drive  
Johannesburg, South Africa

Email: [norman@veersgroup.com](mailto:norman@veersgroup.com)  
Tel: +27 74 366 7048

<i>floodplain of klipspruit watercourse around bridges b1727a and b1727b on road p186/1 (N12) in eldorado park</i>		
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### **Basic Assessments**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
<i>Basic assessment and water use authorization process for the PRASA construction Of a bridge at Koelenhof level crossing, Stellenbosch Local municipality, Western cape</i>	<i>PRASA</i>	<i>Junior EAP</i>

### **Environmental Compliance, Auditing and ECD**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
<i>ECD Monitoring for Construction of road streets and stormwater in Masakeng and Thusanong, LadyBrand, Free State</i>	<i>Mantsopa Municipality</i>	<i>ECD</i>
<i>ECD Monitoring for upgrade of AH Roads, for City of Ekurhuleni, Pomona, Kempton Park, Gauteng.</i>	<i>City of Ekurhuleni</i>	<i>ECD</i>
<i>ECD Monitoring for the Construction of the Limpopo Low level bridge and access road, Limpopo</i>	<i>Modimolle-Mookgophong Local Municipality</i>	<i>ECD</i>
<i>ECD Monitoring for the construction of 2.0km road in Orange farm, Gauteng</i>	<i>JDA</i>	<i>ECD</i>
<i>ECD Monitoring for the upgrade to National Route 3, section 2, from Cato ridge (km 20.2) to Dardanelles (km 26.6), Kwazulu-Natal</i>	<i>RHDHV</i>	<i>ECD</i>

### **Compliance Advice and ESAP reporting**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
<i>Waste Impact Report, Wadeville Gauteng</i>	<i>Umsa Construction</i>	<i>Junior EAP</i>

### **Environmental management systems Auditing**

<b>Systems Audited/Developed</b>	<b>Client Name &amp; Location</b>	<b>Role</b>
<i>HSE systems Internal auditing</i>	<i>Johnson Matthey (South Africa)</i>	<i>Candidate Systems Auditor</i>
<i>QHSE systems development and Implementation</i>	<i>Gancri Tropicus Transport and Logistics (Namibia)</i>	<i>Candidate Systems Auditor</i>

## Appendix B: Bird Monitoring

The primary aims of a long-term monitoring programme would be to:

- i. Determine the densities of birds resident within the impact area of the wind energy facility before construction of the facility, and afterwards, once the facility, or phases of the facility, become operational.
- ii. Document patterns of bird activity and movements in the vicinity of the proposed wind energy facility before construction, and afterwards, once the facility is operational.
- iii. Monitor patterns of bird activity and movement in relation to weather conditions, time of day and season for at least a full calendar year after the facility is commissioned.
- iv. Register and as far as possible document the circumstances surrounding all avian collisions with the turbines for at least a full calendar year after the facility becomes operational.

Bird density and activity monitoring should focus on rare and/or endemic, potentially disturbance or collision prone species, which occur with some regularity in the area. Ultimately, the study should provide much needed quantitative information on the effects of the facility on the distribution and abundance of birds, and the actual risk it poses to the local avifauna, and serve to inform and improve mitigation measures to reduce this risk. It will also establish a precedent and a template for research and monitoring of avian impacts at possible, future wind energy sites in the region. This programme outline is informed by monitoring studies established in other countries (e.g. Erickson et al. 1999, Scottish National Heritage 2005), but is based substantially on those developed for both the Darling and the Klipheuwel wind power demonstration facilities in South Africa. The bulk of the work involved should be done by an expert ornithologist or under the supervision of such.

### Monitoring protocols

#### Avian densities before and after

A set of at least 10 walk-transect routes, each of at least 1000 m in length, should be established in areas representative of all the avian habitats present within a 10 km radius of the centre of the development site. Each of these should be walked at least once every two months over the six months preceding construction, and at least once every two months over the same calendar period, at least six months after the facility is commissioned. The transects should be walked after 06h00 and before 09h00, and the species, number and perpendicular distance from the transect line of all birds seen should be recorded for subsequent analysis and comparison. In addition, any cliff-lines within the development area should be surveyed for cliff-nesting raptors at least every six months using documented protocols, and all sightings of key species on site should be carefully plotted and documented, and the major waterbodies on and close to the development area should be surveyed for wetland species on each visit to the study area, using the standard protocols set out by the CWAC initiative.

#### Bird activity monitoring

Monitoring of bird activity in the vicinity of the facility should be done over a 2-3 day period at least every two months for the six months preceding construction, and at least once per quarter for a full calendar year starting at least six months after the facility is commissioned. Each monitoring day should involve:

- (i) Half-day counts of all priority species flying over or past the impact area (see passage rates below)
- (ii) Opportunistic surveys of large terrestrial species and raptors seen when travelling around the site.

### **Passage rates of priority bird species**

Counts of bird traffic over and around the proposed/operational facility should be conducted from suitable vantage points (and a number of these should be selected and used to provide coverage of avian flights in relation to all areas of the site), and extend alternately from dawn to midday, or from midday to dusk, so that the equivalent of four full days of counts is completed each count period. This should provide an adequate (if minimal) sample of bird movements around the facility in relation to a representative cross-section of conditions and times of day, for all seasons of the year. Once in position at the selected count station, the observer should record (preferably on a specially designed data sheet) the date, count number, start-time and conditions at start - extent of cloud cover, temperature, wind velocity and visibility - and proceed with the count. The counts should detail all individuals or flocks of the stipulated priority bird species, all raptors, and any additional species of particular interest or conservation concern, seen flying within 500 m of the envisaged or actual periphery of the facility. Each record should include the following data: time, updated weather assessment, species, number, mode of flight (flapping, gliding, soaring), flight activity (commuting, hunting other), direction of flight, vertical zoning relative to the envisaged or actual turbine string (low - below or within the rotor arc, medium - within c.100 m of the upper rotor arc, high - >100 m above the upper rotor arc), and horizontal zoning relative to the envisaged or actual turbine string (near - through the turbine string or within the outer rotor arc, middle - within c.100 m of the outer rotor arc, distant - >100 m beyond the outer rotor arc) and, for post construction monitoring, notes on any obvious evasive behaviour or flight path changes observed in response to the wind energy facility. The time and weather conditions should again be noted at the end of each count.

### **Avian collisions**

Collision monitoring should have two components: (i) experimental assessment of search efficiency and scavenging rates of bird carcasses on the site, and (ii) regular searches of the vicinity of the wind farm for collision casualties.

### **Assessing search efficiency and scavenging rates**

The value of surveying the area for collision victims only holds if some measure of the accuracy of the survey method is developed. To do this, a sample of suitable bird carcasses (of similar size and colour to the priority species - e.g. Egyptian Goose *Alopochen aegyptiacus*, domestic waterfowl and pigeons) should be obtained and distributed randomly around the site without the knowledge of the surveyor, some time before the site is surveyed. This process should be repeated opportunistically (as and when suitable bird carcasses become available) for the first two months of the monitoring period, with the total number of carcasses not less than 20. The proportion of the carcasses located in surveys will indicate the relative efficiency of the survey method.

Simultaneous to this process, the condition and presence of all the carcasses positioned on the site should be monitored throughout the initial two-month period, to determine the rates at which carcasses are scavenged from the area, or decay to the point that they are no longer obvious to the surveyor. This should provide an indication of scavenge rate that should inform subsequent survey work for collision victims, particularly in terms of the frequency of surveys required to maximise survey efficiency and/or the extent to which estimates of collision frequency should be adjusted to account for scavenge rate. Scavenger numbers and activity in the area may vary seasonally so, ideally, scavenge and decomposition rates should be measured twice during the monitoring year, once in winter and once in summer.



### **Collision victim surveys**

The area within a radius of at least 50 m of each of the turbines at the facility should be checked regularly for bird casualties. The frequency of these surveys should be informed by assessments of scavenge and decomposition rates conducted in the initial stages of the monitoring period, but they should be done at least weekly for the first two months of the study. The area around each turbine, or a larger area encompassing the entire facility, should be divided into quadrants, and each should be carefully and methodically searched for any sign of a bird collision incident (carcasses, dismembered body parts, scattered feathers, injured birds). All suspected collision incidents should be comprehensively documented, detailing the precise location (preferably a GPS reading), date and time at which the evidence was found, and the site of the find should be photographed with all the evidence in situ. All physical evidence should then be collected, bagged and carefully labelled, and refrigerated or frozen to await further examination. If any injured birds are recovered, each should be contained in a suitably-sized cardboard box. The local conservation authority should be notified and requested to transport casualties to the nearest reputable veterinary clinic or wild animal/bird rehabilitation centre. In such cases, the immediate area of the recovery should be searched for evidence of impact with the turbine blades, and any such evidence should be fully documented. In tandem with surveys of the wind farm for collision casualties, sample sections of any new lengths of power line associated with the development should also be surveyed for collision victims using established protocols.

Annotated list of the bird species considered likely to occur within the impact zone of the proposed Msenge Emoyeni Wind Energy Facility. Species seen during the time spent on site appear in bold (Jenkins et al.2015).i

Species	Scientific name	Conservation status	Endemism	Habitat		
				Grasslands (incl. light <i>Acacia</i> woodland)	Thicket (incl. dense riparian woodland)	Wetlands (incl. vleis, rivers and dams)
<b>Common Ostrich</b>	<i>Struthio camelus</i>			X		
<b>Grey-winged Francolin</b>	<i>Scleroptila africanus</i>		<b>Endemic</b>	X		
<b>Common Quail</b>	<i>Coturnix coturnix</i>			X		
<b>Helmeted Guineafowl</b>	<i>Numida meleagris</i>			X		
<b>Egyptian Goose</b>	<i>Alopochen aegyptiaca</i>					X
<b>South African Shelduck</b>	<i>Tadorna cana</i>		<b>Endemic</b>			X
<b>Spur-winged Goose</b>	<i>Plectropterus gambensis</i>					X
<b>White-faced Duck</b>	<i>Dendrocygna viduata</i>					X
African Black Duck	<i>Anas sparsa</i>					X
<b>Yellow-billed Duck</b>	<i>Anas undulata</i>					X
<b>Cape Shoveler</b>	<i>Anas smithii</i>		<b>Endemic</b>			X
<b>Cape Teal</b>	<i>Anas capensis</i>					X
<b>Red-billed Teal</b>	<i>Anas erythrorhyncha</i>					X
Greater Honeyguide	<i>Indicator indicator</i>				X	
Lesser Honeyguide	<i>Indicator minor</i>				X	
Red-throated Wryneck	<i>Jynx ruficollis</i>				X	

Species	Scientific name	Conservation status	Endemism	Habitat		
				Grasslands (incl. light <i>Acacia</i> woodland)	Thicket (incl. dense riparian woodland)	Wetlands (incl. vleis, rivers and dams)
Cardinal Woodpecker	<i>Dendropicos fuscescens</i>				X	
<b>Acacia Pied Barbet</b>	<i>Tricholaema leucomelas</i>		<b>Near-endemic</b>		<b>X</b>	
<b>Black-collared Barbet</b>	<i>Lybius torquatus</i>				<b>X</b>	
Red-fronted Tinkerbird	<i>Pogoniulus pusillus</i>				X	
<b>Crowned Hornbill</b>	<i>Tockus alboterminatus</i>				<b>X</b>	

Species	Scientific name	Conservation status	Endemism	Habitat		
				Grasslands (incl. light <i>Acacia</i> woodland)	Thicket (incl. dense riparian woodland)	Wetlands (incl. vleis, rivers and dams)
<b>African Hoopoe</b>	<b><i>Upupa africana</i></b>				X	
Green Wood-Hoopoe	<i>Phoeniculus purpureus</i>				X	
European Roller	<i>Coracias garrulus</i>			X		
Malachite Kingfisher	<i>Alcedo cristata</i>					X
<b>Brown-hooded Kingfisher</b>	<b><i>Halcyon albiventris</i></b>				X	
Giant Kingfisher	<i>Megaceryle maximus</i>					X
Pied Kingfisher	<i>Ceryle rudis</i>					X
European Bee-eater	<i>Merops apiaster</i>			X		
<b>White-backed Mousebird</b>	<b><i>Colius colius</i></b>				X	
<b>Speckled Mousebird</b>	<b><i>Colius striatus</i></b>				X	
<b>Red-faced Mousebird</b>	<b><i>Urocolius indicus</i></b>				X	
Jacobin Cuckoo	<i>Clamator jacobinus</i>				X	
Great Spotted Cuckoo	<i>Clamator glandarius</i>				X	
Red-chested Cuckoo	<i>Cuculus solitarius</i>				X	
Black Cuckoo	<i>Cuculus clamosus</i>				X	
Common Cuckoo	<i>Cuculus canorus</i>				X	
<b>Klaas's Cuckoo</b>	<b><i>Chrysococcyx klaas</i></b>				X	
<b>Diderick Cuckoo</b>	<b><i>Chrysococcyx caprius</i></b>				X	
<b>Burchell's Coucal</b>	<b><i>Centropus burchellii</i></b>					X
<b>Alpine Swift</b>	<b><i>Tachymarptis melba</i></b>			X		
Common Swift	<i>Apus apus</i>			X		

<b>African Black Swift</b>	<i>Apus barbatus</i>			X		
<b>Little Swift</b>	<i>Apus affinis</i>			X		
Horus Swift	<i>Apus horus</i>			X		

Species	Scientific name	Conservation status	Endemism	Habitat		
				Grasslands (incl. light <i>Acacia</i> woodland)	Thicket (incl. dense riparian woodland)	Wetlands (incl. vleis, rivers and dams)
<b>White-rumped Swift</b>	<i>Apus caffer</i>			X		
<b>Barn Owl</b>	<i>Tyto alba</i>			X	X	
<b>African Scops Owl</b>	<i>Otus senegalensis</i>				X	
Cape Eagle-Owl	<i>Bubo capensis</i>			X		
Spotted Eagle-Owl	<i>Bubo africanus</i>			X	X	
Fiery-necked Nightjar	<i>Caprimulgus pectoralis</i>				X	
Rufous-cheeked Nightjar	<i>Caprimulgus rufigena</i>				X	
Rock Dove	<i>Columba livia</i>			X		
Speckled Pigeon	<i>Columba guinea</i>			X		
African Olive-Pigeon	<i>Columba arquatrix</i>				X	
<b>Laughing Dove</b>	<i>Streptopelia senegalensis</i>			X	X	
<b>Cape Turtle-Dove</b>	<i>Streptopelia capicola</i>			X	X	
<b>Red-eyed Dove</b>	<i>Streptopelia semitorquata</i>				X	
Namaqua Dove	<i>Dena capensis</i>			X		
<b>Denham's Bustard</b>	<i>Neotis denhami</i>	Vulnerable		X		
<b>Ludwig's Bustard</b>	<i>Neotis ludwigii</i>	Vulnerable	Near-endemic	X		
Kori Bustard	<i>Ardeotis kori</i>	Vulnerable		X		
<b>Southern Black Korhaan</b>	<i>Afrotis afra</i>		Endemic	X		
<b>Karoo Korhaan</b>	<i>Eupodotis vigorsii</i>		Endemic	X		
<b>White-bellied Korhaan</b>	<i>Eupodotis senegalensis</i>	Vulnerable		X		
<b>Blue Crane</b>	<i>Anthropoides paradiseus</i>	Vulnerable	Endemic	X		X
African Rail	<i>Rallus caerulescens</i>					X

Black Crane	<i>Amaurornis flavirostris</i>					X
Species	Scientific name	Conservation status	Endemism	Habitat		
				Grasslands (incl. light <i>Acacia</i> woodland)	Thicket (incl. dense riparian woodland)	Wetlands (incl. vleis, rivers and dams)
Common Moorhen	<i>Gallinula chloropus</i>					X
Red-knobbed Coot	<i>Fulica cristata</i>					X
Namaqua Sandgrouse	<i>Pterocles namaqua</i>		Near-endemic	X		
African Snipe	<i>Gallinago nigripennis</i>					X
<b>Marsh Sandpiper</b>	<b><i>Tringa stagnatilis</i></b>					<b>X</b>
Common Greenshank	<i>Tringa nebularia</i>					X
Common Sandpiper	<i>Actitis hypoleucos</i>					X
African Jacana	<i>Actophilornis africanus</i>					X
Spotted Thick-knee	<i>Burhinus capensis</i>			X		
<b>Black-winged Stilt</b>	<b><i>Himantopus himantopus</i></b>					<b>X</b>
<b>Pied Avocet</b>	<b><i>Recurvirostra avosetta</i></b>					<b>X</b>
Kittlitz's Plover	<i>Charadrius pecuarius</i>			X		X
Three-banded Plover	<i>Charadrius tricollaris</i>					X
<b>Blacksmith Lapwing</b>	<b><i>Vanellus armatus</i></b>					<b>X</b>
<b>Crowned Lapwing</b>	<b><i>Vanellus coronatus</i></b>			X		
Double-banded Courser	<i>Rhinoptilus africanus</i>			X		
<b>Burchell's Courser</b>	<b><i>Cursorius rufus</i></b>		Endemic	X		
Grey-headed Gull	<i>Larus cirrocephalus</i>					X
<b>Whiskered Tern</b>	<b><i>Chlidonias hybrida</i></b>					<b>X</b>
White-winged Tern	<i>Chlidonias leucopterus</i>					X
<b>Black-shouldered Kite</b>	<b><i>Elanus caeruleus</i></b>			X	X	

<b>Black Kite</b>	<i>Milvus migrans</i>			X	X	
<b>African Fish-Eagle</b>	<i>Haliaeetus vocifer</i>				X	X
<b>Cape Vulture</b>	<i>Gyps coprotheres</i>	Vulnerable	Endemic	X		

Species	Scientific name	Conservation status	Endemism	Habitat		
				Grasslands (incl. light <i>Acacia</i> woodland)	Thicket (incl. dense riparian woodland)	Wetlands (incl. vleis, rivers and dams)
African Marsh-Harrier	<i>Circus ranivorus</i>	Vulnerable				X
<b>Black Harrier</b>	<i>Circus maurus</i>	<b>Near-threatened</b>	<b>Endemic</b>	X		X
Pallid Harrier	<i>Circus macrourus</i>	Near-threatened		X		
<b>African Harrier-Hawk</b>	<i>Polyboroides typus</i>			X	X	
<b>Southern Pale Chanting Goshawk</b>	<i>Melierax canorus</i>		<b>Near-endemic</b>	X	X	
Gabar Goshawk	<i>Melierax gabar</i>				X	
African Goshawk	<i>Accipiter tachiro</i>				X	
Little Sparrowhawk	<i>Accipiter minullus</i>				X	
Rufous-chested Sparrowhawk	<i>Accipiter rufiventris</i>			X	X	
<b>Black Sparrowhawk</b>	<i>Accipiter melanoleucus</i>				X	
<b>Steppe Buzzard</b>	<i>Buteo vulpinus</i>			X	X	
<b>Jackal Buzzard</b>	<i>Buteo rufofuscus</i>		<b>Endemic</b>	X	X	
<b>Verreaux's Eagle</b>	<i>Aquila verreauxii</i>			X		
<b>Booted Eagle</b>	<i>Aquila pennatus</i>			X		
<b>Martial Eagle</b>	<i>Polemaetus bellicosus</i>	Vulnerable		X	X	
<b>Secretarybird</b>	<i>Sagittarius serpentarius</i>	Near-threatened		X		
<b>Lesser Kestrel</b>	<i>Falco naumanni</i>	Vulnerable		X		



<b>Rock Kestrel</b>	<i>Falco rupicolus</i>			X		
<b>Greater Kestrel</b>	<i>Falco rupicoloides</i>			X		
<b>Amur Falcon</b>	<i>Falco amurensis</i>			X		
Eurasian Hobby	<i>Falco subbuteo</i>			X	X	
<b>Lanner Falcon</b>	<i>Falco biarmicus</i>	<b>Near-threatened</b>		X		
Peregrine Falcon	<i>Falco peregrinus</i>	Near-threatened		X		
<b>Little Grebe</b>	<i>Tachybaptus ruficollis</i>					X

Species	Scientific name	Conservation status	Endemism	Habitat		
				Grasslands (incl. light <i>Acacia</i> woodland)	Thicket (incl. dense riparian woodland)	Wetlands (incl. vleis, rivers and dams)
<b>Black-necked Grebe</b>	<i>Podiceps nigricollis</i>					X
<b>African Darter</b>	<i>Anhinga rufa</i>					X
<b>Reed Cormorant</b>	<i>Phalacrocorax africanus</i>					X
<b>White-breasted Cormorant</b>	<i>Phalacrocorax lucidus</i>					X
<b>Little Egret</b>	<i>Egretta garzetta</i>					X
<b>Yellow-billed Egret</b>	<i>Egretta intermedia</i>					X
Great Egret	<i>Egretta alba</i>					X
<b>Grey Heron</b>	<i>Ardea cinerea</i>					X
<b>Black-headed Heron</b>	<i>Ardea melanocephala</i>			X		X
Goliath Heron	<i>Ardea goliath</i>					X
<b>Purple Heron</b>	<i>Ardea purpurea</i>					X
Cattle Egret	<i>Bubulcus ibis</i>			X		X
Squacco Heron	<i>Ardeola ralloides</i>					X
Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>					X
Little Bittern	<i>Ixobrychus minutus</i>					X
Hamerkop	<i>Scopus umbretta</i>					X
Glossy Ibis	<i>Plegadis falcinellus</i>					X
<b>Hadeda Ibis</b>	<i>Bostrychia hagedash</i>				X	X
<b>African Sacred Ibis</b>	<i>Threskiornis aethiopicus</i>					X
<b>African Spoonbill</b>	<i>Platalea alba</i>					X
Yellow-billed Stork	<i>Mycteria ibis</i>	Near-threatened				X
Black Stork	<i>Ciconia nigra</i>	Near-threatened		X		X
White Stork	<i>Ciconia ciconia</i>			X		X

Species	Scientific name	Conservation status	Endemism	Habitat		
				Grasslands (incl. light <i>Acacia</i> woodland)	Thicket (incl. dense riparian woodland)	Wetlands (incl. vleis, rivers and dams)
Eurasian Golden Oriole	<i>Oriolus oriolus</i>				X	
Black-headed Oriole	<i>Oriolus larvatus</i>				X	
<b>Fork-tailed Drongo</b>	<b><i>Dicrurus adsimilis</i></b>				<b>X</b>	
<b>African Paradise-Flycatcher</b>	<b><i>Terpsiphone viridis</i></b>				<b>X</b>	
Black-backed Puffback	<i>Dryoscopus cubla</i>				X	
Southern Tchagra	<i>Tchagra tchagra</i>		Endemic		X	
Southern Boubou	<i>Laniarius ferrugineus</i>		Endemic		X	
<b>Bokmakierie</b>	<b><i>Telophorus zeylonus</i></b>		<b>Near-endemic</b>		<b>X</b>	
Olive Bush-Shrike	<i>Telophorus olivaceus</i>		Near-endemic		X	
<b>Cape Batis</b>	<b><i>Batis capensis</i></b>		<b>Endemic</b>		<b>X</b>	
<b>Chinspot Batis</b>	<b><i>Batis molitor</i></b>				<b>X</b>	
Pirit Batis	<i>Batis pririt</i>		Near-endemic		X	
<b>Cape Crow</b>	<b><i>Corvus capensis</i></b>			<b>X</b>		
<b>Pied Crow</b>	<b><i>Corvus albus</i></b>			<b>X</b>	<b>X</b>	
<b>White-necked Raven</b>	<b><i>Corvus albicollis</i></b>			<b>X</b>		
Red-backed Shrike	<i>Lanius collurio</i>			X	X	
Lesser Grey Shrike	<i>Lanius minor</i>			X		
<b>Common Fiscal</b>	<b><i>Lanius collaris</i></b>			<b>X</b>	<b>X</b>	
Cape Penduline-Tit	<i>Anthoscopus minutus</i>		Near-endemic		X	
Grey Tit	<i>Parus afer</i>		Endemic	X	X	
<b>Southern Black Tit</b>	<b><i>Parus niger</i></b>			<b>X</b>	<b>X</b>	
Sand Martin	<i>Riparia riparia</i>			X		X
<b>Brown-throated Martin</b>	<b><i>Riparia paludicola</i></b>					<b>X</b>

<b>Banded Martin</b>	<i>Riparia cincta</i>			X		X
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Species	Scientific name	Conservation status	Endemism	Habitat		
				Grasslands (incl. light <i>Acacia</i> woodland)	Thicket (incl. dense riparian woodland)	Wetlands (incl. vleis, rivers and dams)
<b>Barn Swallow</b>	<i>Hirundo rustica</i>			X		X
<b>White-throated Swallow</b>	<i>Hirundo albigularis</i>					X
<b>Pearl-breasted Swallow</b>	<i>Hirundo dimidiata</i>			X		X
<b>Greater Striped Swallow</b>	<i>Hirundo cucullata</i>			X		X
Lesser Striped Swallow	<i>Hirundo abyssinica</i>			X		X
South African Cliff-Swallow	<i>Hirundo spilodera</i>		Breeding endemic	X		
<b>Rock Martin</b>	<i>Hirundo fuligula</i>			X		
<b>Common House-Martin</b>	<i>Delichon urbicum</i>			X		X
Black Saw-wing	<i>Psalidoprocne holomelaena</i>				X	
<b>Dark-capped Bulbul</b>	<i>Pycnonotus tricolor</i>				X	
<b>African Red-eyed Bulbul</b>	<i>Pycnonotus nigricans</i>		Near-endemic		X	
Cape Bulbul	<i>Pycnonotus capensis</i>		Endemic		X	
<b>Sombre Greenbul</b>	<i>Andropadus importunus</i>				X	
Fairy Flycatcher	<i>Stenostira scita</i>		Endemic	X	X	
Cape Grassbird	<i>Sphenoeacus afer</i>		Endemic	X		
Long-billed Crombec	<i>Sylvietta rufescens</i>				X	
Yellow-bellied Eremomela	<i>Eremomela icteropygialis</i>				X	
<b>Karoo Eremomela</b>	<i>Eremomela gregalis</i>		Endemic	X		
Little Rush-Warbler	<i>Bradypterus baboecala</i>					X
African Reed-Warbler	<i>Acrocephalus baeticatus</i>					X
Lesser Swamp Warbler	<i>Acrocephalus gracilirostris</i>					X
Willow Warbler	<i>Phylloscopus trachilus</i>				X	
Layard's Tit-Babbler	<i>Parisoma layardi</i>		Endemic	X	X	

Species	Scientific name	Conservation status	Endemism	Habitat		
				Grasslands (incl. light <i>Acacia</i> woodland)	Thicket (incl. dense riparian woodland)	Wetlands (incl. vleis, rivers and dams)
<b>Chestnut-vented Tit-Babbler</b>	<i>Parisoma subcaeruleum</i>		<b>Near-endemic</b>	X	X	
Garden Warbler	<i>Sylvia borin</i>				X	
<b>Cape White-eye</b>	<i>Zosterops virens</i>		<b>Endemic</b>		X	
Orange River White-eye	<i>Zosterops pallidus</i>		Endemic		X	
Lazy Cisticola	<i>Cisticola aberrans</i>			X		
<b>Grey-backed Cisticola</b>	<i>Cisticola subruficapilla</i>			X	X	
Wailing Cisticola	<i>Cisticola lais</i>				X	
<b>Levaillant's Cisticola</b>	<i>Cisticola tinniens</i>					X
<b>Neddicky</b>	<i>Cisticola fulvicapilla</i>			X		
<b>Zitting Cisticola</b>	<i>Cisticola juncidis</i>			X		
Desert Cisticola	<i>Cisticola aridulus</i>			X		
<b>Cloud Cisticola</b>	<i>Cisticola textrix</i>		<b>Near-endemic</b>	X		
<b>Black-chested Prinia</b>	<i>Prinia flavicans</i>		<b>Near-endemic</b>		X	
<b>Karoo Prinia</b>	<i>Prinia maculosa</i>		<b>Endemic</b>	X	X	
Namaqua Warbler	<i>Phragmacia substriata</i>		Endemic		X	
<b>Rufous-eared Warbler</b>	<i>Malcorus pectoralis</i>		<b>Endemic</b>	X		
<b>Bar-throated Apalis</b>	<i>Apalis thoracica</i>				X	
Yellow-breasted Apalis	<i>Apalis flavida</i>				X	
<b>Melodious Lark</b>	<i>Mirafra cheniana</i>	<b>Near-threatened</b>	<b>Endemic</b>	X		
<b>Rufous-naped Lark</b>	<i>Mirafra africana</i>			X		
<b>Cape Clapper Lark</b>	<i>Mirafra apiata</i>		<b>Endemic</b>	X		
<b>Eastern Clapper Lark</b>	<i>Mirafra fasciolata</i>		<b>Near-endemic</b>	X		
Sabota Lark	<i>Calendulauda sabota</i>		Near-endemic	X		
<b>Spike-heeled Lark</b>	<i>Chersomanes albofasciata</i>			X		

Species	Scientific name	Conservation status	Endemism	Habitat		
				Grasslands (incl. light <i>Acacia</i> woodland)	Thicket (incl. dense riparian woodland)	Wetlands (incl. vleis, rivers and dams)
<b>Eastern Long-billed Lark</b>	<i>Certhilauda semitorquata</i>		<b>Endemic</b>	X		
Grey-backed Sparrowlark	<i>Eremopterix verticalis</i>		Near-endemic	X		
<b>Red-capped Lark</b>	<i>Calandrella cinerea</i>			X		
<b>Large-billed Lark</b>	<i>Galerida magnirostris</i>		<b>Endemic</b>	X		
Cape Rock-Thrush	<i>Monticola rupestris</i>		Endemic	X		
Sentinel Rock-Thrush	<i>Monticola explorator</i>		Endemic	X		
<b>Karoo Thrush</b>	<i>Turdus smithi</i>		<b>Endemic</b>	X	X	
<b>Chat Flycatcher</b>	<i>Bradornis infuscatus</i>		<b>Near-endemic</b>	X		
<b>Fiscal Flycatcher</b>	<i>Sigelus silens</i>		<b>Endemic</b>		X	
Spotted Flycatcher	<i>Muscicapa striata</i>				X	
African Dusky Flycatcher	<i>Muscicapa adusta</i>				X	
<b>Cape Robin-Chat</b>	<i>Cossypha caffra</i>				X	
<b>White-browed Scrub-Robin</b>	<i>Cercotrichas leucophrys</i>				X	
<b>Karoo Scrub-Robin</b>	<i>Cercotrichas coryphaeus</i>		<b>Endemic</b>	X	X	
<b>African Stonechat</b>	<i>Saxicola torquatus</i>			X		
<b>Mountain Wheatear</b>	<i>Denanthe monticola</i>		<b>Near-endemic</b>	X		
<b>Capped Wheatear</b>	<i>Denanthe pileata</i>			X		
<b>Sickle-winged Chat</b>	<i>Cercomela sinuata</i>		<b>Endemic</b>	X		
Karoo Chat	<i>Cercomela schlegelii</i>		Near-endemic	X		
<b>Familiar Chat</b>	<i>Cercomela familiaris</i>			X		
<b>Ant-eating Chat</b>	<i>Myrmecocichla formicivora</i>		<b>Endemic</b>	X		
Mocking Cliff-Chat	<i>Thamnolaea cinnamomeiventris</i>			X		
Pale-winged Starling	<i>Onychognathus nabouroup</i>		Near-endemic	X		

Species	Scientific name	Conservation status	Endemism	Habitat		
				Grasslands (incl. light <i>Acacia</i> woodland)	Thicket (incl. dense riparian woodland)	Wetlands (incl. vleis, rivers and dams)
<b>Red-winged Starling</b>	<i>Onychognathus morio</i>			X		
<b>Cape Glossy Starling</b>	<i>Lamprotornis nitens</i>				X	
<b>Pied Starling</b>	<i>Spreo bicolor</i>		<b>Endemic</b>	X		
Wattled Starling	<i>Greatophora cinerea</i>			X	X	
Common Starling	<i>Sturnus vulgaris</i>				X	
<b>Amethyst Sunbird</b>	<i>Chalcomitra amethystina</i>				X	
Malachite Sunbird	<i>Nectarinia famosa</i>			X	X	
<b>Southern Double-collared Sunbird</b>	<i>Cinnyris chalybeus</i>		<b>Endemic</b>	X	X	
<b>Greater Double-collared Sunbird</b>	<i>Cinnyris afer</i>		<b>Endemic</b>	X		
Dusky Sunbird	<i>Cinnyris fuscus</i>		Near-endemic	X		
Scaly-feathered Finch	<i>Sporopipes squamifrons</i>		Near-endemic	X		
White-browed Sparrow-Weaver	<i>Plocepasser mahali</i>			X		
Spectacled Weaver	<i>Ploceus ocularis</i>				X	
Cape Weaver	<i>Ploceus capensis</i>		Endemic	X	X	X
Southern Masked-Weaver	<i>Ploceus velatus</i>			X	X	X
<b>Village Weaver</b>	<i>Ploceus cucullatus</i>				X	
<b>Red-billed Quelea</b>	<i>Quelea quelea</i>			X		X
Yellow-crowned Bishop	<i>Euplectes afer</i>					X
<b>Southern Red Bishop</b>	<i>Euplectes orix</i>			X		X
Yellow Bishop	<i>Euplectes capensis</i>			X		X
<b>Long-tailed Widowbird</b>	<i>Euplectes progne</i>			X		X
<b>Red-collared Widowbird</b>	<i>Euplectes ardens</i>			X		



<b>African Quailfinch</b>	<b><i>Ortygospiza atricollis</i></b>			<b>X</b>		
Species	Scientific name	Conservation status	Endemism	Habitat		
				Grasslands (incl. light <i>Acacia</i> woodland)	Thicket (incl. dense riparian woodland)	Wetlands (incl. vleis, rivers and dams)
Red-headed Finch	<i>Amadina erythrocephala</i>		Near-endemic	X	X	
Swee Waxbill	<i>Coccyzygia melanotis</i>		Endemic		X	
<b>Common Waxbill</b>	<b><i>Estrilda astrild</i></b>			<b>X</b>	<b>X</b>	<b>X</b>
<b>Red-billed Firefinch</b>	<b><i>Lagonosticta senegala</i></b>				<b>X</b>	
<b>African Firefinch</b>	<b><i>Lagonosticta rubricata</i></b>				<b>X</b>	
Bronze Mannikin	<i>Spermestes cucullatus</i>			X		X
<b>Pin-tailed Whydah</b>	<b><i>Vidua macroura</i></b>			<b>X</b>		
Dusky Indigobird	<i>Vidua funerea</i>				X	
<b>House Sparrow</b>	<b><i>Passer domesticus</i></b>			<b>X</b>	<b>X</b>	<b>X</b>
<b>Cape Sparrow</b>	<b><i>Passer melanurus</i></b>		<b>Near-endemic</b>	<b>X</b>		
Southern Grey-headed Sparrow	<i>Passer diffusus</i>			X		
<b>Yellow-throated Petronia</b>	<b><i>Petronia superciliaris</i></b>				<b>X</b>	
African Pied Wagtail	<i>Motacilla aguimp</i>					X
<b>Cape Wagtail</b>	<b><i>Motacilla capensis</i></b>			<b>X</b>		<b>X</b>
Yellow Wagtail	<i>Motacilla flava</i>					X
<b>Cape Longclaw</b>	<b><i>Macronyx capensis</i></b>		<b>Endemic</b>	<b>X</b>		
African Rock Pipit	<i>Anthus crenatus</i>		Endemic	X		
<b>African Pipit</b>	<b><i>Anthus cinnamomeus</i></b>			<b>X</b>		
<b>Plain-backed Pipit</b>	<b><i>Anthus leucophrys</i></b>			<b>X</b>		
<b>Buffy Pipit</b>	<b><i>Anthus vaalensis</i></b>			<b>X</b>		
<b>Long-billed Pipit</b>	<b><i>Anthus similis</i></b>			<b>X</b>		
<b>Cape Canary</b>	<b><i>Serinus canicollis</i></b>		<b>Endemic</b>	<b>X</b>	<b>X</b>	
Black-headed Canary	<i>Serinus alario</i>		Endemic	X		

<b>Yellow-fronted Canary</b>	<b><i>Crithagra mozambicus</i></b>			<b>X</b>	<b>X</b>	
Species	Scientific name	Conservation status	Endemism	Habitat		
				Grasslands (incl. light <i>Acacia</i> woodland)	Thicket (incl. dense riparian woodland)	Wetlands (incl. vleis, rivers and dams)
Black-throated Canary	<i>Crithagra atrigularis</i>			X		
Forest Canary	<i>Crithagra scotops</i>		Endemic		X	
<b>Yellow Canary</b>	<b><i>Crithagra flaviventris</i></b>		<b>Near-endemic</b>	<b>X</b>		
Brimstone Canary	<i>Crithagra sulphuratus</i>			X	X	
White-throated Canary	<i>Crithagra albogularis</i>		Near-endemic	X		
Streaky-headed Seedeater	<i>Crithagra gularis</i>			X	X	
Lark-like Bunting	<i>Emberiza impetuani</i>		Near-endemic	X		
Cinnamon-breasted Bunting	<i>Emberiza tahapisi</i>			X		
<b>Cape Bunting</b>	<b><i>Emberiza capensis</i></b>		<b>Near-endemic</b>	<b>X</b>		
<b>Golden-breasted Bunting</b>	<b><i>Emberiza flaviventris</i></b>				<b>X</b>	

**Appendix C: Heritage Sites Sites identified by Halkett (2010) and Binneman (2014) that are located in close proximity to the final layout**

Site ID	Site No.	Site Type	Description	Co-ordinates		Grading
36285	AMA203	Settlement		-32,913764	26,072778	Grade IIIb
36106	AMA109	Structures	Long stone wall on edge of ridge. One end on Farm 222/1 and the other end on Leeuw Fontein. It does not correspond with current cadastral boundaries.	-32,881595	26,064775	Grade IIIb
36097	AMA028	Stone walling	Dry stone wall (contd).	-32,881536	26,062846	Grade IIIa
36107	AMA110	Structures	Same dry stone wall as 431 A-C extending in other direction where it degenerates and becomes a line of intermittent aloes. Crosses 2 farms. 0.5-0.6m width. Extends the same alignment as GPS 8359C.	-32,881449	26,06396	Grade IIIa
36108	AMA111	Structures	Stone feature, probably not a grave. Treat it as a grave though!.	-32,874834	26,102726	Grade IIIa

36109	AMA112	Structures	Stone and brick house. Inside plastered, evidence of whitewash outside. Lots of changes, internal and external additions, roof changes. Few artefacts (bits of ceramic, glass and lead, but seem not too old).	-32,875456	26,102801	Grade IIIa
36110	AMA113	Structures	Outbuilding, ruined down to foundation level, one wall makes a slight terrace behind main house.	-32,875339	26,103017	Grade IIIa
36111	AMA114	Structures	Enclosure with a packed clay floor. Probably just fenced with corrugated iron. Adjoins another fenced enclosure. Seems not that old but some historical glass and ceramics inside. Screws and washers show roof type and a few	-32,873953	26,102455	Grade IIIc

			fragments of corrugated iron lying about.			
36118	AMA037	Artefacts	Flakes (1 retouched), 1 lower grindstone near a tree.	-32,920565	26,067375	Grade IIIc
36119	AMA038	Artefacts	LSA stone artefacts. Quartzite flakes, HF bipolar core. (intrusive glass and tin).	-32,903265	26,066538	Grade IIIc
36120	AMA039	Stonewalling	Stone walls and gate (age uncertain).	-32,89149	26,05539	Grade IIIc
36124	AMA117	Structures	Old road alignment, slightly scooped out with dirt banked on each side.	-32,873943	26,103182	Grade IIIc
36125	AMA118	Structures	Terrace walling near house. Revetment dry-stone wall of rectilinear terrace, NE of farmhouse; SE extent of revetment wall.	-32,875438	26,104044	Grade IIIc
36122	AMA115	Burial Grounds & Graves	Graveyard, 8 graves, 3 with slate top, 1 without, 4 with gravestones (1 fallen) Marine	-32,874433	26,104162	Grade IIIa

			shells on 1 grave) (see Graveyard 2). Broli, Green, Weichman, dates 1816-1914.			
36123	AMA116	Burial Grounds & Graves	12 farm workers graves, badly disturbed by animals.	-32,873962	26,104271	Grade IIIa

## Appendix D: Grievance Mechanism for Public Complaints and Issues

### PURPOSE

This Grievance Mechanism has been developed to receive and facilitate the resolution of concerns and grievances regarding the project's environmental and social performance. The aim of the Grievance Mechanism is to ensure that grievances or concerns raised by stakeholders are addressed in a manner that:

- » Provides a predictable, accessible, transparent, and credible process to all parties, resulting in outcomes that are fair, equitable, accountable and efficient.
- » Promotes trust as an integral component of broader community relation activities.
- » Enables more systematic identification of emerging issues and trends, facilitating corrective action and pre-emptive engagement.

The aim of this Grievance Mechanism is to provide a process to address grievances in a manner that does not require a potentially costly and time-consuming legal process. This plan should be updated through the project development process to ensure relevance at all project stages.

### PROCEDURE FOR RECEIVING AND RESOLVING GRIEVANCES

The following proposed grievance procedures are to be complied with throughout the construction, operation and decommissioning phases of the project. These procedures should be updated as and when required to ensure that the Grievance Mechanism is relevant for the project and effective in providing the required processes.

- » Local landowners, communities and authorities must be informed in writing by the Developer of the grievance mechanism and the process by which grievances can be brought to the attention of the Developer through its designated representative. This must be undertaken with the commencement of the construction phase.
- » A company representative must be appointed as the contact person to which grievances can be directed. The name and contact details of the contact person must be provided to local landowners, communities and authorities when requested.
- » Project related grievances relating to the construction, operation and or decommissioning phases must be addressed in writing to the contact person. The contact person should assist local landowners and/ or communities who may lack resources to submit/prepare written grievances, by recording grievances and completing written grievance notices where applicable, translating requests or concerns or by facilitating contact with relevant parties who can address the raised concerns. The following information should be obtained, as far as possible, regarding each written grievance, which may act as both acknowledgement of receipt as well as record of grievance received:
  - a. The name and contact details of the complainant;
  - b. The nature of the grievance;
  - c. Date raised, received, and for which the meeting was arranged;
  - d. Persons elected to attend the meeting (which will depend on the grievance); and
  - e. A clear statement that the grievance procedure is, in itself, not a legal process. Should such avenues be desired, they must be conducted in a separate process and do not form part of this grievance mechanism.
- » The grievance must be registered with the contact person who, within 2 working days of receipt of the grievance, must contact the Complainant to discuss the grievance and, if required, agree on suitable date and venue for a meeting in order to discuss the grievances raised. Unless otherwise agreed, the meeting should be held within 2 weeks of receipt of the grievance.
- » The contact person must draft a letter to be sent to the Complainant acknowledging receipt of the grievance, the name and contact details of Complainant, the nature of the grievance, the date that the grievance was raised, and the date and venue for the meeting (once agreed and only if required).
- » A grievance register must be kept on site (in electronic format, so as to facilitate editing and updating), and shall be made available to all parties wishing to gain access thereto.



- » Prior to the meeting being held the contact person must contact the Complainant to discuss and agree on the parties who should attend the meeting, as well as a suitable venue. The people who will be required to attend the meeting will depend on the nature of the grievance. While the Complainant and / or Developer are entitled to invite their legal representatives to attend the meeting/s, it should be made clear to all the parties involved in the process that the grievance mechanism process is not a legal process, and that if the Complainant invites legal representatives, the cost will be their responsibility. It is therefore recommended that the involvement of legal representatives be limited as far as possible, as a matter of last resort, and that this process be primarily aimed at stakeholder relationship management as opposed to an arbitration or litigation mechanism.
- » The meeting should be chaired by the Developer's representative appointed to address grievances. The Developer must supply and nominate a representative to capture minutes and record the meeting/s.
- » Draft copies of the minutes must be made available to the Complainant and the Developer within 5 working days of the meeting being held. Unless otherwise agreed, comments on the Draft Minutes must be forwarded to the company representative appointed to manage the grievance mechanism within 5 working days of receipt of the draft minutes.
- » The meeting agenda must be primarily the discussion of the grievance, avoidance and mitigation measures available and proposed by all parties, as well as a clear indication of the future actions and responsibilities, in order to put into effect the proposed measures and interventions to successfully resolve the grievance.
- » In the event of the grievance being resolved to the satisfaction of all the parties concerned, the outcome must be recorded and signed off by the relevant parties. The record should provide details of the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.
- » In the event of a dispute between the Complainant and the Developer regarding the grievance, the option of appointing an independent mediator to assist with resolving the issue should be discussed. The record of the meeting/s must note that a dispute has arisen and that the grievance has not been resolved to the satisfaction of all the parties concerned.
- » In the event that the parties agree to appoint a mediator, the Developer will be required to identify three (3) mediators and forward the names and CVs to the Complainant within 2 weeks of the dispute being declared. The Complainant, in consultation with the Developer, must identify the preferred mediator and agree on a date for the next meeting. The cost of the mediator must be borne by the Developer. The Developer must supply and nominate a representative to capture minutes and record the meeting/s.
- » In the event of the grievance, with the assistance of the mediator, being resolved to the satisfaction of all the parties concerned, the outcome must be recorded and signed off by the relevant parties, including the mediator. The record should provide details on the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.
- » In the event of the dispute not being resolved, the mediator must prepare a draft report that summaries the nature of the grievance and the dispute. The report should include a recommendation by the mediator on the proposed way forward with regard to the addressing the grievance.
- » The draft report must be made available to the Complainant and the Developer for comment before being finalised and signed by all parties, which signature may not be unreasonably withheld by either party. Unless otherwise agreed, comments on the draft report must be forwarded to the company representative appointed to manage the grievance mechanism within 5 working days. The way forward will be informed by the recommendations of the mediator and the nature of the grievance.

A Complaint is closed out when no further action is required, or indeed possible. Closure status must be classified and captured following mediation or successful resolution in the Complaints Register as follows:

- » Resolved. Complaints where a resolution has been agreed and implemented and the Complainant has signed the Confirmation Form.
- » Unresolved. Complaints where it has not been possible to reach an agreed resolution despite mediation.
- » Abandoned. Complaints where the Complainant is not contactable after one month following receipt of a Complaint and efforts to trace his or her whereabouts have been unsuccessful.

The grievance mechanism does not replace the right of an individual, community, group or organisation to take legal action should they so wish. In the event of the grievance not being resolved to the satisfaction of the Complainant and / or the Developer, either party may be entitled to legal action if an appropriate option, however, this grievance mechanism aims to avoid such interactions by addressing the grievances within a short timeframe, and to mutual satisfaction, where possible.

## Appendix E: Alien Plant and Open Space Management Plan

### 1. PURPOSE

Invasive alien plant species pose the second largest threat to biodiversity after direct habitat destruction. The purpose of this Alien Plant and Open Space Management Plan is to provide a framework for the management of alien and invasive plant species during the construction and operation of the infrastructure establishment at the Msenge Emoyeni WEF. The broad objectives of the plan include the following:

- » Ensure alien plants do not become dominant in parts of the site, or the whole site, through the control and management of alien and invasive species presence, dispersal and encroachment.
- » Develop and implement a monitoring and eradication programme for alien and invasive plant species.
- » Promote the natural re-establishment and planting of indigenous species in order to retard erosion and alien plant invasion.

This plan should be updated throughout the life-cycle of the various infrastructure, as required in order to ensure that appropriate measures are in place to manage and control the establishment of alien and invasive plant species and to ensure compliance with relevant legislation.

### 2. LEGISLATIVE CONTEXT

#### Conservation of Agricultural Resources Act (Act No. 43 of 1983)

In terms of the amendments to the regulations under the Conservation of Agricultural Resources Act (Act No. 43 of 1983), all declared alien plant species must be effectively controlled. Landowners are legally responsible for the control of invasive alien plants on their properties. In terms of this Act, alien invasive plant species are ascribed to one of the following categories:

- » Category 1: Prohibited and must be controlled.
- » Category 2 (commercial used plants): May be grown in demarcated areas provided that there is a permit and that steps are taken to prevent their spread.
- » Category 3 (ornamentally used plants): May no longer be planted. Existing plants may be retained as long as all reasonable steps are taken to prevent the spreading thereof, except within the flood line of watercourses and wetlands.

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

The National Environmental Management: Biodiversity Act (NEM:BA) regulates all invasive organisms in South Africa, including a wide range of fauna and flora. Regulations have been published in Government Notices R.506, R.507, R.508 and R.509 of 2013 under NEM:BA. According to this Act and the regulations, any species designated under Section 70 cannot be propagated, grown, bought or sold without a permit. Below is an explanation of the three categories:

- » Category 1a: Invasive species requiring compulsory control. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
- » Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.
- » Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones.

- » Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

The following guide is a useful starting point for the identification of alien plant species: Bromilow, C. 2010. Problem Plants and Alien Weeds of South Africa. Briza, Pretoria.

It is important to note that alien plant species that are regulated in terms of the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA) as weeds and invader plants are exempted from NEM:BA. This implies that the provisions of the CARA in respect of listed weed and invader plants supersede those of NEM:BA.

### 3. ALIEN PLANT MANAGEMENT PRINCIPLES

#### 3.1. Prevention and early eradication

A prevention strategy should be considered and established, including regular surveys and monitoring for invasive alien plants, effective rehabilitation of disturbed areas and prevention of unnecessary disturbance of natural areas.

Monitoring plans should be developed which are designed to identify Invasive Alien Plant Species already on site, as well as those that are introduced to the site by the construction activities. Keeping up to date on which weeds are an immediate threat to the site is important, but efforts should be planned to update this information on a regular basis. When additional Invasive Alien Plant Species are recorded on site, an immediate response of locating the site for future monitoring and either hand-pulling the weeds or an application of a suitable herbicide (where permissible only) should be planned. It is, however, better to monitor regularly and act swiftly than to allow invasive alien plants to become established on site.

#### 3.2. Containment and control

If any alien invasive plants are found to become established on site, action plans for their control should be developed, depending on the size of the infestations, budgets, manpower considerations and time. Separate plans of control actions should be developed for each location and/or each species. Appropriate registered chemicals and other possible control agents should be considered in the action plans for each site/species. The use of chemicals are not recommended for any wetland areas. Herbicides should be applied directly to the plant and not to the soil. The key is to ensure that no invasions get out of control. Effective containment and control will ensure that the least energy and resources are required to maintain this status over the long-term. This will also be an indicator that natural systems are impacted to the smallest degree possible.

#### 3.3. General Clearing and Guiding Principles

Alien species control programmes are long-term management projects and should consist of a clearing plan which includes follow up actions for rehabilitation of the cleared area. The lighter infested areas should be cleared first to prevent the build-up of seed banks. Pre-existing dense mature stands ideally should be left for last, as they probably won't increase in density or pose a greater threat than they are currently. Collective management and planning with neighbours may be required in the case of large woody invaders as seeds of alien species are easily dispersed across boundaries by wind or watercourses. All clearing actions should be monitored and documented to keep records of which areas are due for follow-up clearing.

##### i. Clearing Methods

Different species require different clearing methods such as manual, chemical or biological methods or a combination of both. Care should however be taken so that the clearing methods used do not encourage further invasion and that they are appropriate to the specific species of concern. As such, regardless of the methods used, disturbance to the soil should be kept to a minimum.

Fire should not be used for alien species control or vegetation management at the site. The best-practice clearing method for each species identified should be used.

» Mechanical control

This entails damaging or removing the plant by physical action. Different techniques could be used, e.g. uprooting, felling, slashing, mowing, ringbarking or bark stripping. This control option is only really feasible in sparse infestations or on a small scale, and for controlling species that do not coppice after cutting. Species that tend to coppice, need to have the cut stumps or coppice growth treated with herbicides following the mechanical treatment. Mechanical control is labour intensive and therefore expensive and could cause severe soil disturbance and erosion.

» Chemical Control

Although it is usually preferable to use manual clearing methods where possible, such methods may create additional disturbance which stimulates alien plant invasion and may also be ineffective for many woody species which re-sprout. Where herbicides are to be used, the impact of the operation on the natural environment should be minimised by observing the following:

- Area contamination must be minimised by careful, accurate application with a minimum amount of herbicide to achieve good control.
- All care must be taken to prevent contamination of any water bodies. This includes due care in storage, application, cleaning equipment and disposal of containers, product and spray mixtures.
- Equipment should be washed where there is no danger of contaminating water sources and washings carefully disposed of at a suitable site.
- To avoid damage to indigenous or other desirable vegetation, products should be selected that will have the least effect on non-target vegetation.
- Coarse droplet nozzles should be fitted to avoid drift onto neighbouring vegetation.
- The appropriate health and safety procedures should also be followed regarding the storage, handling and disposal of herbicides.
- The use of chemicals is not recommended for wetland areas.

For all herbicide applications, the following Regulations and guidelines should be followed:

- Working for Water: Policy on the Use of Herbicides for the Control of Alien Vegetation.
- Pesticide Management Policy for South Africa published in terms of the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No. 36 of 1947) – GNR 1120 of 2010.
- South African Bureau of Standards, Standard SANS 10206 (2010).

According to Government Notice No. 13424 dated 26 July 1992, it is an offence to “acquire, dispose, sell or use an agricultural or stock remedy for a purpose or in a manner other than that specified on the label on a container thereof or on such a container”.

Contractors using herbicides need to have a valid Pest Control Operators License (limited weeds controller) according to the Fertilizer, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act No. 36 of 1947). This is regulated by the Department of Environment, Forestry and Fisheries.

» Biological control

Biological weed control consists of the use of natural enemies to reduce the vigour or reproductive potential of an invasive alien plant. Biological control agents include insects, mites, and micro-organisms such as fungi or bacteria. They usually attack specific parts of the plant, either the reproductive organs directly (flower buds, flowers or fruit) or the seeds after they have dropped. The stress caused by the biological control agent

may kill a plant outright or it might impact on the plant's reproductive capacity. In certain instances, the reproductive capacity is reduced to zero and the population is effectively sterilised. All of these outcomes will help to reduce the spread of the species.

To obtain biocontrol agents, provincial representatives of the Working for Water Programme or the Directorate: Land Use and Soil Management (LUSM), Department of Forestry, Fisheries and the Environment (DFFE) can be contacted.

### 3.4. General management practices

The following general management practices should be encouraged or strived for:

- » Establish an on-going monitoring programme for the construction phase to detect and quantify any alien species that may become established.
- » Alien vegetation regrowth on areas disturbed by construction must be immediately controlled.
- » Care must be taken to avoid the introduction of alien invasive plant species to the site. Particular attention must be paid to imported material such as building sand or dirty earth-moving equipment.
- » Stockpiles should be checked regularly and any weeds emerging from material stockpiles should be removed.
- » Cleared areas that have become invaded by alien species can be sprayed with appropriate herbicides provided that these herbicides break down on contact with the soil. Residual herbicides should not be used.
- » The effectiveness of vegetation control varies seasonally, and this is also likely to impact alien species. Control early in the wet season will allow species to regrow, and follow-up control is likely to be required. It is tempting to leave control until late in the wet season to avoid follow-up control. However, this may allow alien species to set seed before control, and hence will not contribute towards reducing alien species abundance. Therefore, vegetation control should be aimed at the middle of the wet season, with a follow-up event towards the end of the wet season. There are no exact dates that can be specified here as each season is unique and management must therefore respond according to the state and progression of the vegetation.
- » Alien plant management is an iterative process and it may require repeated control efforts to significantly reduce the abundance of a species. This is often due to the presence of large and persistent seed banks. However, repeated control usually results in rapid decline once seed banks become depleted.
- » Some alien species are best individually pulled by hand. Regular vegetation control to reduce plant biomass within the site should be conducted. This should be timed so as to coincide with the critical growth phases of the most important alien species on site. This will significantly reduce the cost of alien plant management as this should contribute towards the control of the dominant alien species and additional targeted control will be required only for a limited number of species.
- » No alien species should be cultivated on-site. If vegetation is required for aesthetic purposes, then non-invasive, water-wise locally-occurring species should be used.
- » During operation, surveys for alien species should be conducted regularly. It is recommended that this be undertaken every 6 months for the first two years after construction and annually thereafter. All alien plants identified should be cleared using appropriate means.

### 3.5. Monitoring

In order to assess the impact of clearing activities, follow-ups and rehabilitation efforts, monitoring must be undertaken. This section provides a description of a possible monitoring programme that will provide an assessment of the magnitude of alien plant invasion on site, as well as an assessment of the efficacy of the management programme.

In general, the following principles apply for monitoring:

- » Photographic records must be kept of areas to be cleared prior to work starting and at regular intervals during initial clearing activities. Similarly, photographic records should be kept of the area from immediately before and after follow-up clearing activities. Rehabilitation processes must also be recorded.
- » Simple records must be kept of daily operations, e.g. area/location cleared, labour units and, if ever used, the amount of herbicide used.
- » It is important that, if monitoring results in detection of invasive alien plants, that this leads to immediate action.

The following monitoring should be implemented to ensure management of alien invasive plant species.

The Alien Invasive Management Plan as developed in consultation with the Terrestrial Ecologist must be followed and abided by for all phases of the development.

### **Bush Encroachment Management Plan:**

Bush encroachment entails increased abundance of indigenous woody vegetation in the grassland and savanna biomes. In South Africa, where these biomes make up 27.9% and 32.5% of the land surface area, respectively, there has been a significant increase in tree cover since national-scale aerial photography was first undertaken in the 1940s.

Over 40 species are listed as part of the bush encroachment problem in South Africa, and new species are being added. Bush encroachment is not caused by particular species, but is rather a change in balance of the types of plants occurring in ecosystems.

Some species respond to the drivers of bush encroachment more prolifically than others, and may be identified as the 'chief culprits' in a particular area (Table 1). However, the same species are likely to be benign and useful at their natural densities. Large tracts of *Vachellia karroo* commonly known as Sweet thorn have been identified within the wind energy facility site.

<b>Common name</b>	<b>Scientific name</b>	<b>Main Regions</b>
Blackthorn	<i>Senegalia mellifera</i>	Kalahari
Sicklebush	<i>Dichrostachys cinerea</i>	Bushveld and Lowveld
Mopane	<i>Colophospermum mopane</i>	Mopane
Red bush willow	<i>Combretum apiculatum</i>	Lowveld
Silver cluster leaf	<i>Terminalia sericea</i>	Lowveld
Sweet thorn	<i>Vachellia karroo</i>	Savanna and grasslands
Brankrupt bush	<i>Seriphium plumosum</i>	Highveld grasslands
Paperbark thorn	<i>Vachellia sieberiana</i>	Grasslands

Figure 1. *Vachellia karroo* (Source: <http://pza.sanbi.org/vachellia-karroo>)



### **Description:**

*Vachellia karroo* has a rounded crown, branching fairly low down on the trunk. It is variable in shape and size, reaching a maximum of about 12m where there is good water. The bark is red on young branches, darkening and becoming rough with age. Sometimes an attractive reddish colour can be seen in the deep bark fissures. The leaves are finely textured and dark green.

The flowers appear in early summer in a mass of yellow pompons. Many insects visit and pollinate these flowers. The seed pods are flat and crescent shaped, sometimes with constrictions between the seeds. They are green when young becoming brown and dry. The pods split open allowing the seeds to fall to the ground.



The thorns are paired, greyish to white and are long and straight. On mature trees, the thorns may be quite short. They may be held at 90° to the stem or raked forward slightly. Technically the thorns are called "spines" and are developed from modified stipules (small, leaf-like scales, seen at the base of the leaf-stalk). In some other thorny acacia species, the thorns are not stipular in origin and are called "prickles". These originate in the epidermis ("skin") and are always short and curved, a bit like rose thorns. Thorns on African vachellias and sengalias are important for identification, they are divided into 5 main groups according the size, shape and position of the thorns.

### **Habitat:**

Savannas are characterised by the coexistence of grasses and trees (or shrubs) and are the transitional biome between grasslands and forests. The degree of woody cover in these systems largely boils down to how variation in rainfall and fire affect the competition between grasses and tree seedlings.<sup>3</sup> Increased rainfall and increased rainfall period move savannas towards closed forest systems, whereas lower rainfall, longer dry seasons and the resulting increase of fire moves them towards grassland systems.

The progression of bush encroachment is also influenced by the amount of rainfall in the wet season and the length of the dry season. Rainfall above about 650 mm per year supports closed canopy cover while a longer dry season reduces the rate of canopy closure and increases fire frequency. Soil characteristics may also be an important determinant of the vulnerability of landscapes to encroachment, since these influence the dynamics between grasses and trees, and the combination of low soil nutrients and high rainfall may favour bush encroachment.

In general, bush encroachment should be regarded as a form of land degradation, despite its contribution to carbon sequestration. Addressing bush encroachment will lead to positive welfare gains relative to allowing it to proceed. Continued encroachment could have a significant negative impact on overall supply and value of ecosystem services, biodiversity and livelihoods.

### **Management:**

- Bush encroachment can be avoided or reversed to some extent by better rangeland management (to maintain a healthy grass layer), including fire management;
- Alternatively, where it has progressed too far for this to be effective on its own, bush encroachment should be cleared or thinned manually or mechanically;
- Chemical spraying is harmful and should be discouraged.
- Best practices for active clearing include determining the appropriate degree of remediation, having a long-term management strategy and undertaking follow-up treatments accordingly.
- Clearing or thinning activities must be supervised by a suitable qualified terrestrial ecologist.

Current policy and legislation does not deal specifically with bush encroachment. The Conservation of Agricultural Resources Act, 1983 (CARA) encourages maintenance of rangelands, but if agricultural clearing occurs within an important biodiversity area or affects listed species, it can require authorisation under the National Environmental Management Act, 1998 (NEMA), National Forests Act, 1998 (NFA) or the Biodiversity Act, 2004 (NEMBA).

**MSENGE EMOYENI WIND ENERGY FACILITY**  
**ALIEN INVASIVE PLANT MANAGEMENT PLAN**

**Prepared for:**

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**Prepared by:**

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**JUNE 2022**



**SCHERMAN ENVIRONMENTAL**  
Aquatic & Environmental Management  
Consulting



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## **LIST OF ACRONYMS AND ABBREVIATIONS**

ACED	African Clean Energy Developments
AIP	Alien Invader Plant
CARA	Conservation of Agricultural Resources Act (Act 43 of 1983)
CBC	Centre for Biocontrol
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and Environment
EA	Environmental Authorisation
ECBCP	Eastern Cape Biodiversity Conservation Plan
ECO	Environmental Control Officer
NEMBA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
OHPs	Overhead Powerlines
SOP	Standard Operating Procedure
SSC	Species of Special Concern
WEF	Wind Energy Facility
WfW	Working-for-Water
WTG	Wind Turbine Generator

## Management Plan Objectives

The purpose of the Msenge Emoyeni Wind Energy Facility (WEF) Alien Plant Management Plan is to provide a framework for the management of Alien Invader Plant (AIP) species during the construction and operation of the Msenge Wind Energy Facility. The broad objectives of the plan include the following:

- Conduct an accurate baseline for all declared AIPs in the WEF footprint.
- Create awareness and information regarding AIPs for all WEF staff and contractors, as well as the landowners.
- Where possible eradication of Category 1 AIPs as defined by the legislation.
- Where eradication is not possible reduce the rate of spread, reduce the population numbers and densities to an absolute minimum so as not to impede the base flows of ecosystem goods and services.
- Initiate and implement a monitoring programme for AIPs.

## Background

South Africa and the rest of the world is in the midst of a biodiversity crisis, with an ever-increasing number of plant and animal species being listed with some form of threat status. One of the key drivers of the decline in plants species is the prevalence of AIPs, and these are likely to become more aggressive with anthropogenic climate change. This is particularly true for succulent AIPs which will enjoy both increased temperatures and carbon dioxide fertilization over the next few decades.

South Africa has a dismal record for implementing the Conservation of Agricultural Resources Act (CARA, Act 43 of 1983), as amended in 2001. CARA regulations require landowners to control and eradicate Declared Weeds and Declare Invader Plants. CARA sought to divide the species as follows:

- Category 1 - To be removed and controlled, with no more planting, propagation or trading.
- Category 2 – Allowed only in demarcated areas and require a water users license.
- Category 3 – Ornamental plants that have the capacity to invade. Existing plants do not have to be removed but no new plantings may occur and the plants may not be sold.

Recent national legislation regarding AIPs is the NEMBA 2014 (DEA 2014), with amendments published in 2016 (DEA 2016).

Table 1. The definitions for the various classes of AIPs as defined by NEMBA (DEA 2016).

<b>Restricted Activities as defined in the Act</b>	<b>Category 1a</b>	<b>Category 1b</b>	<b>Category 2</b>	<b>Category 3</b>
a. Importing into the Republic, including introducing from the sea, any specimen of a listed invasive species.	Prohibited	Prohibited	Permit Required	Prohibited
b. Having in possession or exercising physical control over any specimen of a listed invasive species.	Exempted	Exempted	Permit Required	Exempted
c. Growing, breeding or in any other way propagating any specimen of a listed invasive species, or causing it to multiply.	Prohibited	Prohibited	Permit Required	Prohibited
d. Conveying, moving or otherwise translocating any specimen of a listed invasive species.	Prohibited	Prohibited	Permit Required	Prohibited
e. Selling or otherwise trading in, buying, receiving, giving, donating or accepting as a gift, or in any way acquiring or disposing of any specimen of a listed invasive species.	Prohibited	Prohibited	Permit Required	Prohibited

NEMBA Category 1 AIP species require eradication or management and comply with:

- Section 73(2) – all landowners are obliged to notify (in writing) the competent authority of any listed species (as per NEMBA and CARA regulations) occurring on the land they own. Take measures to eradicate and control listed AIPs and take measures to mitigate the impact of AIPs on biodiversity.
- Section 75(1) – AIP clearing methods must be species-specific and suited to the environment.
- Section 75(2) – AIP clearing should be undertaken with care and with a view to minimise impact on biodiversity
- Section 75(3) – AIP clearing should also focus on the regenerative capacity of the species (seedbanks, coppicing etc).
- Authorised officials to enter the property for monitoring or assistance with removal and eradication.
- Any AIP species classified as NEMBA Category 3, but occurs in a riparian zone should be treated as a Category 1 case. Category two species require the landowner to have permits and typically occur around dwellings and development zones. This implies that a holistic and comprehensive AIP plan requires a systematic assessment of all the farms where dwellings and other development zones occur.

## General Clearing & Guiding Principles

- Early detection and rapid response are vitally important to reduce AIP management costs. New or emergent species to an area can be cleared at a fraction of the costs and save millions of Rands over the long-term.
- The lighter infested areas (% cover) should be cleared first to prevent populations reaching a threshold beyond the capacity of the landowners to clear.
- The fastest spreading species should be high priorities.
- Collaborative AIP clearing is the long-term solution where adjacent landowners co-create a bioregional AIP clearing plan.
- Only herbicides registered for the specific AIP species may be used.
- All clearing actions should be monitored and documented to keep track of which areas are due for follow-up clearing.
- AIP management is heavily reliant on accurate and up-to-date spatial data.

## Alien Invader Species and Naturalised Weeds

The Msenge Emoyeni WEF site is not currently heavily invaded by AIPs and the number of species is limited. There are also a limited number of naturalised weeds (see Table 2). The *Opuntias* and particularly, *O. aurantiaca* and *O. megapotamica* pose a real threat to the biodiversity and grazing capacity of the rangelands. *O. aurantiaca* is an extremely aggressive invader, being rapidly transported by wild mammals, as well as livestock. Naturalised weeds are prone to invasion where there has been disturbance and over-grazing. Weedy species encountered in the field are listed below in Table 2.

The anomalous concentrated location of young populations of *O. megapatamica* around the base of the Overhead Powerline (OHP) pylons suggests an avian vector of fruit dispersal. If this is the case, this species of AIP needs to be eradicated ASAP while the populations are still young and isolated and the densities are low.

**Table 2.** List of alien plant species encountered on Msenge Emoyeni WEF proposed development zone.

Genus	Species	Family	English name	Afrikaans name	Category
<i>Agave</i>	<i>americana</i> <sup>1</sup>	Agavaceae	American Aloe	Amerikaanse Alwyn	Naturalised Exotic
<i>Alternanthera</i>	<i>pungens</i> <sup>2</sup>	Amaranthaceae	Paperthorn	Kakiebubbeltjie	Naturalised weed
<i>Atriplex</i>	<i>semibacatta</i>	Amaranthaceae	Australian Saltbush	Australiese Brakbossie	Naturalised weed
<i>Bidens</i>	<i>pilosa</i>	Asteraceae	Blackjack	Duiwelskerwel	Naturalised weed
<i>Chenopodium</i>	<i>carcinatum</i>	Chenopodiaceae	Green Goosefoot	Groenhondebossie	Naturalised weed
<i>Datura</i>	<i>stramonium</i>	Solanaceae	Common Thorn Apple	Olieboom	Category 1 CARA, Category 1b NEMBA 2004
<i>Malva</i>	<i>parvifolia</i>	Malvaceae	Small Mallow	Kiesieblaar	Naturalised weed
<i>Opuntia</i>	<i>aurantiaca</i>	Cactaceae	Jointed Prickly Pear	Litjiesurksvy	Category 1 CARA, Category 1b NEMBA 2004
<i>Opuntia</i>	<i>ficus indica</i>	Cactaceae	Sweet Prickly Pear	Boereturksvy	Category 1 CARA, Category 1b NEMBA 2004
<i>Opuntia</i>	<i>megapotamica</i> <sup>3</sup>	Cactaceae	Small Round-Leaved Prickly Pear		Category 1b NEMBA 2004
<i>Salsola</i>	<i>kali</i>	Chenopodiaceae	Russian Tumbleweed	Rolbossie	Naturalised weed
<i>Schkuhria</i>	<i>pinnata</i>	Asteraceae	Dwarf Marigold	Kleinkakiebos	Naturalised weed
<i>Solanum</i>	<i>nigrum</i> <sup>4</sup>	Solanaceae	Nightsahade	Nastergal	Naturalised weed
<i>Solanum</i>	<i>Sp.</i>	Solanaceae			Naturalised weed
<i>Tagetes</i>	<i>minuta</i>	Asteraceae	Tall Khakiweed	Langkakiebos	Naturalised weed
<i>Verbena</i>	<i>bonariensis</i>	Verbenaceae	Purple Top	Blouwaterbos	Category 1b NEMBA 2004
<i>Xanthium</i>	<i>spinosum</i>	Asteraceae	Spiny Cocklebur	Boetebossie	Category 1 CARA, Category 1b NEMBA 2004

The short period of time for the fieldwork will have prevented a complete list of AIPs for the Msenge Emoyeni WEF. It should be appreciated that considerably more AIPs and naturalised weeds could be

<sup>1</sup> Located on Farm 225 outside of development and buffer zones. Listed as Category 1 in the Western Cape.

<sup>2</sup> Sighted on the iziDuli properties but omitted from the full list of species.

<sup>33</sup> This species was previously identified as *O. engelmanni* (Iain Paterson pers. comm) but is still listed as such in the 2016 and 2020 NEMBA regulations (see Appendix 6).

<sup>4</sup> Bromilow (2001) lists the species as *S. retroflexum*.



located on the Msenge Emoyeni WEF and the areas outside of the development footprint. The field work was only mandated to look for AIPs in the development and buffer zones. It is vitally important and should be a condition of the Environmental Authorisation (EA), that the Msenge Emoyeni AIP Management Plan is implement as a co-management agreement between the landowners and the developer. It is NOT ecologically, financially and socially prudent to only manage the AIPs in the development and buffer zones, without simultaneously undertaking to clear the AIPs from the rest of the properties within the Msenge Emoyeni WEF.

The plants listed by Hoare (2010) in his previous fieldwork for the area provide insights into other potential and emergent species not listed in Table 2. These are provided in Appendix 1 and should be used by the ECO as a provisional list for early detection of emergent species. Similarly, the full list of declared AIPs as defined by NEMBA (DEA 2016) should be consulted regularly (see Appendix 2). The species highlighted in yellow have a higher likelihood of occurrence on this site and should form the foundation of the AIP awareness, training and monitoring. The latest list of AIPs is attached as Appendix 3 (DFFE 2016).

There will be a small number of Category 2 (NEMBA) plant species near homes, dwellings and other infrastructure, these will require permits or eradication (e.g. *Bauhinia* spp., *Causarina* spp., *Celtis* spp., *Tecoma stans* etc). Some species like *Tradescantia zebrina* (Wandering Jew) and *Canna indica* (Indian shot) are category 1b species, but popular in farm gardens.

## Recommended Management Practice & Clearing Methods

The following general recommendations are proposed for the AIP Management Plan during and following construction:

- Herbicide should be used as a last resort.
- Mechanical clearing and Biocontrol are preferred option – even if more costly at the onset. Full ecological accounting will reflect the benefit of reduced herbicide usage.
- The use of residual herbicides should be avoided at all costs.
- Herbicide in riparian zones and near water bodies should be completely banned.
- Herbicide in rocky areas and bushclumps should be avoided to prevent collateral damage to SSC.

Table 3. The AIP species identified and suggested management activities.

Genus	Species	Clearing method	Registered Herbicide	Follow-up method
<i>Agave</i>	<i>americana</i> <sup>5</sup>	Mechanical removal of the above ground material and herbicide application to the bole to kill the roots.		Foliar application to the leaves <sup>6</sup> when the plants are small.

<sup>5</sup> Located on Farm 225 outside of development and buffer zones. Listed as Category 1 in the Western Cape.

<sup>6</sup> All plants in riparian zones should be mechanically removed, to prevent herbicides from entering the water table or flowing water.

<i>Alternanthera</i>	<i>pungens</i> <sup>7</sup>	Sustainable rangeland management and reduced soil disturbance	NA	NA
<i>Atriplex</i>	<i>semibacatta</i>	Sustainable rangeland management and reduced soil disturbance	NA	NA
<i>Bidens</i>	<i>pilosa</i>	Sustainable rangeland management and reduced soil disturbance	NA	NA
<i>Chenopodium</i>	<i>carcinatum</i>	Sustainable rangeland management and reduced soil disturbance	NA	NA
<i>Datura</i>	<i>stramonium</i>	Sustainable rangeland management and reduced soil disturbance	NA	NA
<i>Malva</i>	<i>parvifolia</i>	Sustainable rangeland management and reduced soil disturbance	NA	NA
<i>Opuntia</i>	<i>aurantiaca</i>	Where infestations are large, plants should be collected manually and centralised preferably close to roads and other infrastructure	Only a registered herbicide for this species.	Mechanical removal and disposal or foliar spray <sup>8</sup>
<i>Opuntia</i>	<i>Ficus-indica</i>	Herbicide application to the main stem for large specimens, but only after the fruiting period to prevent secondary mortality to birds, primates and other animals.	Only a registered herbicide for this species.	Mechanical removal and disposal or foliar spray <sup>9</sup>
<i>Opuntia</i>	<i>megapotamica</i> <sup>10</sup>		Only a registered herbicide for this species.	Mechanical removal and disposal or foliar spray <sup>11</sup>
<i>Salsola</i>	<i>kali</i>	Sustainable rangeland management and reduced soil disturbance	NA	NA
<i>Schkuhria</i>	<i>pinnata</i>	Sustainable rangeland management and reduced soil disturbance	NA	NA
<i>Solanum</i>	<i>nigrum</i> <sup>12</sup>	Sustainable rangeland management and reduced soil disturbance	NA	NA
<i>Solanum</i>	<i>sp.</i>	Sustainable rangeland management and reduced soil disturbance	NA	NA
<i>Tagetes</i>	<i>minuta</i>	Sustainable rangeland management and reduced soil disturbance	NA	NA
<i>Verbena</i>	<i>bonariensis</i>	Sustainable rangeland management and reduced soil disturbance	NA	NA
<i>Xanthium</i>	<i>spinsum</i>	Herbicide Application or mechanical preferably	Only a registered herbicide for this species.	Foliar spray when young with a lower dosage of the herbicide or mechanical

<sup>7</sup> Sighted on the iziDuli properties but omitted from the full list of species.

<sup>8</sup> No foliar spray on rocky outcrops or in bushclumps.

<sup>9</sup> No foliar spray on rocky outcrops or in bushclumps.

<sup>10</sup> This species was previously identified as *O. engelmanni* (Iain Paterson pers. comm)

<sup>11</sup> No foliar spray on rocky outcrops or in bushclumps.

<sup>12</sup> Bromilow (2001) lists the species as *S. retroflexum*.

- Where possible biocontrol methods should be explored – especially for emergent species. The AIP monitoring program should have biocontrol efficacy as a feedback to guide management. The *Opuntia* species have a long track record of biocontrol, but efficacy is not uniformly successful and could be autocorrelated with environmental cues like rainfall or frost. When biocontrol is reporting as increasing in efficacy, the focus should be on spreading the biocontrol agents.
- Herbicides have been shown to have significant negative environmental and human health impacts and should be used as a last resort. The current infestation levels of all the Category 1 species could be controlled using a combination of mechanical and biological control techniques. This would be a vast saving in herbicide, eliminate the chance of accidental mortality for key SSC such as *E. meloformis*, *Faucaria tuberculosa* and others. Many of the smaller cryptic species (especially those in rocky outcrops and bushclumps) would be highly susceptible to accidental foliar herbicide application.
- Fire is a natural phenomenon in the area and fire should be used for alien control but only at the correct fire frequency interval for the respective vegetation types.
- Large individuals for species such as *Agave americana*, can effectively be eliminated with a combination of heavy machinery and herbicide application (provided the soil is not disturbed).
- All herbicide equipment and containers need to be brought back to the stores or office for cleaning and storing.
- All herbicide containers need to be punctured or destroyed to prevent them being used as water containers and creating a health risk at dump sites.
- Foliar application using knapsacks requires coarse droplet nozzles to mitigate drift onto neighbouring vegetation.
- Foliar application should never be undertaken on windy days.
- The appropriate health and safety procedures should also be followed regarding the storage, handling and disposal of herbicides.
- The Environmental Control Officer (ECO) will need to develop a Standard Operating Procedure (SOP) for all alien clearing and herbicide activities.
- The ECO will need to complete AIP training with regards to correct identification, clearing methods, biocontrol activities and herbicide methods.

The South African Working for Water (WfW) Programme is a global pioneer for large-scale AIP activities and they have produced a large amount of protocols and guidelines since inception in 1995 (<https://www.dffe.gov.za/projectsprogrammes/wfw>). The 2007 guideline (WfW 2007) for implementers is attached as Appendix 4, but a more useful guideline (Appendix 5) is the guideline for the development of AIP Implementation Plan, developed by the Biocontrol team at DFFE. The most comprehensive guideline for the use of herbicides in AIP clearing work was developed by Debbie Muir from WfW and is attached as Appendix 6.

## Alien Plant Management & Monitoring Plan

In order to implement the alien plant management plan, a monitoring and control schedule is required to evaluate the presence and on-going control of AIPs within the facility. This provides a guideline on the frequency with which AIPs should be monitored and what parameters are likely to be important.

### Construction Phase Activities

The following management actions are aimed at reducing soil disturbance during the construction phase of the development, as well as reducing the likelihood that alien species will be brought onto site or otherwise encouraged.

Action	Frequency
Develop AIP field guide for Msenge Emoyeni WEF Staff and contractors	Once at the onset
Undertake training for AIP clearing and follow-up methodologies	
Update Msenge Emoyeni AIP inventory	Annual
The ECO needs to develop a comprehensive AIP implementation plan with monthly targets	Once at the onset
The Msenge Emoyeni WEF requires a zonation map for the AIP implementation plan, based on species and distribution densities	Once at the onset

### Monitoring – Construction Phase

The following monitoring actions should be implemented during the construction phase of the development.

Monitoring Action	Indicator	Timeframe
Establish baseline for AIP awareness: Test WEF staff for AIP identification	Test scores	Onset
Document alien plant distribution	Alien plant distribution map within priority areas	3 Monthly
Document & record alien control measures implemented	Record of clearing activities	3 Monthly
Review & evaluation of control success rate	Decline in documented alien abundance over time	Biannually

### Operational Phase Activities

The following management actions are aimed at reducing the abundance of alien species within the site and maintaining non-invaded areas clear of aliens.

Action	Frequency
Update Msenge Emoyeni AIP Field Guide	Annually
An extensive baseline for the identification and spatial distribution of AIPs across the entire properties.	Early in year 1
Field surveys for the identification of new AIPs species and their spatial distribution of AIPs across the entire properties.	Annually
The AIP Management Plan needs to be planned and executed in conjunction with the Revegetation and Restoration Plan, a Bush Encroachment Plan, the Fire Management Plan and Search and Rescue Efforts.	Ongoing
Sustainable grazing practices across properties will reduce the need to control naturalised weeds, and to a limited extent reduce the opportunity for reinvasion by declared AIPs.	Ongoing

## Monitoring – Operational Phase

The monitoring during the operational phase is the single most important facet of the AIP Management Plan. The Environmental Control Officer will have to implement monthly monitoring program and to be in a position to complete an annual meta-reflection to senior management.

Monitoring Action	Indicator	Timeframe
Update Msenge Emoyeni AIP field guide	Total number of AIP species	Annually, but monthly for the first year
Monitor WEF staff for AIP identification	Test scores	Annually
Spatial documentation of AIPs distribution	AIP distribution map	Annually
Document AIP methods, costs and efficacy	Restoration costs AIP mortality or AIP density	Monthly
Meta-Reflection of AIP Strategic Adaptive Management Plan	Density of AIPs No of AIP species AIP clearing costs	Annually

## Conclusions and Recommendations

- The properties should be destocked from livestock for a period of two years. This would allow for the recovery of the grass sward and start the process towards increasing the grass species richness, as well as reduce the rate of the spread of *O. aurantiaca*. It would also give the rare, endemic and threatened species a chance to recover. This measure if done with an aggressive AIP implementation plan is the best chance to eradicate *O. aurantiaca*. The opportunity costs for the landowners should be offset with the income from land leases for WTGs or substations, as well as the future costs of heavy AIP when populations are many-fold worse.

- The greatest danger to the property is going to be the massive expansion of *O. aurantiaca* populations. This species is top priority and requires a dedicated team and a Strategic Adaptive Monitoring Plan for this species.
- The second highest priority is the *O. megapotamica* populations. These are currently at very low levels (bar for the 3-4 dense populations along the old Eskom OHP on property 3/203).
- Vigilance for AIP with a creeper growth habit or guild is highly recommended.
- An annual Veld Condition Assessment is needed for the first three years. Part of the brief to the consultant would be to vet the Veld Management or Sustainable Landuse Management Plans, as well as critique the AIP Monitoring Meta-Reflection Reports. After the first three years a veld condition assessment every three years will be needed.

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Appendix 1. AIPs and Naturalised Weeds as listed by Hoare (2010)  
for the study site

No	Genus	Species	Subsp./Variation	Family
1	<i>Acacia mearnsii</i>	<i>mearnsii</i>		Fabaceae
2	<i>Alternanthera</i>	<i>pungens</i>		Amaranthaceae
3	<i>Amaranthus</i>	<i>thunbergii</i>		Amaranthaceae
4	<i>Anredera</i>	<i>baselloides</i>		Basselaceae
5	<i>Argemone</i>	<i>ochroleuca</i>		Papaveraceae
6	<i>Bidens</i>	<i>bipinnata</i>		Asteraceae
7	<i>Boerhavia</i>	<i>cordobensis</i>		Nyctaginaceae
8	<i>Centella</i>	<i>asiatica</i>		Amaranthaceae
9	<i>Chenopodium</i>	<i>pumilio</i>		Chenopodiaceae
10	<i>Conyza</i>	<i>bonariensis</i>		Asteraceae
11	<i>Conyza</i>	<i>scabrida</i>		Asteraceae
12	<i>Conyza</i>	<i>ulmifolia</i>		Asteraceae
13	<i>Cuscuta</i>	<i>campestris</i>		Convolvulaceae
14	<i>Gomphrena</i>	<i>celosioides</i>		Amaranthaceae
15	<i>Hypochaeris</i>	<i>microcephala</i>	<i>albiflora</i>	Asteraceae
16	<i>Medicago</i>	<i>laciniata</i>		Fabaceae
17	<i>Nasturtium</i>	<i>officinale</i>		Brassicaceae
18	<i>Opuntia</i>	<i>ficus-indica</i>		Cactaceae
19	<i>Opuntia</i>	<i>aurantiaca</i>		Cactaceae
20	<i>Persicaria</i>	<i>lapathifolia</i>		Polygonaceae
21	<i>Phragmites</i>	<i>australis</i>		Poaceae
22	<i>Schkuhria</i>	<i>pinnata</i>		Asteraceae
23	<i>Solanum</i>	<i>nigrum</i>		Solanaceae
24	<i>Tagetes</i>	<i>minuta</i>		Asteraceae
25	<i>Verbena</i>	<i>tenuisecta</i>		Verbenaceae
26	<i>Vicia</i>	<i>hirsuta</i>		Fabaceae

APPENDIX 2. NEMBA 2016 AIP SPECIES LISTS

NO.	SPECIES	COMMON NAME	CATEGORY AND RESTRICTIONS	EXEMPTIONS
1.	<i>Acacia adunca</i> A.Cunn. ex G.Don	Cascade wattle, Wallangarra wattle	1a	
2.	<i>Acacia baileyana</i> F.Muell.	Bailey's wattle	3	
3.	<i>Acacia cyclops</i> A.Cunn. ex G.Don	Red eye	1b	
4.	<i>Acacia dealbata</i> Link	Silver wattle	2	
5.	<i>Acacia decurrens</i> Willd. and hybrids, varieties and selections	Green wattle	2	Exempted for an existing plantation.
6.	<i>Acacia elata</i> A.Cunn. ex Benth. ( <i>Acacia terminalis</i> (Salisb.) misapplied in South Africa)	Pepper tree wattle	1b	
7.	<i>Acacia fimbriata</i> A.Cunn. ex G.Don	Fringed wattle, Brisbane wattle	1a	
8.	<i>Acacia implexa</i> Benth.	Screw pod wattle	1a	
9.	<i>Acacia longifolia</i> (Andrews) Willd.	Long-leaved wattle	1b	
10.	<i>Acacia mearnsii</i> De Wild. and hybrids, varieties and selections	Black wattle	2	Exempted for an existing plantation.
11.	<i>Acacia melanoxylon</i> R.Br. and hybrids, varieties and selections	Australian blackwood	2	
12.	<i>Acacia paradoxa</i> DC. (= <i>A. armata</i> R.Br.)	Kangaroo thorn, Kangaroo wattle	1a	
13.	<i>Acacia podalyriifolia</i> A.Cunn. ex G.Don	Pearl acacia	1b	
14.	<i>Acacia pycnantha</i> Benth.	Golden wattle	1b	
15.	<i>Acacia saligna</i> (Labill.) H.L.Wendl.	Port Jackson, Port Jackson willow	1b	
16.	<i>Acacia stricta</i> (Andrews) Willd.	Hop wattle	1a	
17.	<i>Acer buergerianum</i> Miq.	Chinese maple	a. 3 in Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga, North-West, Northern Cape and Western Cape. b. Not listed in urban areas in the Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga, North-West, Northern Cape and Western Cape. c. Not listed elsewhere.	



18.	<i>Acer negundo</i> L.	Ash-leaved maple, Box elder	a. 3 b. Sterile cultivars or hybrids are not listed.	
19.	<i>Agave americana</i> L. subsp. <i>americana</i> var. <i>expansa</i> (Jacobi) Gentry	Spreading century-plant	a. 3 in Western Cape. b. Not listed elsewhere.	
20.	<i>Agave sisalana</i> Perrine	Sisal hemp, Sisal	2	
21.	<i>Ageratina adenophora</i> (Spreng.) R.M.King & H.Rob. (= <i>Eupatorium adenophorum</i> Spreng.)	Crofton weed	1b	
22.	<i>Ageratina riparia</i> (Regel) R.M.King & H.Rob. (= <i>Eupatorium riparium</i> Regel)	Mistflower	1b	
23.	<i>Ageratum conyzoides</i> L.	Invading ageratum	1b	
24.	<i>Ageratum houstonianum</i> Mill.	Mexican ageratum	a. 1b b. Sterile cultivars or hybrids are not listed.	
25.	<i>Agrimonia procera</i> Wallr. (= <i>A. odorata</i> Mill.)	Scented agrimony	1b	
26.	<i>Agrostis castellana</i> Boiss. & Reut.	Bent grass	a. 1a Prince Edward Island. b. 1b Marion Island. c. Not listed on mainland or other off-shore islands.	
27.	<i>Agrostis gigantea</i> Roth	Black bent grass, Redtop	a. 1a Prince Edward and Marion Islands. b. Not listed on mainland or other off-shore islands.	
28.	<i>Agrostis stolonifera</i> L.	Creeping bent grass	a. 1a Prince Edward Island. b. 1b Marion Island. c. Not listed on mainland or other off-shore islands.	
29.	<i>Ailanthus altissima</i> (Mill.) Swingle	Tree-of-heaven	1b	
30.	<i>Albizia lebeck</i> (L.) Benth.	Lebeck tree	1b	
31.	<i>Albizia procera</i> (Roxb.) Benth.	False lebeck	1b	
32.	<i>Alhagi maurorum</i> Medik. (= <i>A. camelorum</i> Fisch.)	Camel thorn bush	1b	
33.	<i>Alisma plantago-aquatica</i> L.	Mud plantain, Water alisma	1b	
34.	<i>Alopecurus geniculatus</i> L. (= <i>A. australis</i> Nees)	Marsh foxtail, Water foxtail	a. 1a Prince Edward and Marion Islands.	

			b. Not listed on mainland or other off-shore islands.	
35.	<i>Alpinia zerumbet</i> (Pers.) B.L.Burt & R.M.Sm. (= <i>A. speciosa</i> (J.C.Wendl.) Schum.)	Shell ginger, Pink porcelain lily	3	
36.	<i>Ammophila arenaria</i> (L.) Link	Marram grass	3	
37.	<i>Anredera cordifolia</i> (Ten.) Steenis ( <i>A. baselloides</i> misapplied in South Africa)	Madeira vine, Bridal wreath	1b	
38.	<i>Antigonon leptopus</i> Hook. & Arn.	Coral creeper	1b	
39.	<i>Araujia sericifera</i> Brot.	Moth catcher	1b	
40.	<i>Ardisia crenata</i> Sims ( <i>Ardisia crispa</i> misapplied in South Africa)	Coralberry tree, Coral Bush	1b	
41.	<i>Ardisia elliptica</i> Thunb. (= <i>A. humilis</i> Vahl)	Shoebuttan ardisia	1b	
42.	<i>Argemone mexicana</i> L.	Yellow-flowered Mexican poppy	1b	
43.	<i>Argemone ochroleuca</i> Sweet	White-flowered Mexican poppy	1b	
44.	<i>Aristolochia elegans</i> Mast.	Dutchman's pipe	1b	
45.	<i>Arundo donax</i> L.	Giant reed, Spanish reed	1b	
46.	<i>Atriplex inflata</i> F.Muell. (= <i>A. lindleyi</i> Moq. subsp. <i>inflata</i> (F.Muell.) Paul G.Wilson)	Sponge-fruit saltbush	1b	
47.	<i>Atriplex nummularia</i> Lindl. subsp.	Old man saltbush	2	
48.	<i>Nummularia</i>			
49.	<i>Austrocylindropuntia cylindrica</i> (Juss. ex Lam.) Backeberg.	Cane cactus	1a	
50.	<i>Austrocylindropuntia subulata</i> (Muehlenpf.) Backeb. subsp. <i>exaltata</i> (A.Berger) D.R.Hunt (= <i>Opuntia exaltata</i> A.Berger)	Long spine cactus	1b	
51.	<i>Azolla cristata</i> Kaulf. (= <i>A. microphylla</i> Kaulf.)	Tropical red water fern	1b	
52.	<i>Azolla filiculoides</i> Lam.	Azolla, Red water fern	1b	
53.	<i>Azolla pinnata</i> R.Br. subsp. <i>asiatica</i> R.M.K.Saunders & K.Fowler (= <i>A. imbricata</i> (Roxb. ex Griff.) Nakai)	Mosquito fern	1b	
54.	<i>Bartlettina sordida</i> (Less.) R.M. King & H.Rob. (= <i>Eupatorium atrorubens</i> (Lem.) G.Nicholson, <i>E. sordidum</i> Less.)	Bartlettina	1b	

55.	<i>Bauhinia purpurea</i> L.	Butterfly orchid tree	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. 3 in Free State, Gauteng, North-West, Northern Cape and Western Cape.	
56.	<i>Bauhinia variegata</i> L.	Orchid tree	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. 3 in Free State, Gauteng, North-West, Northern Cape and Western Cape.	
57.	<i>Berberis thunbergii</i> DC.	Japanese barberry	a. 3 b. Sterile cultivars or hybrids are not listed.	
58.	<i>Billardiera heterophylla</i> (Lindl.) L.W.Cayzer & Crisp (= <i>Sollya heterophylla</i> Lindl.)	Bluebell creeper	1a	
59.	<i>Bryophyllum delagoense</i> (Eckl. & Zeyh.) Schinz (= <i>B. tubiflorum</i> Harv., <i>Kalanchoe tubiflora</i> (Harv.) Raym.-Hamet, <i>K. delagoensis</i> Eckl. & Zeyh.)	Chandelier plant	1b	
60.	<i>Bryophyllum pinnatum</i> (Lam.) Oken	Cathedral bells	1b	
61.	<i>Bryophyllum proliferum</i> Bowie ex Hook. (= <i>Kalanchoe prolifera</i> (Bowie) Raym.-Hamet)	Green mother of millions	1b	
62.	<i>Buddleja davidii</i> Franch.	Chinese sagewood, Summer lilac	a. 3 b. Sterile cultivars or hybrids are not listed.	
63.	<i>Buddleja madagascariensis</i> Lam.	Madagascar sagewood	3	
64.	<i>Cabomba caroliniana</i> A.Gray	Cabomba, Carolina fanwort	1a	
65.	<i>Caesalpinia decapetala</i> (Roth) Alston (= <i>C. sepiparia</i> Roxb.)	Mauritius thorn	1b	
66.	<i>Caesalpinia gilliesii</i> (Hook.) D.Dietr.	Bird-of-paradise flower	1b	
67.	<i>Callisia repens</i> (Jacq.) L.	Creeping inch plant	1b	
68.	<i>Callistemon citrinus</i> (Curtis) Skeels (= <i>Melaleuca citrina</i> (Curtis) Dum.Cours.)	Lemon bottlebrush	3	

69.	<i>Callistemon rigidus</i> R.Br.	Stiff-leaved bottlebrush	a. 1b in Eastern Cape and Western Cape. b. 3 in Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, North-West and Northern Cape.	
70.	<i>Callistemon viminalis</i> (Sol. ex Gaertn.) G.Don	Weeping bottlebrush	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. 3 in Free State, Gauteng, North-West, Northern Cape and Western Cape. c. Sterile cultivars or hybrids are not listed.	
71.	<i>Calotropis procera</i> (Aiton) W.T.Aiton	Calotropis, Giant- milkweed	1b	
72.	<i>Campuloclinium macrocephalum</i> (Less.) DC. (= <i>Eupatorium macrocephalum</i> Less.)	Pompom weed	1b	
73.	<i>Canna indica</i> L.	Indian shot	a. 1b b. Sterile cultivars or hybrids are not listed.	
74.	<i>Cardiospermum grandiflorum</i> Sw.	Balloon vine	1b	
75.	<i>Cardiospermum halicacabum</i> L.	Lesser balloon vine	3	
76.	<i>Carduus nutans</i> L. (= <i>C. macrocephalus</i> Desf.)	Nodding thistle	1b	
77.	<i>Casuarina cunninghamiana</i> Miq.	Beefwood	a. 2 b. 1b within 100 metres of riparian areas or untransformed land.	
78.	<i>Casuarina equisetifolia</i> L.	Horsetail tree	2	
79.	<i>Catharanthus roseus</i> (L.) G.Don	Madagascar periwinkle	a. 1b b. Sterile cultivars or hybrids are not listed.	
80.	<i>Celtis australis</i> L.	Nettle tree, European hackberry	3	
81.	<i>Celtis occidentalis</i> L.	Common hackberry	3	
82.	<i>Centranthus ruber</i> (L.) DC.	Red valerian, Devil's beard	a. 1b in Western Cape b. Not listed elsewhere	
83.	<i>Cerastium fontanum</i> Baumg.	Common mouse-ear chickweed	a. 1b Prince Edward and Marion Islands	

			b. Not listed on mainland or other off-shore islands.	
84.	<i>Cereus hexagonus</i> (L.) Mill.,	Queen of the night	1b	
85.	<i>Cereus hildmannianus</i> K. Schum.(= <i>C. peruvianus</i> auct. pl., <i>C. uruguayanus</i> R.Kiesling)	Queen of the night	1b	
86.	<i>Cereus jamacaru</i> DC.	Queen of the night	1b	
87.	<i>Cestrum aurantiacum</i> Lindl.	Orange cestrum	1b	
88.	<i>Cestrum elegans</i> (Brongn.) Schltl. (= <i>C. purpureum</i> (Lindl.) standl.)	Crimson cestrum	1b	
89.	<i>Cestrum laevigatum</i> Schltl.	Inkberry	1b	
90.	<i>Cestrum parqui</i> L'Hér.	Chilean cestrum	1b	
91.	<i>Cestrum</i> species not specifically listed	<i>Cestrum</i> species	a. 3 b. Sterile cultivars or hybrids are not listed.	
92.	<i>Chondrilla juncea</i> L.	Skeleton weed	1a	
93.	<i>Chromolaena odorata</i> (L.) R.M.King & H.Rob. (= <i>Eupatorium odoratum</i> L.)	Triffid weed, Chromolaena	1b	
94.	<i>Cinnamomum camphora</i> (L.) J.Presl	Camphor tree	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. 3 in Western Cape. c. National Heritage Trees or National Monument Trees in terms of the National Heritage Resources Act, 1999, (Act No. 25 of 1999) in Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga and the Western Cape, are not listed. d. Not listed elsewhere.	
95.	<i>Cirsium vulgare</i> (Savi) Ten. (= <i>C. lanceolatum</i> (L.) Scop.)	Spear thistle, Scotch thistle	1b	
96.	<i>Convolvulus arvensis</i> L.	Field bindweed, Wild morning-glory	1b	
97.	<i>Coreopsis lanceolata</i> L.	Tickseed	a. 1a b. Sterile cultivars or hybrids are not listed.	

98.	<i>Cortaderia jubata</i> (Lemoine ex Carrière) Stapf	Pampas grass	1b	
99.	<i>Cortaderia selloana</i> (Schult.) Asch. & Graebn.	Pampas grass	a. 1b b. Sterile cultivars or hybrids are not listed.	
100.	<b><i>Cotoneaster franchetii</i> Bois</b>	<b>Cotoneaster</b>	<b>1b</b>	
101.	<i>Cotoneaster glaucophyllus</i> Franch.	Late cotoneaster	1b	
102.	<i>Cotoneaster pannosus</i> Franch.	Silver leaf cotoneaster	1b	
103.	<i>Cotoneaster salicifolius</i> Franch.	Willow-leaved showberry	1b	
104.	<i>Cotoneaster simonsii</i> Baker	Himalayan cotoneaster, Simon's cotoneaster	1b	
105.	<i>Crotalaria agatiflora</i> Schweinf.	Canarybird bush, Bird flower	1b	
106.	<i>Cryptostegia grandiflora</i> R.Br.	Rubber vine	1b	
107.	<i>Cryptostegia madagascariensis</i> Bojer ex Decne.	Madagascar rubber vine	1b	
108.	<b><i>Cuscuta campestris</i> Yunck.</b>	<b>Common dodder</b>	<b>1b</b>	
109.	<i>Cuscuta suaveolens</i> Ser.	Lucerne dodder	1b	
110.	<i>Cylindropuntia fulgida</i> (Engelm.) F.M.Knuth var. <i>fulgida</i> (= <i>Opuntia fulgida</i> Engelm.) ( <i>O. rosea</i> DC. misapplied in South Africa).	Chain-fruit cholla (previously known as rosea cactus)	1b	
111.	<i>Cylindropuntia fulgida</i> (Engelm.) F.M.Knuth var. <i>mamillata</i> (Schott ex Engelm.) Backeb. .	Boxing-glove cactus, Mamillate cactus	1b	
112.	<i>Cylindropuntia imbricata</i> (Haw.) F.M.Knuth (= <i>Opuntia imbricata</i> (Haw.) DC.	Imbricate cactus, Imbricate prickly pear	1b	
113.	<i>Cylindropuntia leptocaulis</i> (DC.)		1b	
114.	F.M.Knuth	Pencil cactus		
115.	<i>Cylindropuntia pallida</i> (Rose) F.M.Knuth	Pink-flowered sheathed cholla	1a	
116.	<i>Cylindropuntia spinosior</i> (Engelm.) F.M.Knuth	Cane cholla, Spiny cholla	1a	
117.	<i>Cytisus scoparius</i> (L.) Link (= <i>Genista scoparia</i> (L.) Lam.)	Scotch broom	1a	
118.	<b><i>Datura ferox</i> L.</b>	<b>Large thorn apple</b>	<b>1b</b>	
119.	<i>Datura innoxia</i> Mill.	Downy thorn apple	1b	
120.	<b><i>Datura stramonium</i> L.</b>	<b>Common thorn apple</b>	<b>1b</b>	

121.	<i>Diplocyclos palmatus</i> (L.) C.Jeffrey	Lollipop-climber	1a	
122.	<i>Dolichandra unguis-cati</i> (L.) L. G. Lohmann (= <i>Macfadyena unguis-cati</i> (L.) A.H.Gentry)	Cat's claw creeper	1b	
123.	<i>Duchesnea indica</i> (Andrews) Focke	Wild strawberry	1b	
124.	<i>Duranta erecta</i> L. (= <i>D. repens</i> L., <i>D. plumieri</i> Jacq.)	Forget-me-not-tree, Pigeon berry	a. 3 in Gauteng, Kwazulu-Natal, Limpopo, Mpumalanga and North-West. b. 2 for breeding in nurseries in Gauteng, Kwazulu-Natal, Limpopo, Mpumalanga and North-West, but may not be transferred within these Provincial boundaries. c. Not listed elsewhere. d. Sterile cultivars or hybrids are not listed. e. "Sheena's Gold" cultivar is not listed.	
125.	<i>Echinodorus cordifolius</i> (L.) Griseb.	Creeping burhead	1b	
126.	<i>Echinodorus tenellus</i> (Mart. ex Schult.f.) Buchenau	Amazon sword plant	1b	
127.	<i>Echinopsis schickendantzii</i> F.A.C.Weber (= <i>E. spachiana</i> (Lem.) Friedrich & G.D.Rowley)	Torch cactus	1b	
128.	<i>Echium plantagineum</i> L. (= <i>E. lycopsis</i> L.)	Patterson's curse	1b	
129.	<i>Echium vulgare</i> L.	Blue echium	1b	
130.	<i>Egeria densa</i> Planch. (= <i>Elodea densa</i> (Planch.) Casp.)	Dense water weed	1b	
131.	<i>Eichhornia crassipes</i> (Mart.) Solms	Water hyacinth	1b	
132.	<i>Elodea canadensis</i> Michx.	Canadian water weed	1b	
133.	<i>Elytrigia repens</i> (L.) Desv. ex Nevski (= <i>Agropyron repens</i> (L.) P. Beauv., <i>Elymus repens</i> (L.) Gould)	Couch grass	a. 1a Prince Edward and Marion Islands. b. Not listed on mainland or other off-shore islands.	
134.	<i>Equisetum hyemale</i> L.	Rough horsetail, Common scouring-rush	1a	

135.	<i>Eriobotrya japonica</i> (Thunb.) Lindl.	Loquat	<p>a. 1b in Western Cape and Forest biome.</p> <p>b. Not listed in urban areas in Western Cape.</p> <p>c. Not listed elsewhere.</p> <p>d. The fruit of the loquat is not listed if used for human consumption.</p>	
136.	<i>Eucalyptus camaldulensis</i> Dehnh. and hybrids, varieties and selections	River red gum	<p>a. Category 1b within-</p> <p>(i) riparian areas;</p> <p>(ii) a Protected Area declared in terms of the Protected Areas Act; or,</p> <p>(iii) within a Listed Ecosystem or an ecosystem identified for conservation in terms of a Bioregional Plan or Biodiversity Management Plans published under the Act.</p> <p>b. Not listed within Nama-Karoo, Succulent Karoo and Desert biomes, excluding within any area mentioned in (a) above.</p> <p>c. Category 1b in Fynbos, Grassland, Savanna, Albany Thicket, Forest and Indian Ocean Coastal Belt biomes, but-</p> <p>(i) Category 2 for plantations, woodlots, bee-forage areas, wind-rows and the lining of avenues.</p> <p>(ii) Not listed within cultivated land that is at least 50 metres away from untransformed land, but excluding within any area in (a) above.</p> <p>(iii) Not listed within 50 metres of the main house on a farm,</p>	Exempted for an existing plantation.
137.	<i>Eucalyptus cladocalyx</i> F.Muell. and hybrids, varieties and selections	Sugar gum		



138.	<i>Eucalyptus conferruminata</i> D.J.Carr & S.G.M.Carr and hybrids, varieties and selections ( <i>E. lehmannii</i> misapplied in South Africa)	Spider gum		
139.	<i>Eucalyptus diversicolor</i> F.Muell. and hybrids, varieties and selections	Karri, Saligna gum, Rose gum		
140.	<i>Eucalyptus grandis</i> W.Hill ex Maiden ( <i>E. saligna</i> Sm. in part) and hybrids, varieties and selections		but excluding in (a) above. (iv) Not listed in urban areas for trees with a diameter of more than 400 mm at 1000 mm height at the time of publishing of this Notice, but excluding in (a) above.	
141.	<i>Eucalyptus tereticornis</i> Sm. and hybrids, varieties and selections	Forest red gum		
142.	<i>Eugenia uniflora</i> L.	Pitanga, Surinam cherry	1b	
143.	<i>Euphorbia esula</i> L. (= <i>E. xpseudovirgata</i> (Schur) Soó, <i>E. tommasiniana</i> Bertol., <i>E. virgata</i> Waldst. & Kit.)	Leafy spurge	1a	
144.	<i>Euphorbia leucocephala</i> Lotsy	White poinsettia	1b	
145.	<i>Fallopia sachalinensis</i> (F.Schmidt) Ronse Decr. (= <i>Polygonum sachalinense</i> F.Schmidt, <i>Reynoutria sachalinensis</i> (F.Schmidt) Nakai)	Giant knotweed	1a	
146.	<i>Festuca rubra</i> L.	Creeping red fescue	a. 1a Prince Edward and Marion Islands. b. Not listed on mainland or other off-shore islands.	
147.	<i>Flaveria bidentis</i> (L.) Kuntze	Smelter's-bush	1b	
148.	<i>Fraxinus americana</i> L.	American ash	a. 3 in Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga and Western Cape. b. Not listed elsewhere.	
149.	<i>Fraxinus angustifolia</i> Vahl	Algerian ash	a. 3 in Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga and Western Cape. b. Not listed elsewhere.	
150.	<i>Furcraea foetida</i> (L.) Haw.	Mauritian hemp	1a	

151.	<i>Genista monspessulana</i> (L.) L.A.S.Johnson (= <i>Cytisus monspessulanus</i> L., <i>C. candicans</i> (L.) DC.)	Montpellier broom	1a	
152.	<i>Gleditsia triacanthos</i> L.	Honey locust	a. 1b b. Sterile cultivars or hybrids are not listed.	
153.	<i>Glyceria maxima</i> (Hartm.) Holmb. (= <i>Poa aquatica</i> L., <i>Glyceria aquatica</i> (L.) Wahlb.)	Reed meadow grass, Reed sweet grass	a. 1b in Protected Areas and wetlands. b. Not listed elsewhere.	
154.	<i>Grevillea banksii</i> R.Br.	Australian crimson oak, Red flowering silky oak	1b	
155.	<i>Grevillea robusta</i> A.Cunn. ex R.Br.	Australian silky oak	3	
156.	<i>Grevillea rosmarinifolia</i> A.Cunn.	Rosemary grevillea	3	
157.	<i>Hakea drupacea</i> (C.F.Gaertn.) Roem. & Schult. (= <i>H. suaveolens</i> R.Br.)	Sweet hakea	1b	
158.	<i>Hakea gibbosa</i> (Sm.) Cav.	Rock hakea	1b	
159.	<i>Hakea salicifolia</i> (Vent.) B.L.Burt	Willow hakea	a. 1b in Western Cape. b. Not listed elsewhere.	
160.	<i>Hakea sericea</i> Schrad. & J.C.Wendl.	Silky hakea	1b	
161.	<i>Harrisia balansae</i> (K.Schum.) N.P.Taylor & Zappi	Strangler prickly apple	1a	
162.	<i>Harrisia martinii</i> (Labour.) Britton (= <i>Eriocereus martinii</i> (Labour.) Riccob.)	Moon cactus	1b	
163.	<i>Harrisia pomanensis</i> (F.A.C.Weber) Britton & Rose	Midnight lady, Devil's rope cactus	1a	
164.	<i>Harrisia tortuosa</i> (J.Forbes ex Otto & A.Dietr.) Britton & Rose	Spiny snake cactus	1b	
165.	<i>Hedera canariensis</i> Willd. (= <i>Hedera helix</i> L. subsp. <i>canariensis</i> (Willd.) Cout.)	Canary ivy, Madeira ivy, Algerian ivy	a. 3 b. Sterile cultivars or hybrids are not listed.	
166.	<i>Hedera helix</i> L. (= <i>Hedera helix</i> L. subsp. <i>helix</i> )	English ivy	a. 3 b. Sterile cultivars or hybrids are not listed.	
167.	<i>Hedychium coccineum</i> Buch.-Ham. ex Sm.	Red ginger lily	1b	
168.	<i>Hedychium coronarium</i> J.König	White ginger lily	1b	
169.	<i>Hedychium flavescens</i> Carey ex Roscoe	Yellow ginger lily	1b	

170.	<i>Hedychium gardnerianum</i> Sheppard ex Ker Gawl.	Kahili ginger lily	1b	
171.	<i>Homalanthus populifolius</i> Graham	Bleeding-heart tree	1b	
172.	<i>Houttuynia cordata</i> Thunb.	Chameleon plant	3	
173.	<i>Hydrilla verticillata</i> (L.f.) Royle	Hydrilla	1a	
174.	<i>Hydrocleys nymphoides</i> (Humb. & Bonpl. ex Willd.) Buchenau	Water poppy	1a	
175.	<i>Hylocereus undatus</i> (Haw.) Britton & Rose	Night-blooming cereus, Dragon fruit, Pitahaya	a. 2 b. The fruit of night-blooming cactus is not listed if used for human consumption.	
176.	<i>Hypericum androsaemum</i> L.	Tutsan	1b	
177.	<i>Hypericum perforatum</i> L.	St. John's wort, Tipton weed	2	
178.	<i>Ipomoea alba</i> L.	Moonflower	1b	
179.	<i>Ipomoea carnea</i> Jacq. subsp. <i>fistulosa</i> (Mart. ex Choisy) D.F.Austin (= <i>I. fistulosa</i> Mart. ex Choisy)	Morning-glory bush	1b	
180.	<i>Ipomoea indica</i> (Burm.) Merr. (= <i>I. congesta</i> R.Br.)	Morning glory	a. 1b b. Sterile cultivars or hybrids are not listed.	
181.	<i>Ipomoea purpurea</i> (L.) Roth	Morning glory	a. 1b b. Sterile cultivars or hybrids are not listed.	
182.	<i>Iris pseudacorus</i> L.	Yellow flag	1a	
183.	<i>Jacaranda mimosifolia</i> D.Don	Jacaranda	a. 1b in Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga and North-West. b. Not listed for urban areas in Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga and North-West. c. Not listed within 50 metres of the main house on a farm in Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga and North- West, for trees with a diameter of more than 400 mm at 1000 mm height at the	

			time of publishing of this Notice, provided such tress are located outside riparian areas. d. Not listed elsewhere.	
184.	<i>Jatropha curcas</i> L.	Physic nut	2	
185.	<i>Jatropha gossypifolia</i> L.	Cotton-leaf physic nut	1b	
186.	<i>Juniperus virginiana</i> L.	Red cedar	a. 3 in Eastern Cape and Free State. b. Not listed elsewhere.	
187.	<i>Kunzea ericoides</i> (A.Rich.) Joy Thomps.	Burgan, White teatree	1a	
188.	(= <i>Leptospermum ericoides</i> A. Rich.)			
189.	<i>Lantana</i> – all seed-producing species or seed-producing hybrids that are non- indigenous to South Africa	Lantana, Tickberry, Cherry pie	1b	
190.	<i>Lepidium draba</i> L. (= <i>Cardaria draba</i> (L.) Desv.)	Hoary cardaria	1b	
191.	<i>Leptospermum laevigatum</i> (Gaertn.) F.Muell.	Australian myrtle	1b	
192.	<i>Leucaena leucocephala</i> (Lam.) de Wit (= <i>L. glauca</i> Benth.)	Leucaena	2	
193.	<i>Ligustrum japonicum</i> Thunb.	Japanese wax-leaved privet	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga, North-West and Western Cape. b. 3 in Free State, Gauteng and Northern Cape.	
194.	<i>Ligustrum lucidum</i> W.T.Aiton	Chinese wax-leaved privet	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga, North-West and Western Cape. b. 3 in Free State, Gauteng and Northern Cape. c. Sterile cultivars or hybrids are not listed.	

195.	<i>Ligustrum ovalifolium</i> Hassk.	Californian privet	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga, North-West and Western Cape. b. 3 in Free State, Gauteng and Northern Cape. c. Sterile cultivars or hybrids are not listed.	
196.	<i>Ligustrum sinense</i> Lour.	Chinese privet	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga, North-West and Western Cape. b. 3 in Free State, Gauteng and Northern Cape.	
197.	<i>Ligustrum vulgare</i> L.	Common privet	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga, North-West and Western Cape. b. 3 in Free State, Gauteng and Northern Cape.	
198.	<i>Lilium formosanum</i> Wallace (= <i>L. longiflorum</i> Thunb. var. <i>formosanum</i> Baker)	Formosa lily	1b	
199.	<i>Limonium sinuatum</i> (L.) Mill.	Statice, Sea lavender	a. 1b in Northern Cape and Western Cape. b. Not listed elsewhere. c. Sterile cultivars or hybrids are not listed.	
200.	<i>Linaria dalmatica</i> (L.) Mill.	Dalmatian toadflax, Broadleaf	1b	
201.	(= <i>Antirrhinum dalmaticum</i> L., <i>Linaria genistifolia</i> subsp. <i>dalmatica</i> (L.) Maire & Petitm.	toadflax		
202.	<i>Linaria vulgaris</i> Mill.	Common toadflax, Butter- and-eggs	1b	
203.	<i>Litsea glutinosa</i> (Lour.) C.B.Rob. (= <i>Litsea sebifera</i> Pers.)	Indian laurel	1b	
204.	<i>Lonicera japonica</i> Thunb. 'Halliana'	Japanese or Hall's honeysuckle	3	
205.	<i>Ludwigia peruviana</i> (L.) H. Hara	Water-primrose, Peruvian primrosebush	1a	

206.	<i>Luzula multiflora</i> (Ehrh.) Lej.	Woodrush	a. 1a Prince Edward and Marion Islands. b. Not listed on mainland or other off-shore islands.	
207.	<i>Lythrum hyssopifolia</i> L.	Hyssop loosestrife	1b	
208.	<i>Lythrum salicaria</i> L.	Purple loosestrife	1a	
209.	<i>Malva dendromorpha</i> M.F.Ray (= <i>Lavatera arborea</i> L.)	Tree mallow	1b	
210.	<i>Malva verticillata</i> L.	Mallow	1b	
211.	<i>Malvastrum coromandelianum</i> (L.) Garcke	Prickly malvastrum	1b	
212.	<i>Marsilea mutica</i> Mett.	Nardoo, Australian water-clover	1a	
213.	<i>Melaleuca hypericifolia</i> Sm.	Red-flowering tea tree	1a	
214.	<i>Melaleuca quinquenervia</i> (Cav.) S.T. Blake	Bottle brush tree, Broadleaf paperbark tree	a. 1b b. National Heritage Trees or National Monument Trees in terms of the National Heritage Resources Act, 1999, (Act No. 25 of 1999), are not listed.	
215.	<i>Melia azedarach</i> L.	Seringa	a. 1b b. 3 in urban areas.	
216.	<i>Metrosideros excelsa</i> Sol. ex Gaertn. (= <i>M. tomentosa</i> A.Rich.)	New Zealand Christmas tree	a. 1a in the Overstrand District. b. Not listed elsewhere. c. Sterile cultivars or hybrids are not listed.	
217.	<i>Mimosa pigra</i> L.	Giant sensitive plant	1b	
218.	<i>Mirabilis jalapa</i> L.	Four-o'clock, Marvel-of-Peru	1b	
219.	<i>Montanoa hibiscifolia</i> Benth.	Tree daisy	1b	
220.	<i>Morus alba</i> L.	White mulberry, Common mulberry	a. 3 b. Sterile cultivars or hybrids are not listed. c. The fruit of the white mulberry is not listed if used for human consumption.	

221.	<i>Murraya paniculata</i> (L.) Jack. (= <i>M. exotica</i> L.)	Orange Jessamine	a. 1b in KwaZulu-Natal, Limpopo and Mpumalanga. b. 2 for breeding in nurseries in KwaZulu-Natal, Limpopo and Mpumalanga, but may not be transferred within these Provincial boundaries. c. Not listed elsewhere. d. Sterile cultivars or hybrids are not listed.	
222.	<i>Myoporum insulare</i> R.Br.	Manatoka, Boobyalla	3	
223.	<i>Myoporum laetum</i> G.Forst.	New Zealand manatoka	3	
224.	<i>Myoporum montanum</i> R.Br. (= <i>Myoporum tenuifolium</i> G.Forst.)	Manatoka	3	
225.	<i>Myriophyllum aquaticum</i> (Vell.) Verdc.	Parrot's feather	1b	
226.	<i>Myriophyllum spicatum</i> L.	Spiked water-milfoil	1b	
227.	<i>Myrtillocactus geometrizans</i> (Mart.) Console	Bilberry cactus	1a	
228.	<i>Nassella tenuissima</i> (Trin.) Barkworth (= <i>Stipa tenuissima</i> Trin.)	White tussock	1b	
229.	<i>Nassella trichotoma</i> (Nees) Hack. ex Arechav. (= <i>Stipa trichotoma</i> Nees)	Nassella tussock	1b	
230.	<i>Nasturtium officinale</i> R.Br. (= <i>Rorippa nasturtium-aquaticum</i> (L.) Hayek)	Watercress	2	
231.	<i>Nephrolepis cordifolia</i> (L.) C.Presl (= <i>Polypodium cordifolium</i> L.)	Erect sword fern, Ladder sword fern	a. 1b in Eastern Cape, KwaZulu-Natal, Mpumalanga, Limpopo and Western Cape. b. 3 in Free State, Gauteng, North-West and Northern Cape. c. Sterile cultivars or hybrids are not listed.	
232.	<i>Nephrolepis exaltata</i> (L.) Schott (= <i>Polypodium exaltatum</i> L.)	Sword fern, Boston sword fern	a. 1b in Eastern Cape, KwaZulu-Natal, Mpumalanga, Limpopo and Western Cape. b. 3 in Free State, Gauteng, North-West and Northern Cape.	

			c. Sterile cultivars or hybrids are not listed.	
233.	<i>Nerium oleander</i> L.	Oleander	a. 1b b. Sterile cultivars or hybrids are not listed.	
234.	<i>Nicandra physalodes</i> (L.) Gaertn.	Apple-of-Peru	1b	
235.	<i>Nicotiana glauca</i> Graham	Wild tobacco	1b	
236.	<i>Nuphar lutea</i> (L.) Sm. (= <i>N. minor</i> Dumort., <i>N. sericea</i> Láng, <i>N. spathulifera</i> Rchb., <i>N. tenella</i> Rchb., <i>Nymphaea lutea</i> L., <i>N. umbilicalis</i> Salisb., <i>Nymphozanthus luteus</i> (L.) Fernald, <i>N. sericeus</i> (Láng) Fernald, <i>N. vulgaris</i> Rich.)	Yellow water-lily	1a	
237.	<i>Nymphaea mexicana</i> Zucc.	Yellow water lilies	1b	
238.	<i>Nymphoides peltata</i> (S.G.Gmel.) Kuntze (= <i>Limnanthemum peltatum</i> S.G.Gmel.)	Gringed waterlily, Yellow floating-heart	1a	
239.	<i>Oenothera sinuosa</i> W.L.Wagner & Hoch (= <i>Gaura sinuata</i> Nutt. ex Ser.)	Wavy-leaf gaura	3	
240.	<i>Opuntia aurantiaca</i> Lindl.	Jointed cactus	1b	
241.	<i>Opuntia elata</i> Link & Otto ex Salm-Dyck	Orange tuna	1b	
242.	<i>Opuntia engelmanni</i> <sup>1</sup> Salm-Dyck ex Engelm. (= <i>O. lindheimeri</i> Engelm., <i>O. tardospina</i> Griffiths)	Small round-leaved prickly pear	1b	
243.	<i>Opuntia ficus-indica</i> (L.) Mill. (= <i>O. megacantha</i> Salm-Dyck)	Mission prickly pear, Sweet prickly pear	a. 1b b. Spineless cactus pear cultivars and selections are not listed. c. The fruit of the sweet prickly pear is not listed if used for human consumption.	
244.	<i>Opuntia humifusa</i> (Raf.) Raf. ( <i>O. compressa</i> misapplied in South Africa)	Large-flowered prickly pear, Creeping prickly pear	1b	
245.	<i>Opuntia leucotricha</i> DC.	Aaron's-beard prickly-pear	1b	

<sup>1</sup> Currently *O. megapotamica*



246.	<i>Opuntia microdasys</i> (Lehm.) Pfeiff.	Yellow bunny-ears, Teddy- bear cactus	1b	
247.	<i>Opuntia monacantha</i> Haw. ( <i>O. vulgaris</i> misapplied in South Africa)	Cochineal prickly pear, Drooping prickly pear	1b	
248.	<i>Opuntia pubescens</i> J.C.Wendl. ex Pfeiff.	Velvet bur cactus	1a	
249.	(= <i>O. pestifer</i> Britton & Rose)			
250.	<i>Opuntia robusta</i> H.L.Wendl. ex Pfeiff.	Blue-leaf cactus	a. 1a b. Spineless cultivars and selections are not listed.	
251.	<i>Opuntia salmiana</i> J. Parm. ex Pfeiff.	Bur cactus	1a	
252.	<i>Opuntia spinulifera</i> Salm-Dyck	Saucepan cactus, Large roundleaved prickly pear	1b	
253.	<i>Opuntia stricta</i> (Haw.) Haw. var. <i>stricta</i> and var. <i>dillenii</i> (Ker Gawl.) L.D.Benson (= <i>O. dillenii</i> (Ker Gawl.)Haw.)	Pest pear of Australia	1b	
254.	<i>Opuntia tomentosa</i> Salm-Dyck	Velvet opuntia, Velvet tree-pear	1b	
255.	<i>Orobanche minor</i> Sm.	Lesser broomrape, Clover broomrape	1b	
256.	<i>Orobanche ramosa</i> L.	Blue broomrape, Branched broomrape	1b	
257.	<i>Paraserianthes lophantha</i> (Willd.) I.C.Nielsen (= <i>Albizia lophantha</i> (Willd.) Benth.)	Australian albizia, Stink bean	1b	
258.	<i>Parkinsonia aculeata</i> L.	Jerusalem thorn	1b	
259.	<i>Parthenium hysterophorus</i> L.	Famine weed	1b	
260.	<i>Paspalum quadrifarium</i> Lam.	Tussock paspalum	1a	
261.	<i>Passiflora caerulea</i> L.	Blue passion flower	1b	
262.	<i>Passiflora edulis</i> Sims	Purple granadilla, Passion fruit	a. 2 in Eastern Cape, Gauteng, KwaZulu-Natal, Mpumalanga, Limpopo and North-West. b. Not listed in urban areas in Eastern Cape, Gauteng, KwaZulu-Natal, Mpumalanga, Limpopo and North-West. c. Not listed elsewhere.	

			d. The fruit of the purple granadilla is not listed if used for human consumption.	
263.	<i>Passiflora tripartita</i> (Juss.) Poir. var. <i>mollissima</i> (Kunth) Holm-Niels. & P.Jorg. (= <i>P. mollissima</i> (Kunth) L.H.Bailey)	Banana poka, Bananadilla	1b	
264.	<i>Passiflora suberosa</i> L.	Devil's pumpkin, Indigo berry	1b	
265.	<i>Passiflora subpeltata</i> Ortega	Granadina	1b	
266.	<i>Paulownia tomentosa</i> (Thunb.) Steud. (= <i>Paulownia imperialis</i> Siebold & Zucc.)	Empress tree, Princess tree, Royal Paulownia	1a	
267.	<i>Peniocereus serpentinus</i> (Lag. & Rodr.) N.P.Taylor	Serpent cactus, Snake cactus	1b	
268.	<i>Pennisetum clandestinum</i> Hochst. ex Chiov.	Kikuyu grass	a. 1b in Protected Areas and wetlands in which it does not already occur. b. Not listed elsewhere.	
269.	<i>Pennisetum purpureum</i> Schumach.	Elephant grass, Napier grass	2	
270.	<i>Pennisetum setaceum</i> (Forssk.) Chiov.	Fountain grass	a. 1b b. Sterile cultivars or hybrids are not listed.	
271.	<i>Pennisetum villosum</i> R.Br. ex Fresen.	Feathertop	1b	
272.	<i>Pereskia aculeata</i> Mill.	Pereskia, Barbados gooseberry	1b	
273.	<i>Persicaria capitata</i> (Buch.-Ham. ex D.Don) H.Gross (= <i>Polygonum capitatum</i> Buch.-Ham. ex D.Don)	Knotweed	1b	
274.	<i>Phytolacca americana</i> L. (= <i>P. decandra</i> L.)	American pokeweed	1b	
275.	<i>Phytolacca dioica</i> L.	Belhambra	3	
276.	<i>Phytolacca octandra</i> L.	Forest inkberry	1b	
277.	<i>Pinus canariensis</i> C.Sm.	Canary pine	3	
278.	<i>Pinus elliotti</i> Engelm. and hybrids, varieties and selections	Slash pine	a. 2 for sterile specimens. b. 1b for non-sterile specimens.	Exempted for an existing plantation of sterile specimens.

279.	<i>Pinus halepensis</i> Mill.	Aleppo pine	a. 3 in Eastern Cape, Free State and Western Cape. b. Not listed elsewhere.	
280.	<i>Pinus patula</i> Schiede ex Schltdl. & Cham. and hybrids, varieties and selections	Patula pine	2	Exempted for an existing plantation.
281.	<i>Pinus pinaster</i> Aiton and hybrids, varieties and selections	Cluster pine	a. 2 for plantations and wind-rows. b. 1b elsewhere. c. National Heritage Trees or National Monument Trees in terms of the National Heritage Resources Act, 1999, (Act No. 25 of 1999), are not listed. d. Except for "a" above, specimens with a circumference greater than 1.256 m at a height of 1000 mm at the date of publication of this Notice are not listed for urban areas in Cape Town, the Overberg District Council and Winelands District Council, except when in riparian areas or in a protected area or any property directly abutting a protected area, where they remain listed as Category 1b.	Exempted for an existing plantation outside of the Western Cape. Existing plantations in the Western Cape are exempted from undertaking a risk assessment in terms of section
282.	<i>Pinus radiata</i> D. Don and hybrids, varieties and selections	Radiata pine, Monterey pine	a. 2 for plantations and wind-rows. b. 1b elsewhere. c. National Heritage Trees or National Monument Trees in terms of the National Heritage Resources Act, 1999 (Act No. 25 of 1999), are not listed. d. Except for "a" above, specimens with a circumference greater than 1.256 m at a height of 1000 mm at the date of publication of this Notice are not listed for urban areas in Cape Town, the Overberg District Council and Winelands District Council,	Exempted for an existing plantation outside of the Western Cape. Existing plantations in the Western Cape are exempted from undertaking a risk assessment in terms of section 71(2) of the Act prior to applying for a permit.

			except when in riparian areas or in a protected area or any property directly abutting a protected area, where they remain listed as Category 1b.	
283.	<i>Pinus roxburghii</i> Sarg. and hybrids, varieties and selections (= <i>P. longifolia</i> Roxb. ex Lamb.)	Chir pine, Longifolia pine	2	Exempted for an existing plantation.
284.	<i>Pinus taeda</i> L. and hybrids, varieties and selections	Loblolly pine	2	Exempted for an existing plantation.
285.	<i>Pistia stratiotes</i> L.	Water lettuce	1b	
286.	<i>Pittosporum crassifolium</i> Banks & Sol. ex A.Cunn.	Karo, Stiff-leaved cheesewood	3	
287.	<i>Pittosporum undulatum</i> Vent.	Australian cheesewood, Sweet pittosporum	1b	
288.	<i>Plectranthus barbatus</i> var. <i>grandis</i> (= <i>P. comosus</i> Sims)	'Abyssinian' coleus, Woolly plectranthus	1b	
289.	<i>Poa pratensis</i> L.	Kentucky bluegrass	a. 1a Prince Edward Island. b. 1b Marion Island. c. Not listed on mainland or other off-shore islands.	
290.	<i>Polypodium aureum</i> (L.) J.Sm.	Rabbits-foot fern	a. 3 in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. Not listed elsewhere.	
291.	<i>Pontederia cordata</i> L.	Pickerel weed	1b	
292.	<i>Populus alba</i> L.	White poplar	2	
293.	<i>Populus x canescens</i> (Aiton) Sm.	Grey poplar, Matchwood poplar	2	
294.	<i>Prosopis glandulosa</i> Torr. var. <i>torreyana</i> (L.D. Benson) M.C. Johnst. and hybrids	Honey mesquite	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 listed in the Northern	

			Cape, Eastern Cape, Free State, North-West and Western Cape. d. Not listed elsewhere.	
295.	<i>Prosopis velutina</i> Wooton and hybrids	Velvet mesquite	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 listed in the Northern Cape, Eastern Cape, Free State, North-West and Western Cape. d. Not listed elsewhere.	
296.	<i>Prunus serotina</i> Ehrh.	Black cherry	1b	
297.	<i>Psidium cattleianum</i> Sabine (= <i>P. littorale</i> Raddi var. <i>longipes</i> (O.Berg.) Fosberg)	Strawberry guava	1b	
298.	<i>Psidium guajava</i> L.	Guava	a. 2 for plantations in Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga and North-West. b. 3 elsewhere in Eastern Cape, Kwazulu-Natal, Limpopo, Mpumalanga and North-West. c. The fruit of the guava is not listed if used for human consumption. d. Not listed elsewhere.	
299.	<i>Psidium guineense</i> Sw.	Brazilian guava	1b	
300.	<i>Psidium x durbanensis</i> Baijnath ined.	Durban guava	1b	
301.	<i>Pueraria montana</i> (Lour.) Merr. var. <i>lobata</i> (Willd.) Maesen & S.M.Almeida	Kudzu vine	1a	
302.	(= <i>P. lobata</i> (Willd.) Ohwi)			
303.	<i>Pyracantha angustifolia</i> (Franch.) C.K.Schneid.	Yellow firethorn	a. 1b b. Sterile cultivars or hybrids are not listed.	
304.	<i>Pyracantha coccinea</i> M.Roem.	Red firethorn	a. 1b b. Sterile cultivars or hybrids are not listed.	

305.	<i>Pyracantha crenatoserrata</i> (Hance) Rehder (= <i>P. fortuneana</i> misapplied)	Chinese firethorn, Broad leaf firethorn	a. 1b b. Sterile cultivars or hybrids are not listed.	
306.	<i>Pyracantha crenulata</i> (D.Don) M.Roem; including var. <i>rogersiana</i> (= <i>P. rogersiana</i> (A.B.Jacks.) Chitt.)	Himalayan firethorn	a. 1b b. Sterile cultivars or hybrids are not listed.	
307.	<i>Pyracantha koidzumii</i> (Hayata) Rehder	Formosa firethorn	a. 1b b. Sterile cultivars or hybrids are not listed.	
308.	<i>Rhus glabra</i> L.	Scarlet sumach, Vinegar bush	3	
309.	<i>Ricinus communis</i> L.	Castor-oil plant	2	
310.	<i>Rivina humilis</i> L.	Rivina, Bloodberry	1b	
311.	<i>Robinia pseudoacacia</i> L.	Black locust	1b	
312.	<i>Rosa rubiginosa</i> L. (= <i>R. eglantheria</i> L.)	Eglantine, Sweetbriar	1b	
313.	<i>Rubus cuneifolius</i> Pursh and hybrid <i>R. x proteus</i> C.H.Stirt.	American bramble	1b	
314.	<i>Rubus ellipticus</i> Sm.	Asian wild raspberry, Yellow Himalayan raspberry	1a	
315.	<i>Rubus flagellaris</i> Willd.	Bramble	1b.	
316.	<i>Rubus fruticosus</i> L. agg.	European blackberry	a. 2 b. The fruit of the European blackberry is not listed if used for human consumption.	
317.	<i>Rubus immixtus</i> Gust.	Hogsback raspberry	1b	
318.	<i>Rubus niveus</i> Thunb.	Ceylon raspberry, Mysore raspberry	1b	
319.	<i>Rumex acetosella</i> L.	Sheep sorrel, Red sorrel	a. 1a Prince Edward and Marion Islands. b. Not listed on mainland or other off-shore islands.	
320.	<i>Rumex usambarensis</i> (Dammer) Dammer (= <i>R. nervosus</i> Vahl var. <i>usambarensis</i> Dammer)	East African dock	1b	
321.	<i>Sagina procumbens</i> L.	Birdeye pearlwort	a. 1b Prince Edward and Marion Islands. b. Not listed on mainland or other off-shore islands.	

322.	<i>Sagittaria platyphylla</i> (Engelm.) J.G.Sm.	Delta arrowhead, Slender arrowhead	1a	
323.	<i>Salsola kali</i> L.	Tumbleweed	1b	
324.	<i>Salsola tragus</i> L. (= <i>S. australis</i> R.Br.)	Russian tumbleweed	1b	
325.	<i>Salvia tiliifolia</i> Vahl	Lindenleaf sage	1b	
326.	<i>Salvinia minima</i> Baker	Small salvinia	1b	
327.	<i>Salvinia molesta</i> D.S.Mitch. and other species of the Family Salviniaceae	Kariba weed, Salvinia	1b	
328.	<i>Sambucus canadensis</i> L. (= <i>S. nigra</i> L. subsp. <i>canadensis</i> (L.) Bolli)	Canadian elder	1b	
329.	<i>Sambucus nigra</i> L.	European elder	1b	
330.	<i>Sasa ramosa</i> (Makino) Makino & Shibata (= <i>Arundinaria vagans</i> Gamble)	Dwarf yellow-striped bamboo	3	
331.	<i>Schefflera actinophylla</i> (Endl.) Harms	Australian cabbage tree, Queensland umbrella tree	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. Not listed elsewhere.	
332.	<i>Schefflera arboricola</i> (Hayata) Merr.	Dwarf umbrella tree	a. 3 in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. Not listed elsewhere.	
333.	<i>Schefflera elegantissima</i> (hort. Veitch ex Mast.) Lowry & Frodin (= <i>Dizygotheca elegantissima</i> (hort. Veitch ex Mast.) R.Vig. & Guillaumin)	False aralia	a. 3 in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. Not listed elsewhere.	
334.	<i>Schinus terebinthifolius</i> Raddi	Brazilian pepper tree	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. 3 in Free State, Gauteng, North-West, Northern Cape and Western Cape.	
335.	<i>Senna bicapsularis</i> (L.) Roxb. (= <i>Cassia bicapsularis</i> L.)	Rambling cassia	1b	
336.	<i>Senna didymobotrya</i> (Fresen.) H.S.Irwin & Barneby (= <i>Cassia didymobotrya</i> Fresen.)	Peanut butter cassia	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga and Western Cape. b. Not listed elsewhere.	

337.	<i>Senna hirsuta</i> (L.) H.S.Irwin & Barneby (= <i>Cassia hirsuta</i> L.)	Hairy senna, Woolly senna	1b	
338.	<i>Senna occidentalis</i> (L.) Link (= <i>Cassia occidentalis</i> L.)	Stinking weed, Wild coffee	1b	
339.	<i>Senna pendula</i> (Willd.) H.S.Irwin & Barneby var. <i>glabrata</i> (Vogel) H.S.Irwin & Barneby (= <i>Cassia coluteoides</i> Collad.)	Climbing cassia, Easter cassia	1b	
340.	<i>Senna septemtrionalis</i> (Viv.) H.S.Irwin & Barneby (= <i>Cassia floribunda</i> sensu Brenan, <i>C. laevigata</i> Willd.)	Arsenic bush, Smooth senna	1b	
341.	<i>Sesbania punicea</i> (Cav.) Benth.	Red sesbania	1b	
342.	<i>Solanum betaceum</i> Cav. (= <i>Cyphomandra betacea</i> (Cav.) Sendtn.)	Tree tomato	a. 3 in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. The fruit of the tree tomato is not listed if used for human consumption, in the Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. c. Not listed elsewhere.	
343.	<i>Solanum chrysotrichum</i> Schtdl. ( <i>S. hispidum</i> misapplied in South Africa)	Giant devil's fig	1b	
344.	<i>Solanum elaeagnifolium</i> Cav.	Silver-leaf bitter apple	1b	
345.	<i>Solanum mauritanium</i> Scop.	Bugweed	1b	
346.	<i>Solanum pseudocapsicum</i> L.	Jerusalem cherry	1b	
347.	<i>Solanum seafortianum</i> Andrews	Potato creeper	1b	
348.	<i>Solanum sisymbriifolium</i> Lam.	Wild tomato, Dense- thorned bitter apple	1b	
349.	<i>Sorghum halepense</i> (L.) Pers.	Johnson grass, Aleppo grass	2	
350.	<i>Spartina alterniflora</i> Loisel.	Smooth cordgrass, Salt-water cordgrass	1a	
351.	<i>Spartium junceum</i> L.	Spanish broom	a. 1b in Eastern Cape and Western Cape. b. 3 in Free State, Gauteng, KwaZulu-Natal, Limpopo,	



			Mpumalanga. North-West and Northern Cape.	
352.	<i>Spathodea campanulata</i> P.Beauv.	African flame tree	a. 3 in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. Not listed elsewhere.	
353.	<i>Sphagneticola trilobata</i> (L.) Pruski (= <i>Thelechitonia trilobata</i> (L.) H.Rob. & Cuatrec., <i>Wedelia trilobata</i> (L.) Hitchc.)	Singapore daisy	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. 3 in Free State, Gauteng, North-West, Northern Cape and Western Cape.	
354.	<i>Stachytarpheta cayennensis</i> (Rich.) Vahl (= <i>S. urticifolia</i> Sims)	Blue snakeweed, Cayenne snakeweed	3	
355.	<i>Stachytarpheta mutabilis</i> (Jacq.) Vahl	Pink snakeweed	3	
356.	<i>Stellaria media</i> (L.) Vill.	Common chickweed	a. 1a Prince Edward Island. b. 1b Marion Island. c. Not listed on mainland or other off-shore islands.	
357.	<i>Syngonium podophyllum</i> Schott	Goose foot, Arrow- head vine	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. 2 for breeding in nurseries in in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga, but may not be transferred within these Provincial boundaries. c. Not listed elsewhere.	
358.	<i>Syzygium cumini</i> (L.) Skeels	Jambolan	a. 1b b. The fruit of the jambolan is not listed if used for human consumption.	
359.	<i>Syzygium jambos</i> (L.) Alston	Rose apple	3	
360.	<i>Tamarix aphylla</i> (L.) H.Karst. Not to be confused with indigenous <i>Tamarix usneoides</i> E.Mey. ex Bunge	Athel tree, Desert tamarisk	1b	
361.	<i>Tamarix chinensis</i> Lour. Not to be confused with indigenous <i>Tamarix usneoides</i> E.Mey. ex Bunge	Chinese tamarisk	1b	

362.	<i>Tamarix gallica</i> L. Not to be confused with indigenous <i>Tamarix usneoides</i> E.Mey. ex Bunge	French tamarisk	1b	
363.	<i>Tamarix ramosissima</i> Ledeb. Not to be confused with indigenous <i>Tamarix usneoides</i> E.Mey. ex Bunge	Pink tamarisk	1b	
364.	<i>Tecoma stans</i> (L.) Juss. ex Kunth	Yellow bells	1b	
365.	<i>Tephrocactus articulatus</i> (Pfeiff.) Backeb. (= <i>Opuntia articulata</i> (Pfeiff.) D.R.Hunt)	Pine cone cactus, Paper-spine cholla	1a	
366.	<i>Thevetia peruviana</i> (Pers.) K.Schum. (= <i>T. neriifolia</i> Juss. ex Steud.)	Yellow oleander	1b	
367.	<i>Tipuana tipu</i> (Benth.) Kuntze (= <i>T. speciosa</i> Benth.)	Tipu tree	3	
368.	<i>Tithonia diversifolia</i> (Hemsl.) A.Gray	Mexican sunflower	1b	
369.	<i>Tithonia rotundifolia</i> (Mill.) S.F.Blake	Red sunflower	1b	
370.	<i>Toona ciliata</i> M.Roem. (= <i>Cedrela toona</i> Roxb. ex Willd.)	Toon tree	3	
371.	<i>Toxicodendron succedaneum</i> (L.) Kuntze (= <i>Rhus succedanea</i> L.)	Wax tree	1b	
372.	<i>Tradescantia fluminensis</i> Vell.	Wandering Jew	1b	
373.	<i>Tradescantia zebrina</i> hort. ex Bosse (= <i>Zebrina pendula</i> Schnizl.)	Wandering Jew	1b	
374.	<i>Triplaris americana</i> L.	Ant tree, Triplaris	1a	
375.	<i>Tropaeolum speciosum</i> Poepp. & Endl.	Chilean flame creeper, Flame nasturtium	3	
376.	<i>Ulex europaeus</i> L.	European gorse	1a	
377.	<i>Verbena bonariensis</i> L.	Wild verbena, Tall verbena, Purple top	1b	
378.	<i>Verbena brasiliensis</i> Vell.	Brazilian verbena	1b	
379.	<i>Verbena rigida</i> Spreng. (= <i>V. venosa</i> Gillies & Hook.)	Veined verbena	1b	
380.	<i>Vinca major</i> L.	Greater periwinkle	a. 1b b. Sterile cultivars or hybrids are not listed.	

381.	<i>Vinca minor</i> L.	Lesser periwinkle	a. 1b b. Sterile cultivars or hybrids are not listed.	
382.	<i>Vitex trifolia</i> L.	Indian three-leaf vitex	1b	
383.	<i>Wigandia urens</i> (Ruiz & Pav.) Kunth var. <i>caracasana</i> (Kunth) D.N.Gibson (= <i>W. caracasana</i> Kunth)	Wigandia	3	
384.	<i>Xanthium spinosum</i> L.	Spiny cocklebur	1b	
385.	<i>Xanthium strumarium</i> L.	Large cocklebur	1b	

APPENDIX 3. WfW Operating Standards ver 3.

**DEPARTMENT OF ENVIRONMENT, FORESTRY AND FISHERIES**

NO. 1003

18 SEPTEMBER 2020

**NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, 2004  
(ACT NO. 10 OF 2004)****ALIEN AND INVASIVE SPECIES LISTS, 2020**

I, Barbara Dallas Creecy, Minister of Forestry, Fisheries and the Environment, hereby publish the following Alien and Invasive Species lists in terms of sections 66(1), 67(1), 70(1)(a), 71(3) and 71A of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) as set out in the Schedule hereto.



**BARBARA DALLAS CREECY**  
**MINISTER OF FORESTRY, FISHERIES AND THE ENVIRONMENT**

<b>NOTICES AND LISTS IN TERMS OF SECTIONS 66(1), 67(1), 70(1)(a), 71(3) and 71A</b>
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**Notice 1:** Notice in respect of Categories 1a, 1b, 2 and 3, Listed Invasive Species, in terms of which certain Restricted Activities are prohibited in terms of section 71A(1); exempted in terms of section 71(3); require a Permit in terms of section 71(1)

**Notice 2: Exempted Alien Species** in terms of section 66(1).

**Notice 3: National Lists of Invasive Species** in terms section 70(1).

List 1:	National List of Invasive Terrestrial and Fresh-water Plant Species	
List 2:	National List of Invasive Marine Plant Species	
List 3:	National List of Invasive Mammal Species	
List 4:	National List of Invasive Bird Species	
List 5:	National List of Invasive Reptile Species	
List 6:	National List of Invasive Amphibian Species	
List 7:	National List of Invasive Fresh-water Fish Species	
	National List of Invasive Marine Fish Species	
List 8:	National List of Invasive Terrestrial Invertebrate Species	
List 9:	National List of Invasive Fresh-water Invertebrate Species	
List 10:	National List of Invasive Marine Invertebrate Species	
List 11:	National List of Invasive Microbial Species	

**These notices must be read together with the Alien and Invasive Species Regulations. Any word or phrase defined in the Alien and Invasive Species Regulations shall have the same meaning in these notices.**

**These notices shall take effect 30 days from date of publication in the Gazette.**

**These notices replace and repeal any Alien and Invasive Species lists published under the Act including Government Gazette 40166 Notice 864 of 29 July 2016.**

## NOTICE 1:

**NOTICE IN RESPECT OF CATEGORIES 1a, 1b, 2 AND 3 LISTED INVASIVE SPECIES, IN TERMS OF WHICH CERTAIN RESTRICTED ACTIVITIES ARE PROHIBITED IN TERMS OF SECTION 71A(1); EXEMPTED IN TERMS OF SECTION 71(3); REQUIRE A PERMIT IN TERMS OF SECTION 71(1)**

Where the scientific name of any listed species changes or there is a spelling error in the scientific name, the common name of the species takes precedence and determines whether a particular species is listed or not.

In respect of Categories 1a, 1b, 2 and 3 Listed Invasive Species, certain Restricted Activities are—

- (a) Prohibited in terms of section 71A(1);
- (b) exempted in terms of section 71(3); or
- (c) require a Permit in terms of Chapter 7, and must be read with the lists in Notice 3.

“**catchment**”, in relation to a watercourse or watercourses or part of a watercourse, means the area from which any rainfall will drain into the watercourse or watercourses or part of a watercourse, through surface flow to a common point or common points;

“**cultivation**”, in relation to land, means any act by means of which the topsoil is disturbed mechanically;

“**discrete catchment systems**” means all inland water bodies, whether fresh or saline, including rivers, lakes, dams, wetlands and estuaries, that are within a catchment that is separated from other catchments;

“**untransformed land**” means land that has not been altered from its natural state, or land that is used for natural grazing, and includes land in its natural state that has been degraded by factors such as soil erosion, over-grazing, over-burning, flooding, invasive species and bush encroachment; and

“**watercourse**” shall have the meaning assigned to it in the National Water Act, 1998 (Act No. 36 of 1998).

**General exemption of listed invasive species:**

1. All dead specimens of any listed invasive species are exempted from requiring a Permit for any restricted activity.
2. Notwithstanding any prohibition in Notice 1 or Notice 3 below, but subject to paragraph 1 above, any person in possession of a listed invasive plant species which is being utilised as biomass is hereby exempted from requiring a permit for and may undertake the restricted activities of—
  - (a) conveying, moving or otherwise translocating any specimen of a listed invasive plant species; and
  - (b) selling or otherwise trading in, buying, receiving, giving, donating or accepting as a gift, or in any way acquiring or disposing of any specimen of a listed invasive plant species,
 on the condition that the person complies with any norms and standards relating to biomass, published in terms of the Act.

3. Notwithstanding any prohibition in Notice 1 or Notice 3, any person conveying, moving or otherwise translocating any specimen of a listed invasive plant species for disposal or treatment as waste, is hereby exempted from requiring a permit for and may undertake such restricted activity, provided such person complies with any norms and standards relating to disposal of listed invasive species, published in terms of the Act.
4. Notwithstanding any prohibition in Notice 1 or Notice 3 below, any authorised official, is hereby exempted from requiring a permit for and may undertake any restricted activity necessary to perform their functions in terms of the Act or the National Environmental Management Act.
5. An extension to a plantation is exempted from undertaking a risk assessment in terms of section 71(2) of the Act, prior to applying for a permit in terms of the Act and Alien and Invasive Species Regulations, 2020, provided the application for an environmental authorisation in terms of the National Environmental Management Act included an invasive species risk assessment.

**Note that the species-specific exemptions and prohibitions in Notice 3 take precedence over Notice 1, in the event of any conflict.**

Restricted Activities as defined in the Act		Category 1a	Category 1b	Category 2	Category 3
a.	Importing into the Republic, including introducing from the sea, any specimen of a listed invasive species.	Prohibited	Prohibited	Permit Required	Prohibited
b.	Having in possession or exercising physical control over any specimen of a listed invasive species.	Exempted	Exempted	Permit Required	Exempted
c.	Growing, breeding or in any other way propagating any specimen of a listed invasive species, or causing it to multiply.	Prohibited	Prohibited	Permit Required	Prohibited
d.	Conveying, moving or otherwise translocating any specimen of a listed invasive species.	Prohibited	Prohibited	Permit Required	Prohibited
e.	Selling or otherwise trading in, buying, receiving, giving, donating or accepting as a gift, or in any way acquiring or disposing of any specimen of a listed invasive species.	Prohibited	Prohibited	Permit Required	Prohibited
Restricted Activities as defined in Regulation 6					
f.	Spreading or allowing the spread of any specimen of a listed invasive species.	Prohibited	Prohibited	Permit Required	Prohibited
g.	Releasing any specimen of a listed invasive species.	Prohibited	Prohibited	Permit Required	Prohibited
h.	The transfer or release of a specimen of a listed invasive fresh-water species from one discrete catchment system in which it occurs, to another discrete catchment system in which it does not occur; or, from	Prohibited	Prohibited	Permit Required	Prohibited



within a part of a discrete catchment system where it does occur to another part where it does not occur as a result of a natural or artificial barrier.					
i. Discharging of or disposing into any waterway or the ocean, water from an aquarium, tank or other receptacle that has been used to keep a specimen of an alien or a listed invasive species.	Prohibited	Prohibited	Prohibited	Permit Required	Prohibited
j. Catch and release of a specimen of a listed invasive fresh-water fish or listed invasive fresh-water invertebrate species.	Prohibited	See Notice 3	See Notice 3	See Notice 3	See Notice 3
k. The introduction of a specimen of an alien or a listed invasive species to off-shore islands.	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited
l. The release of a specimen of a listed invasive fresh-water fish species, or of a listed invasive fresh-water invertebrate species, into a discrete catchment system in which it already occurs.	See Notice 3	See Notice 3	See Notice 3	See Notice 3	See Notice 3

## NOTICE 2:

## NOTICE IN TERMS OF SECTION 66(1) – EXEMPTED ALIEN SPECIES

1. The following categories of alien species that are within the Republic when this Notice comes into effect, are exempted from the provisions of section 65(1) of the Act:
  - a. Dead specimens of any alien species, including:
    - (i) dead specimens imported, kept, or removed from one area to another as taxonomic reference specimen; and
    - (ii) dead specimens used as derivatives in products, including food, cosmetics and detergents.
  - b. Subject to e, any alien species that has been legally introduced into the Republic, or was introduced into the Republic prior to any legal requirement for such introduction, for agricultural purposes, and any new cultivar, variety, or hybrid of any species legally imported for agricultural purposes (excluding those which are already listed as invasive).
  - c. Subject to e, any alien species, other than an alien species introduced for agricultural purposes as contemplated in paragraph (b) above, that has been legally introduced into the Republic, or was introduced into the Republic prior to any legal requirement for such introduction, prior to the commencement of this Notice.
  - d. Any invasive species listed in terms of section 70(1)(a) of the Act.
  - e. All alien fresh-water fish, except for the release of alien freshwater fish into rivers, wetlands, natural lakes and estuaries.
2. The exemptions in paragraph 1 above, do not apply to the *Diceros bicornis michaelsi* (Zukowsky, 1965) (common name, Eastern Black Rhinoceros (Kenya)) and the provisions of section 65(1) of the Act apply, until the species is listed as a protected species with the commencement of Government Notice 627 in *Government Gazette* 43386 of 3 June 2020.
3. The following categories of alien species that are not within the Republic when this Notice comes into effect and comes into the Republic from outside of the Republic are exempted from the provisions of section 65(1) of the Act:
  - a. Any alien species that-
    - (i) has been subjected to a risk assessment and authorised for importation in terms of the Act; and
    - (ii) is listed in a register of alien species legally imported into the Republic for the first time after the date of publication of the Alien and Invasive Species Regulations, 2014 and this Notice, which register is established and maintained by the Institute.
  - b. Dead specimens of any alien species including:
    - (i) dead specimens imported, kept, or removed from one area to another as taxonomic reference specimens; and
    - (ii) dead specimens used as derivatives in products, including food, cosmetics and detergents.
  - c. Any invasive species listed in terms of section 70(1)(a) of the Act.

## NOTICE 3:

## NATIONAL LIST OF INVASIVE SPECIES IN TERMS SECTION 70(1)(a)

In this Notice and where elsewhere referred to in this Government Notice:

“**dormant plantation**” means a plantation that has not been operational, functioning as a plantation or does not have a valid authorisation in terms of section 22(1)(a) or (b) of the National Water Act, 1998 (Act No. 36 of 1998) for a period of 10 years and where no reasonable attempt has been made to clear any listed invasive species from that location;

“**exempted for an existing plantation**” means an existing plantation is exempted from requiring a permit for that specific species for any restricted activity in terms of the Act or the Alien and Invasive Species Regulations, 2014;

“**existing plantation**” means any plantation which was operational, functioning and authorised to grow a specific listed invasive species in terms of section 22(1)(a) or (b) of the National Water Act, 1998 (Act No. 36 of 1998) when this Notice comes into effect and does not include:

- (a) any extension to a plantation;
- (b) any new plantation; or
- (c) any dormant plantation,

which is established or recommissioned after the commencement of this Notice;

“**extension to a plantation**” means the increase of the area of a plantation beyond the limits, area or location specified in—

- (a) a permit issued in terms of the Act or the Alien and Invasive Species Regulations, 2014; or
- (b) an authorisation in terms of section 22(1)(a) or (b) of the National Water Act, 1998 (Act No. 36 of 1998); and
- (c) the size of such extension will trigger the requirement to obtain an environmental authorisation in terms of the National Environmental Management Act; and

“**urban area**” means the area within the proclaimed urban edge, as delineated in the Municipal Spatial Development Framework in terms of the Spatial Land Use Management Act, 2013 (Act No. 16 of 2013).

## List 1: National list of Invasive Terrestrial and Fresh-water Plant Species

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
1.	<i>Acacia adunca</i> A.Cunn. ex G.Don	Cascade wattle, Wallangarra wattle	1a	
2.	<i>Acacia baileyana</i> F.Muell.	Bailey's wattle	3	
3.	<i>Acacia cyclops</i> A.Cunn. ex G.Don	Red eye	1b	
4.	<i>Acacia dealbata</i> Link	Silver wattle	2	
5.	<i>Acacia decurrens</i> Willd. and hybrids, varieties and selections	Green wattle	2	Exempted for an existing plantation.

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
6.	<i>Acacia elata</i> A.Cunn. ex Benth. ( <i>Acacia terminalis</i> (Salisb.) misapplied in South Africa)	Pepper tree wattle	1b	
7.	<i>Acacia fimbriata</i> A.Cunn. ex G.Don	Fringed wattle, Brisbane wattle	1a	
8.	<i>Acacia implexa</i> Benth.	Screw pod wattle	1a	
9.	<i>Acacia longifolia</i> (Andrews) Willd.	Long-leaved wattle	1b	
10.	<i>Acacia mearnsii</i> De Wild. and hybrids, varieties and selections	Black wattle	2	Exempted for an existing plantation.
11.	<i>Acacia melanoxylon</i> R.Br. and hybrids, varieties and selections	Australian blackwood	2	Exempted for an existing plantation.
12.	<i>Acacia paradoxa</i> DC. (= <i>A. armata</i> R.Br.)	Kangaroo thorn, Kangaroo wattle	1a	
13.	<i>Acacia podalyriifolia</i> A.Cunn. ex G.Don	Pearl acacia	1b	
14.	<i>Acacia pycnantha</i> Benth.	Golden wattle	1b	
15.	<i>Acacia saligna</i> (Labill.) H.L.Wendl.	Port Jackson, Port Jackson willow	1b	
16.	<i>Acacia stricta</i> (Andrews) Willd.	Hop wattle	1a	
17.	<i>Acer buergerianum</i> Miq.	Chinese maple	a. 3 in Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga, North-West, Northern Cape and Western Cape. b. Not listed in urban areas in the Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga, North-West, Northern Cape and Western Cape. c. Not listed elsewhere.	
18.	<i>Acer negundo</i> L.	Ash-leaved maple, Box elder	a. 3 b. Sterile cultivars or hybrids are not listed.	
19.	<i>Agave americana</i> L. subsp. <i>americana</i> var. <i>expansa</i> (Jacobi) Gentry	Spreading century-plant	a. 3 in Western Cape. b. Not listed elsewhere.	
20.	<i>Agave sisalana</i> Perrine	Sisal hemp, Sisal	2	
21.	<i>Ageratina adenophora</i> (Spreng.) R.M.King & H.Rob. (= <i>Eupatorium adenophorum</i> Spreng.)	Crofton weed	1b	
22.	<i>Ageratina riparia</i> (Regel) R.M.King & H.Rob. (= <i>Eupatorium riparium</i> Regel)	Mistflower	1b	
23.	<i>Ageratum conyzoides</i> L.	Invading ageratum	1b	
24.	<i>Ageratum houstonianum</i> Mill.	Mexican ageratum	a. 1b b. Sterile cultivars or hybrids are not listed.	
25.	<i>Agrimonia procera</i> Wallr.	Scented agrimony	1b	

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
	(= <i>A. odorata</i> Mill.)			
26.	<i>Agrostis casteliana</i> Boiss. & Reut.	Bent grass	a. 1a Prince Edward Island. b. 1b Marion Island. c. Not listed on mainland or other off-shore islands.	
27.	<i>Agrostis gigantea</i> Roth	Black bent grass, Redtop	a. 1a Prince Edward and Marion Islands. b. Not listed on mainland or other off-shore islands.	
28.	<i>Agrostis stolonifera</i> L.	Creeping bent grass	a. 1a Prince Edward Island. b. 1b Marion Island. c. Not listed on mainland or other off-shore islands.	
29.	<i>Ailanthus altissima</i> (Mill.) Swingle	Tree-of-heaven	1b	
30.	<i>Albizia lebeck</i> (L.) Benth.	Lebeck tree	1b	
31.	<i>Albizia procera</i> (Roxb.) Benth.	False lebeck	1b	
32.	<i>Alhagi maurorum</i> Medik. (= <i>A. camelorum</i> Fisch.)	Camel thorn bush	1b	
33.	<i>Alisma plantago-aquatica</i> L.	Mud plantain, Water alisma	1b	
34.	<i>Alopecurus geniculatus</i> L. (= <i>A. australis</i> Nees)	Marsh foxtail, Water foxtail	a. 1a Prince Edward and Marion Islands. b. Not listed on mainland or other off-shore islands.	
35.	<i>Alpinia zerumbet</i> (Pers.) B.L.Burtt & R.M.Sm. (= <i>A. speciosa</i> (J.C.Wendl.) Schum.)	Shell ginger, Pink porcelain lily	3	
36.	<i>Ammophila arenaria</i> (L.) Link	Marram grass	a. 2 in Western Cape b. Not listed elsewhere	
37.	<i>Anredera cordifolia</i> (Ten.) Steenis ( <i>A. baseloides</i> misapplied in South Africa)	Madeira vine, Bridal wreath	1b	
38.	<i>Antigonon leptopus</i> Hook. & Arn.	Coral creeper	1b	
39.	<i>Araujia sericifera</i> Brot.	Moth catcher	1b	
40.	<i>Ardisia crenata</i> Sims ( <i>Ardisia crispa</i> misapplied in South Africa)	Coralberry tree, Coral Bush	1b	
41.	<i>Ardisia elliptica</i> Thunb. (= <i>A. humilis</i> Vahl)	Shoebutt on ardisia	1b	
42.	<i>Argemone mexicana</i> L.	Yellow-flowered Mexican poppy	1b	
43.	<i>Argemone ochroleuca</i> Sweet	White-flowered Mexican poppy	1b	
44.	<i>Aristolochia elegans</i> Mast.	Dutchman's pipe	1b	
45.	<i>Arundo donax</i> L.	Giant reed, Spanish reed	1b	
46.	<i>Atriplex inflata</i> F.Muell. (= <i>A. lindleyi</i> Moq. subsp. <i>inflata</i> )	Sponge-fruit saltbush	1b	

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
	(F.Muell.) Paul G. Wilson)			
47.	<i>Atriplex nummularia</i> Lindl. subsp. <i>nummularia</i>	Old man saltbush	2	
48.	<i>Austrocylindropuntia cylindrica</i> (Juss. ex Lam.) Backeberg.	Cane cactus	1a	
49.	<i>Austrocylindropuntia subulata</i> (Muehlenpf.) Backeb. subsp. <i>exaltata</i> (A. Berger) D.R. Hunt (= <i>Opuntia exaltata</i> A. Berger)	Long spine cactus	1b	
50.	<i>Azolla cristata</i> Kaulf. (= <i>A. microphylla</i> Kaulf.)	Tropical red water fern	1b	
51.	<i>Azolla filiculoides</i> Lam.	Azolla, Red water fern	1b	
52.	<i>Azolla pinnata</i> R.Br. subsp. <i>asiatica</i> R.M.K. Saunders & K. Fowler (= <i>A. imbricata</i> (Roxb. ex Griff.) Nakai)	Mosquito fern	1b	
53.	<i>Bartlettia sordida</i> (Less.) R.M. King & H. Rob. (= <i>Eupatorium atrorubens</i> (Lem.) G. Nicholson, <i>E. sordidum</i> Less.)	Bartlettina	1b	
54.	<i>Bauhinia purpurea</i> L.	Butterfly orchid tree	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. 3 in Free State, Gauteng, North-West, Northern Cape and Western Cape.	
55.	<i>Bauhinia variegata</i> L.	Orchid tree	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. 3 in Free State, Gauteng, North-West, Northern Cape and Western Cape.	
56.	<i>Berberis thunbergii</i> DC.	Japanese barberry	a. 3 b. Sterile cultivars or hybrids are not listed.	
57.	<i>Billardiera heterophylla</i> (Lindl.) L.W. Cayzer & Crisp (= <i>Sollya heterophylla</i> Lindl.)	Bluebell creeper	1a	
58.	<i>Bryophyllum delagoense</i> (Eckl. & Zeyh.) Schinz (= <i>B. tubiflorum</i> Harv., <i>Kalanchoe tubiflora</i> (Harv.) Raym.-Hamet, <i>K. delagoensis</i> Eckl. & Zeyh.)	Chandelier plant	1b	
59.	<i>Bryophyllum pinnatum</i> (Lam.) Oken	Cathedral bells	1b	
60.	<i>Bryophyllum proliferum</i> Bowie ex Hook.	Green mother of millions	1b	

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
	(= <i>Kalanchoe prolifera</i> (Bowie) Raym.-Hamet)			
61.	<i>Buddleja davicii</i> Franch.	Chinese sagewood, Summer lilac	a. 3 b. Sterile cultivars or hybrids are not listed.	
62.	<i>Buddleja madagascariensis</i> Lam.	Madagascar sagewood	3	
63.	<i>Cabomba caroliniana</i> A.Gray	Cabomba, Carolina fanwort	1a	
64.	<i>Caesalpinia decapetala</i> (Roth) Alston (= <i>C. sepiaria</i> Roxb.)	Mauritius thorn	1b	
65.	<i>Caesalpinia gilliesii</i> (Hook.) D.Dietr.	Bird-of-paradise flower	1b	
66.	<i>Callisia repens</i> (Jacq.) L.	Creeping inch plant	1b	
67.	<i>Callistemon citrinus</i> (Curtis) Skeels (= <i>Melaleuca citrina</i> (Curtis) Dum.Cours.)	Lemon bottlebrush	3	
68.	<i>Callistemon rigidus</i> R.Br.	Stiff-leaved bottlebrush	a. 1b in Eastern Cape and Western Cape. b. 3 in Free State, Gauteng, Kwazulu-Natal, Limpopo, Mpumalanga, North-West and Northern Cape.	
69.	<i>Callistemon viminalis</i> (Sol. ex Gaertn.) G.Don	Weeping bottlebrush	a. 1b in Eastern Cape, Kwazulu-Natal, Limpopo and Mpumalanga. b. 3 in Free State, Gauteng, North-West, Northern Cape and Western Cape. c. Sterile cultivars or hybrids are not listed.	
70.	<i>Calotropis procera</i> (Aiton) W.T.Aiton	Calotropis, Giant-milkweed	1b	
71.	<i>Campuloclinium macrocephalum</i> (Less.) DC. (= <i>Eupatorium macrocephalum</i> Less.)	Pompom weed	1b	
72.	<i>Canna indica</i> L.	Indian shot	1b	
73.	<i>Cardiospermum grandiflorum</i> Sw.	Balloon vine	1b	
74.	<i>Cardiospermum halicacabum</i> L.	Lesser balloon vine	3	
75.	<i>Carduus nutans</i> L. (= <i>C. macrocephalus</i> Desf.)	Nodding thistle	1b	
76.	<i>Casuarina cunninghamiana</i> Miq.	Beefwood	a. 2 b. 1b within 100 metres of riparian areas or untransformed land.	
77.	<i>Casuarina equisetifolia</i> L.	Horsetail tree	2	
78.	<i>Catharanthus roseus</i> (L.) G.Don	Madagascar periwinkle	a. 1b b. Sterile cultivars or hybrids are not listed.	
79.	<i>Celtis australis</i> L.	Nettle tree, European hackberry	3	
80.	<i>Celtis occidentalis</i> L.	Common hackberry	3	
81.	<i>Centranthus ruber</i> (L.) DC.	Red valerian, Devil's beard	a. 1b in Western Cape	

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
			b. Not listed elsewhere	
82.	<i>Cerastium fontanum</i> Baumg.	Common mouse-ear chickweed	a. 1b Prince Edward and Marion Islands b. Not listed on mainland or other off-shore islands.	
83.	<i>Cereus hexagonus</i> (L.) Mill., <i>Cereus hildmannianus</i> K. Schum. (= <i>C. peruvianus</i> auct. pl., <i>C. uruguayanus</i> R.Kiesling)	Queen of the night  Queen of the night	1b  1b	
85.	<i>Cereus jamacaru</i> DC.	Queen of the night	1b	
86.	<i>Cestrum aurantiacum</i> Lindl.	Orange cestrum	1b	
87.	<i>Cestrum elegans</i> (Brongn.) Schltl. (= <i>C. purpureum</i> (Lindl.) Standl.)	Crimson cestrum	1b	
88.	<i>Cestrum laevigatum</i> Schltl.	Inkberry	1b	
89.	<i>Cestrum parqui</i> L'Hér.	Chilean cestrum	1b	
90.	<i>Cestrum</i> species not specifically listed	<i>Cestrum</i> species	3	
91.	<i>Chondrilla juncea</i> L.	Skeleton weed	1a	
92.	<i>Chromolaena odorata</i> (L.) R.M.King & H.Rob. (= <i>Eupatorium odoratum</i> L.)	Triffid weed, Chromolaena	1b	
93.	<i>Cinnamomum camphora</i> (L.) J.Presl	Camphor tree	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. 3 in Western Cape. c. National Heritage Trees or National Monument Trees in terms of the National Heritage Resources Act, 1999, (Act No. 25 of 1999) in Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga and the Western Cape, are not listed. d. Not listed elsewhere.	
94.	<i>Cirsium vulgare</i> (Savi) Ten. (= <i>C. lanceolatum</i> (L.) Scop.)	Spear thistle, Scotch thistle	1b	
95.	<i>Convolvulus anvensis</i> L.	Field bindweed, Wild morning-glory	1b	
96.	<i>Coreopsis lanceolata</i> L.	Tickseed	1b	
97.	<i>Cortaderia jubata</i> (Lemoine ex Carrière) Stapf	Pampas grass	1b	
98.	<i>Cortaderia selloana</i> (Schult.) Asch. & Graebn.	Pampas grass	1b	
99.	<i>Cotoneaster franchetii</i> Bois	Cotoneaster	1b	
100.	<i>Cotoneaster glaucophyllus</i> Franch.	Late cotoneaster	1b	
101.	<i>Cotoneaster pannosus</i> Franch.	Silver leaf cotoneaster	1b	



NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
102.	<i>Cotoneaster salicifolius</i> Franch.	Willow-leaved snowberry	1b	
103.	<i>Cotoneaster simonsii</i> Baker	Himalayan cotoneaster, Simon's cotoneaster	1b	
104.	<i>Crotalaria agaitiflora</i> Schweinf.	Canarybird bush, Bird flower	1b	
105.	<i>Cryptostegia grandiflora</i> R.Br.	Rubber vine	1b	
106.	<i>Cryptostegia madagascariensis</i> Bojer ex Decne.	Madagascar rubber vine	1b	
107.	<i>Cuscuta campestris</i> Yunck.	Common dodder	1b	
108.	<i>Cuscuta suaveolens</i> Ser.	Lucerne dodder	1b	
109.	<i>Cylindropuntia fulgida</i> (Engelm.) F.M.Knuth var. <i>fulgida</i> (= <i>Opuntia fulgida</i> Engelm.) (O. rosea DC. misapplied in South Africa).	Chain-fruit cholla (previously known as rosea cactus)	1b	
110.	<i>Cylindropuntia fulgida</i> (Engelm.) F.M.Knuth var. <i>mammillata</i> (Schott ex Engelm.) Backeb. .	Boxing-glove cactus, Mammillate cactus	1b	
111.	<i>Cylindropuntia imbricata</i> (Haw.) F.M.Knuth (= <i>Opuntia imbricata</i> (Haw.) DC.	Imbricate cactus, Imbricate prickly pear	1b	
112.	<i>Cylindropuntia leptocaulis</i> (DC.) F.M.Knuth	Pencil cactus	1b	
113.	<i>Cylindropuntia pallida</i> (Rose) F.M.Knuth	Pink-flowered sheathed cholla	1a	
114.	<i>Cylindropuntia spinosior</i> (Engelm.) F.M.Knuth	Cane cholla, Spiny cholla	1a	
115.	<i>Cytisus scoparius</i> (L.) Link (= <i>Genista scoparia</i> (L.) Lam.)	Scotch broom	1a	
116.	<i>Datura ferox</i> L.	Large thorn apple	1b	
117.	<i>Datura innoxia</i> Mill.	Downy thorn apple	1b	
118.	<i>Datura stramonium</i> L.	Common thorn apple	1b	
119.	<i>Diplocyclos palmatus</i> (L.) C.Jeffrey	Lollipop-climber	1a	
120.	<i>Dolichandra unguis-cati</i> (L.) L. G. Lohmann (= <i>Macfadyena unguis-cati</i> (L.) A.H.Gentry	Cat's claw creeper	1b	
121.	<i>Duchesnea indica</i> (Andrews) Focke	Wild strawberry	1b	
122.	<i>Duranta erecta</i> L. (= <i>D. repens</i> L., <i>D. plumieri</i> Jacq.)	Forget-me-not-tree, Pigeon berry	a. 3 in Gauteng, Kwazulu-Natal, Limpopo, Mpumalanga and North-West. b. 2 for breeding in nurseries in Gauteng, Kwazulu-Natal, Limpopo, Mpumalanga and North-West, but may not be transferred within these Provincial boundaries.	

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
123.	<i>Echinodorus cordifolius</i> (L.) Griseb.	Creeping burhead	c. Not listed elsewhere. d. Sterile cultivars or hybrids are not listed. e. "Sheena's Gold" cultivar is not listed.	
124.	<i>Echinodorus tenellus</i> (Mart. ex Schult.f.) Buchenau	Amazon sword plant	1b	
125.	<i>Echium plantagineum</i> L. (= <i>E. lycopsis</i> L.)	Patterson's curse	1b	
126.	<i>Echium vulgare</i> L.	Blue echium	1b	
127.	<i>Egeria densa</i> Planch. (= <i>Elodea densa</i> (Planch.) Casp.)	Dense water weed	1b	
128.	<i>Eichhornia crassipes</i> (Mart.) Solms	Water hyacinth	1b	
129.	<i>Elodea canadensis</i> Michx.	Canadian water weed	1b	
130.	<i>Elytrigia repens</i> (L.) Desv. ex Nevski (= <i>Agropyron repens</i> (L.) P. Beauv., <i>Elymus repens</i> (L.) Gould)	Couch grass	a. 1a Prince Edward and Marion Islands. b. Not listed on mainland or other off-shore islands.	
131.	<i>Equisetum hyemale</i> L.	Rough horsetail, Common scouring-rush	1a	
132.	<i>Eriobotrya japonica</i> (Thunb.) Lindl.	Loquat	a. 1b in Western Cape and Forest biome. b. Not listed in urban areas in Western Cape. c. Not listed elsewhere. d. The fruit of the loquat is not listed if used for human consumption.	
133.	<i>Eucalyptus camaldulensis</i> Dehnh. and hybrids, varieties and selections	River red gum	a. Category 1b within- (i) riparian areas; (ii) a Protected Area declared in terms of the Protected Areas Act; or, (iii) within a Listed Ecosystem or an ecosystem identified for conservation in terms of a Bioregional Plan or Biodiversity Management Plans published under the Act.	Exempted for an existing plantation.
134.	<i>Eucalyptus cladocalyx</i> F.Muell. and hybrids, varieties and selections	Sugar gum	b. Not listed within Nama-Karoo, Succulent Karoo and Desert biomes, excluding within any area mentioned in (a) above.	
135.	<i>Eucalyptus conferruminata</i> D.J.Carr & S.G.M.Carr and hybrids, varieties and	Spider gum	c. Category 1b in Fynbos, Grassland, Savanna, Albany Thicket,	

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
	selections ( <i>E. lehmannii</i> misapplied in South Africa)		Forest and Indian Ocean Coastal Belt biomes, but-	
136.	<i>Eucalyptus diversicolor</i> F. Muell. and hybrids, varieties and selections	Karri	(i) Category 2 for plantations, woodlots, bee-forage areas, wind-rows and the lining of avenues. (ii) Not listed within cultivated land that is at least 50 metres away from untransformed land, but excluding within any area in (a) above.	
137.	<i>Eucalyptus grandis</i> W. Hill ex Maiden ( <i>E. saligna</i> Sm. in part) and hybrids, varieties and selections	Saligna gum, Rose gum	(iii) Not listed within 50 metres of the main house on a farm, but excluding in (a) above. (iv) Not listed in urban areas for trees with a diameter of more than 400 mm at 1000 mm height at the time of publishing of this Notice, but excluding in (a) above.	
138.	<i>Eucalyptus tereticornis</i> Sm. and hybrids, varieties and selections	Forest red gum		
139.	<i>Eugenia uniflora</i> L.	Pitanga, Surinam cherry	1b	
140.	<i>Euphorbia esula</i> L. (= <i>E. x pseudovirgata</i> (Schur) Soó, <i>E. tommasianiana</i> Bertol., <i>E. virgata</i> Waldst. & Kit.)	Leafy spurge	1a	
141.	<i>Euphorbia leucocephala</i> Lotz	White poinsettia	1b	
142.	<i>Fallopia sachalinensis</i> (F. Schmidt) Ronse Decr. (= <i>Polygonum sachalinense</i> F. Schmidt, <i>Reynoutria sachalinensis</i> (F. Schmidt) Nakai)	Giant knotweed	1a	
143.	<i>Festuca rubra</i> L.	Creeping red fescue	a. 1a Prince Edward and Marion Islands. b. Not listed on mainland or other off-shore islands.	
144.	<i>Flaveria bidentis</i> (L.) Kuntze	Smelter's-bush	1b	
145.	<i>Fraxinus americana</i> L.	American ash, white ash	a. 3 in Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga and Western Cape. b. Not listed elsewhere.	
146.	<i>Fraxinus angustifolia</i> Vahl	Algerian ash	a. 3 in Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga and Western Cape. b. Not listed elsewhere.	
147.	<i>Furcraea foetida</i> (L.) Haw.	Mauritian hemp	1a	
148.	<i>Genista monspessulana</i> (L.) L.A.S. Johnson (= <i>Cytisus monspessulanus</i> L., C.	Montpellier broom	1a	

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
	<i>candicans</i> (L.) DC.)			
149.	<i>Gleditsia triacanthos</i> L.	Honey locust	1b	
150.	<i>Glyceria maxima</i> (Hartm.) Holmb. (= <i>Poa aquatica</i> L., <i>Glyceria aquatica</i> (L.) Wahlb.)	Reed meadow grass, Reed sweet grass	a. 1b in Protected Areas and wetlands. b. Not listed elsewhere.	
151.	<i>Grevillea banksii</i> R.Br.	Australian crimson oak, Red flowering silky oak	1b	
152.	<i>Grevillea robusta</i> A.Cunn. ex R.Br.	Australian silky oak	3	
153.	<i>Grevillea rosmarinifolia</i> A.Cunn.	Rosemary grevillea	3	
154.	<i>Hakea drupacea</i> (C.F.Gaerth.) Roem. & Schult. (= <i>H. suaveolens</i> R.Br.)	Sweet hakea	1b	
155.	<i>Hakea gibbosa</i> (Sm.) Cav.	Rock hakea	1b	
156.	<i>Hakea salicifolia</i> (Vent.) B.L.Burtt	Willow hakea	a. 1b in Western Cape. b. Not listed elsewhere.	
157.	<i>Hakea sericea</i> Schrad. & J.C.Wendl.	Silky hakea	1b	
158.	<i>Harrisia balansae</i> (K.Schum.) N.P. Taylor & Zappi	Strangler prickly apple	1a	
159.	<i>Harrisia martinii</i> (Labour.) Britton (= <i>Eriocereus martinii</i> (Labour.) Riccob.)	Moon cactus	1b	
160.	<i>Harrisia pomanensis</i> (F.-A.C.Weber) Britton & Rose	Midnight lady, Devil's rope cactus	1a	
161.	<i>Harrisia tortuosa</i> (J.Forbes ex Otto & A.Dietr.) Britton & Rose	Spiny snake cactus	1b	
162.	<i>Hedera canariensis</i> Willd. (= <i>Hedera helix</i> L. subsp. <i>canariensis</i> (Willd.) Cout.)	Canary ivy, Madeira ivy, Algerian ivy	a. 3 b. Sterile cultivars or hybrids are not listed.	
163.	<i>Hedera helix</i> L. (= <i>Hedera helix</i> L. subsp. <i>helix</i> )	English ivy	a. 3 b. Sterile cultivars or hybrids are not listed.	
164.	<i>Hedychium coccineum</i> Buch.-Ham. ex Sm.	Red ginger lily	1b	
165.	<i>Hedychium coronarium</i> J.König	White ginger lily	1b	
166.	<i>Hedychium flavescens</i> Carey ex Roscoe	Yellow ginger lily	1b	
167.	<i>Hedychium gardnerianum</i> Sheppard ex Ker Gawl.	Kahili ginger lily	1b	
168.	<i>Homalanthus populifolius</i> Graham	Bleeding-heart tree	1b	
169.	<i>Houttuynia cordata</i> Thunb.	Chameleon plant	3	
170.	<i>Hydrilla verticillata</i> (L.f.) Royle	Hydrilla	1a	

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
171.	<i>Hydrocleys nymphoides</i> (Humb. & Bonpl. ex Willd.) Buchenau	Water poppy	1a	
172.	<i>Hylocereus undatus</i> (Haw.) Britton & Rose	Night-blooming cereus, Dragon fruit, Pitahaya	a. 2 b. The fruit of night-blooming cactus is not listed if used for human consumption.	
173.	<i>Hypericum androsaemum</i> L.	Tutsan	1b	
174.	<i>Hypericum perforatum</i> L.	St. John's wort, Tipton weed	2	
175.	<i>Ipomoea alba</i> L.	Moonflower	1b	
176.	<i>Ipomoea carnea</i> Jacq. subsp. <i>fistulosa</i> (Mart. ex Choisy) D.F. Austin (= <i>I. fistulosa</i> Mart. ex Choisy)	Morning-glory bush	1b	
177.	<i>Ipomoea indica</i> (Burm.) Merr. (= <i>I. congesta</i> R.Br.)	Blue morning glory	1b	
178.	<i>Ipomoea purpurea</i> (L.) Roth	Purple morning glory	1b	
179.	<i>Iris pseudacorus</i> L.	Yellow flag	1a	
180.	<i>Jacaranda mimosifolia</i> D. Don	Jacaranda	a. 1b in Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga and North-West. b. Not listed for urban areas in Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga and North-West. c. Not listed within 50 metres of the main house on a farm in Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga and North-West, for trees with a diameter of more than 400 mm at 1000 mm height at the time of publishing of this Notice, provided such trees are located outside riparian areas. d. Not listed elsewhere.	
181.	<i>Jatropha curcas</i> L.	Physic nut	2	
182.	<i>Jatropha gossypifolia</i> L.	Cotton-leaf physic nut	1b	
183.	<i>Juniperus virginiana</i> L.	Red cedar	a. 3 in Eastern Cape and Free State. b. Not listed elsewhere.	
184.	<i>Kunzea ericoides</i> (A.Rich.) Joy Thoms. (= <i>Leptospermum ericoides</i> A. Rich.)	Burgan, White teatree	1a	
185.	<i>Lantana</i> – all seed-producing species or seed-producing hybrids that are non-indigenous to South Africa	Lantana, Tickberry, Cherry pie	1b	
186.	<i>Lepidium draba</i> L. (= <i>Cardaria draba</i> (L.) Desv.)	Hoary cardaria	1b	
187.	<i>Leptospermum laevigatum</i> (Gaertn.) F. Muell.	Australian myrtle	1b	

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
188.	<i>Leucaena leucocephala</i> (Lam.) de Wit (= <i>L. glauca</i> Benth.)	Leucaena	2	
189.	<i>Ligustrum japonicum</i> Thunb.	Japanese wax-leaved privet	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga, North-West and Western Cape. b. 3 in Free State, Gauteng and Northern Cape.	
190.	<i>Ligustrum lucidum</i> W.T. Aiton	Chinese wax-leaved privet	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga, North-West and Western Cape. b. 3 in Free State, Gauteng and Northern Cape.	
191.	<i>Ligustrum ovalifolium</i> Hassk.	Californian privet	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga, North-West and Western Cape. b. 3 in Free State, Gauteng and Northern Cape. c. Sterile cultivars or hybrids are not listed.	
192.	<i>Ligustrum sinense</i> Lour.	Chinese privet	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga, North-West and Western Cape. b. 3 in Free State, Gauteng and Northern Cape.	
193.	<i>Ligustrum vulgare</i> L.	Common privet	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga, North-West and Western Cape. b. 3 in Free State, Gauteng and Northern Cape.	
194.	<i>Lilium formosanum</i> Wallace (= <i>L. longiflorum</i> Thunb. var. <i>formosanum</i> Baker)	Formosa lily	1b	
195.	<i>Limonium sinuatum</i> (L.) Mill.	Statice, Sea lavender	a. 1b in Northern Cape and Western Cape. b. Not listed elsewhere.	
196.	<i>Linaria dalmatica</i> (L.) Mill. (= <i>Antirrhinum dalmaticum</i> L., <i>Linaria genistifolia</i> subsp. <i>dalmatica</i> (L.) Maire & Petitm.	Dalmatian toadflax, Broadleaf toadflax	1b	
197.	<i>Linaria vulgaris</i> Mill.	Common toadflax, Butter-and-eggs	1b	
198.	<i>Litsea glutinosa</i> (Lour.) C.B. Rob. (= <i>Litsea sebifera</i> Pers.)	Indian laurel	1b	
199.	<i>Lonicera japonica</i> Thunb. 'Halliana'	Japanese or Hall's honeysuckle	3	
200.	<i>Ludwigia peruviana</i> (L.) H. Hara	Water-primrose, Peruvian primrosebush	1a	
201.	<i>Luzula multiflora</i> (Ehrh.) Lej.	Woodrush	a. 1a Prince Edward and Marion Islands. b. Not listed on mainland or other off-shore islands.	
202.	<i>Lythrum hyssopifolia</i> L.	Hyssop loosestrife	1b	

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
203.	<i>Lythrum salicaria</i> L.	Purple loosestrife	1a	
204.	<i>Malva dendromorpha</i> M.F.Ray (= <i>Lavatera arborea</i> L.)	Tree mallow	1b	
205.	<i>Malva verticillata</i> L.	Mallow	1b	
206.	<i>Malvastrum coronandelianum</i> (L.) Garcke	Prickly malvastrum	1b	
207.	<i>Marsilea mutica</i> Mett.	Nardoo, Australian water-clover	1a	
208.	<i>Melaleuca hypericifolia</i> Sm.	Red-flowering tea tree	1a	
209.	<i>Melaleuca quinquenervia</i> (Cav.) S.T. Blake	Bottle brush tree, Broadleaf paperbark tree	a. 1b b. National Heritage Trees or National Monument Trees in terms of the National Heritage Resources Act, 1999, (Act No. 25 of 1999), are not listed.	
210.	<i>Melia azedarach</i> L.	Syringa	a. 1b b. 3 in urban areas.	
211.	<i>Metrosideros excelsa</i> Sol. ex Gaertn. (= <i>M. tomentosa</i> A.Rich.)	New Zealand Christmas tree	a. 1a in the Overstrand District. b. Not listed elsewhere.	
212.	<i>Mimosa pigra</i> L.	Giant sensitive plant	1b	
213.	<i>Mirabilis jalapa</i> L.	Four-o'clock, Marvel-of-Peru	1b	
214.	<i>Montanoa hibiscifolia</i> Benth.	Tree daisy	1b	
215.	<i>Morus alba</i> L.	White mulberry, Common mulberry	a. 3 b. The fruit of the white mulberry is not listed if used for human consumption.	
216.	<i>Murraya paniculata</i> (L.) Jack. (= <i>M. exotica</i> L.)	Orange Jessamine	a. 1b in KwaZulu-Natal, Limpopo and Mpumalanga. b. 2 for breeding in nurseries in KwaZulu-Natal, Limpopo and Mpumalanga, but may not be transferred within these Provincial boundaries. c. Not listed elsewhere. d. Sterile cultivars or hybrids are not listed.	
217.	<i>Myoporum insulare</i> R.Br.	Manatoka, Boobyalla	3	
218.	<i>Myoporum laetum</i> G.Forst.	New Zealand manatoka	3	
219.	<i>Myoporum montanum</i> R.Br. (= <i>Myoporum tenuifolium</i> G.Forst.)	Manatoka	3	
220.	<i>Myriophyllum aquaticum</i> (Vell.) Verdc.	Parrot's feather	1b	
221.	<i>Myriophyllum spicatum</i> L.	Spiked water-milfoil	1b	
222.	<i>Myrtillocactus geometrizans</i> (Mart.) Console	Bilberry cactus	1a	

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
223.	<i>Nassella tenuissima</i> (Trin.) Barkworth (= <i>Stipa tenuissima</i> Trin.)	White tussock	1b	
224.	<i>Nassella trichotoma</i> (Nees) Hack. ex Atechav. (= <i>Stipa trichotoma</i> Nees)	Nassella tussock	1b	
225.	<i>Nasturtium officinale</i> R.Br. (= <i>Rorippa nasturtium-aquaticum</i> (L.) Hayek)	Watercress	2	
226.	<i>Nephrolepis cordifolia</i> (L.) C.Presl (= <i>Polypodium cordifolium</i> L.)	Erect sword fern, Ladder sword fern	a. 1b in Eastern Cape, KwaZulu-Natal, Mpumalanga, Limpopo and Western Cape. b. 3 in Free State, Gauteng, North-West and Northern Cape.	
227.	<i>Nephrolepis exaltata</i> (L.) Schott (= <i>Polypodium exaltatum</i> L.)	Sword fern, Boston sword fern	a. 1b in Eastern Cape, KwaZulu-Natal, Mpumalanga, Limpopo and Western Cape. b. 3 in Free State, Gauteng, North-West and Northern Cape. c. Sterile cultivars or hybrids are not listed.	
228.	<i>Nerium oleander</i> L.	Oleander	1b	
229.	<i>Nicandra physalodes</i> (L.) Gaertn.	Apple-of-Peru	1b	
230.	<i>Nicotiana glauca</i> Graham	Wild tobacco	1b	
231.	<i>Nuphar lutea</i> (L.) Sm. (= <i>N. minor</i> Dumort., <i>N. sericea</i> Láng, <i>N. spathulifera</i> Rchb., <i>N. tenella</i> Rchb., <i>Nymphaea lutea</i> L., <i>N. umbilicalis</i> Salisb., <i>Nymphaeanthus</i> <i>luteus</i> (L.) Fernald, <i>N. sericeus</i> (Láng) Fernald, <i>N. vulgaris</i> Rich.)	Yellow water-lily	1a	
232.	<i>Nymphaea mexicana</i> Zucc.	Yellow water lilies	1b	
233.	<i>Nymphoides peltata</i> (S.G.Gmel.) Kuntze (= <i>Limnanthemum peltatum</i> S.G.Gmel.)	Griaged waterlily, Yellow floating-heart	1a	
234.	<i>Oenothera sinuosa</i> W.L. Wagner & Hoch (= <i>Gaura sinuata</i> Nutt. ex Ser.)	Wavy-leaf gaura	3	
235.	<i>Opuntia aurantiaca</i> Lindl.	Jointed cactus	1b	
236.	<i>Opuntia elata</i> Link & Otto ex Salm-Dyck	Orange tuna	1b	
237.	<i>Opuntia engelmannii</i> Salm-Dyck ex Engelm. (= <i>O. lindheimeri</i> Engelm., <i>O. tardospina</i> Griffiths)	Small round-leaved prickly pear	1b	
238.	<i>Opuntia ficus-indica</i> (L.) Mill. (= <i>O. megacantha</i> Salm-Dyck)	Mission prickly pear, Sweet prickly pear	a. 1b b. Spineless cactus pear cultivars and selections are not listed. c. The fruit of the sweet prickly pear is not listed if used for human consumption.	



NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
239.	<i>Opuntia humifusa</i> (Raf.) Raf. ( <i>O. compressa</i> misapplied in South Africa)	Large-flowered prickly pear, Creeping prickly pear	1b	
240.	<i>Opuntia leucotricha</i> DC.	Aaron's-beard prickly-pear	1b	
241.	<i>Opuntia microdasys</i> (Lehm.) Pfeiff.	Yellow bunny-ears, Teddy-bear cactus	1b	
242.	<i>Opuntia monacantha</i> Haw. ( <i>O. vulgaris</i> misapplied in South Africa)	Cochineal prickly pear, Drooping prickly pear	1b	
243.	<i>Opuntia pubescens</i> J.C.Wendl. ex Pfeiff. (= <i>O. pestifer</i> Britton & Rose)	Velvet bur cactus	1a	
244.	<i>Opuntia robusta</i> H.L. Wendl. ex Pfeiff.	Blue-leaf cactus	a. 1a b. Spineless cultivars and selections are not listed.	
245.	<i>Opuntia salmiana</i> J. Pam. ex Pfeiff.	Bur cactus	1a	
246.	<i>Opuntia spinulifera</i> Salm-Dyck	Saucepan cactus, Large roundleaved prickly pear	1b	
247.	<i>Opuntia stricta</i> (Haw.) Haw. var. <i>stricta</i> and var. <i>dillenii</i> (Ker Gawl.) L.D. Benson (= <i>O. dillenii</i> (Ker Gawl.) Haw.)	Pest pear of Australia	1b	
248.	<i>Opuntia tomentosa</i> Salm-Dyck	Velvet opuntia, Velvet tree-pear	1b	
249.	<i>Orobanche minor</i> Sm.	Lesser broomrape, Clover broomrape	1b	
250.	<i>Orobanche ramosa</i> L.	Blue broomrape, Branched broomrape	1b	
251.	<i>Paraserianthes lophantha</i> (Willd.) I.C. Nielsen (= <i>Albizia lophantha</i> (Willd.) Benth.)	Australian albizia, Stink bean	1b	
252.	<i>Parkinsonia aculeata</i> L.	Jerusalem thorn	1b	
253.	<i>Parthenium hysterophorus</i> L.	Famine weed	1b	
254.	<i>Paspalum quadrifarium</i> Lam.	Tussock paspalum	1a	
255.	<i>Passiflora caerulea</i> L.	Blue passion flower	1b	
256.	<i>Passiflora edulis</i> Sims	Purple granadilla, Passion fruit	a. 2 in Eastern Cape, Gauteng, KwaZulu-Natal, Mpumalanga, Limpopo and North-West. b. Not listed in urban areas in Eastern Cape, Gauteng, KwaZulu-Natal, Mpumalanga, Limpopo and North-West. c. Not listed elsewhere. d. The fruit of the purple granadilla is not listed if used for human consumption.	
257.	<i>Passiflora tripartita</i> (Juss.) Poir. var.	Banana poka, Bananadilla	1b	

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
	<i>mollissima</i> (Kunth) Holm-Niels. & P. Jorg. (= <i>P. mollissima</i> (Kunth) L.H. Bailey)			
258.	<i>Passiflora suberosa</i> L.	Devil's pumpkin, Indigo berry	1b	
259.	<i>Passiflora subpeltata</i> Ortega	Granadina	1b	
260.	<i>Paulownia tomentosa</i> (Thunb.) Steud. (= <i>Paulownia imperialis</i> Siebold & Zucc.)	Empress tree, Princess tree, Royal Paulownia	1a	
261.	<i>Peniocereus serpentinus</i> (Lag. & Rodr.) N.P. Taylor (= <i>Nyctocereus serpentinus</i> ) Britton & Rose	Serpent cactus, Snake cactus	1b	
262.	<i>Pennisetum clandestinum</i> Hochst. ex Chiov.	Kikuyu grass	a. 1b in Protected Areas and wetlands in which it does not already occur. b. Not listed elsewhere.	
263.	<i>Pennisetum purpureum</i> Schumach.	Elephant grass, Napier grass	2	
264.	<i>Pennisetum setaceum</i> (Forssk.) Chiov.	Fountain grass	a. 1b b. Sterile cultivars or hybrids are not listed.	
265.	<i>Pennisetum villosum</i> R.Br. ex Fresen.	Feathertop	1b	
266.	<i>Pereskia aculeata</i> Mill.	Pereskia, Barbados gooseberry	1b	
267.	<i>Piscaria capitata</i> (Buch.-Ham. ex D. Don) H. Gross (= <i>Polygonum capitatum</i> Buch.-Ham. ex D. Don)	Knotweed	1b	
268.	<i>Phytolacca americana</i> L. (= <i>P. decandra</i> L.)	American pokeweed	1b	
269.	<i>Phytolacca dioica</i> L.	Belhambra	3	
270.	<i>Phytolacca octandra</i> L.	Forest inkberry	1b	
271.	<i>Pinus canariensis</i> C.Sm.	Canary pine	3	
272.	<i>Pinus eliotti</i> Engelm. and hybrids, varieties and selections	Slash pine	2	Exempted for an existing plantation of sterile specimens.
273.	<i>Pinus halepensis</i> Mill.	Aleppo pine	a. 3 in Eastern Cape, Free State and Western Cape. b. Not listed elsewhere.	
274.	<del><i>Pinus hybridae</i> Schwedler &amp; Schumacher</del>	Patula pine	2	Exempted for an existing plantation.
275.	<i>Pinus pinaster</i> Aiton and hybrids, varieties and selections	Cluster pine	a. 2 for plantations and wind-rows. b. 1b elsewhere. c. National Heritage Trees or National Monument Trees in terms of the National Heritage Resources Act, 1999, (Act No. 25 of 1999), are not listed. d. Except for "a" above, specimens with a circumference greater	Exempted for an existing plantation outside of the Western Cape. Existing plantations in the Western Cape are exempted from undertaking a risk assessment in terms of section

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
276.	<i>Pinus radiata</i> D. Don and hybrids, varieties and selections	Radiata pine, Monterey pine	<p>than 1,256 m at a height of 1000 mm at the date of the first publication of this Notice (August 2014) are not listed for urban areas in Cape Town, the Overberg District Council and Winelands District Council, except</p> <ol style="list-style-type: none"> <li>i. when in a riparian area, or</li> <li>ii. when in a protected area or any property directly abutting a protected area, or</li> <li>iii. where they are ruled to pose a wildfire risk, where they remain listed as Category 1b.</li> </ol> <p>e. All specimens with a smaller circumference are Category 1b.</p> <ol style="list-style-type: none"> <li>a. 2 for plantations and wind-rows.</li> <li>b. 1b elsewhere.</li> <li>c. National Heritage Trees or National Monument Trees in terms of the National Heritage Resources Act, 1999 (Act No. 25 of 1999), are not listed.</li> <li>d. Except for "a" above, specimens with a circumference greater than 1,256 m at a height of 1000 mm at the date of the first publication of this Notice (August 2014) are not listed for urban areas in Cape Town, the Overberg District Council and Winelands District Council, except <ol style="list-style-type: none"> <li>i. when in a riparian area, or</li> <li>ii. when in a protected area or any property directly abutting a protected area, or</li> <li>iii. where they are ruled to pose a wildfire risk, where they remain listed as Category 1b.</li> </ol> </li> <li>e. All specimens with a smaller circumference are Category 1b.</li> </ol>	71(2) of the Act prior to applying for a permit.
277.	<i>Pinus roxburghii</i> Saig. and hybrids, varieties and selections (= <i>P. longifolia</i> Roxb. ex Lamb.)	Chir pine, Longifolia pine	2	Exempted for an existing plantation outside of the Western Cape.
278.	<i>Pinus taeda</i> L. and hybrids, varieties and selections	Loblolly pine	2	Existing plantations in the Western Cape are exempted from undertaking a risk assessment in terms of section 71(2) of the Act prior to applying for a permit.
279.	<i>Pisita stratiotes</i> L.	Water lettuce	1b	
280.	<i>Pittosporum crassifolium</i> Banks & Sol. ex A. Cunn.	Karo, Stiff-leaved cheesewood	3	
281.	<i>Pittosporum undulatum</i> Vent.	Australian cheesewood, Sweet pittosporum	1b	
282.	<i>Plectranthus barbatus</i> var. <i>grandis</i> (= <i>P. comosus</i> Sims)	'Abyssinian' coleus, Woolly plectranthus	1b	

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283.	<i>Poa pratensis</i> L.	Kentucky bluegrass	a. 1a Prince Edward Island. b. 1b Marion Island. c. Not listed on mainland or other off-shore islands.	
284.	<i>Polypodium aureum</i> (L.) J.Sm.	Rabbits-foot fern	a. 3 in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. Not listed elsewhere.	
285.	<i>Pontederia cordata</i> L.	Pickereel weed	1b	
286.	<i>Populus alba</i> L.	White poplar	2	
287.	<i>Populus × canescens</i> (Aiton) Sm.	Grey poplar, Matchwood poplar	2	
288.	<i>Prosopis glandulosa</i> Torr. var. <i>torreyana</i> (L.D. Benson) M.C. Johnston. and hybrids	Honey mesquite	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 listed in the Northern Cape, Eastern Cape, Free State, North-West and Western Cape. d. Not listed elsewhere.	
289.	<i>Prosopis velutina</i> Wootton and hybrids	Velvet mesquite	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 listed in the Northern Cape, Eastern Cape, Free State, North-West and Western Cape. d. Not listed elsewhere.	
290.	<i>Prunus serotina</i> Ehrh.	Black cherry	1b	
291.	<i>Psidium cattleianum</i> Sabine (= <i>P. littorale</i> Raddi var. <i>longipes</i> (O.Berg.) Fosberg	Strawberry guava	1b	
292.	<i>Psidium guajava</i> L.	Guava	a. 2 for plantations in Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga and North-West. b. 3 elsewhere in Eastern Cape, Kwazulu-Natal, Limpopo, Mpumalanga and North-West. c. The fruit of the guava is not listed if used for human consumption. d. Not listed elsewhere.	
293.	<i>Psidium guineense</i> Sw.	Brazilian guava	1b	
294.	<i>Psidium × durbanensis</i> Baijnath ined.	Durban guava	1b	
295.	<i>Pueraria montana</i> (Lour.) Merr. var. <i>lobata</i> (Willd.) Maesen & S.M.Almeida (= <i>P. lobata</i> (Willd.) Ohwi)	Kudzu vine	1a	

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296.	<i>Pyracantha angustifolia</i> (Franch.) C.K.Schneid.	Yellow firethorn	1b	
297.	<i>Pyracantha coccinea</i> M.Roem.	Red firethorn	1b	
298.	<i>Pyracantha crenatoserrata</i> (Hance) Rehder (= <i>P. fortuneana</i> misapplied)	Chinese firethorn, Broad leaf firethorn	1b	
299.	<i>Pyracantha crenulata</i> (D.Don) M.Roem; including var. <i>rogersiana</i> (= <i>P. rogersiana</i> (A.B.Jacks.) Chitt.)	Himalayan firethorn	1b	
300.	<i>Pyracantha koidzumii</i> (Hayata) Rehder	Formosa firethorn	1b	
301.	<i>Rhus glabra</i> L.	Scarlet sumach, Vinegar bush	3	
302.	<i>Ricinus communis</i> L.	Castor-oil plant	2	
303.	<i>Rivina humilis</i> L.	Rivina, Bloodberry	1b	
304.	<i>Robinia pseudoacacia</i> L.	Black locust	1b	
305.	<i>Rosa rubiginosa</i> L. (= <i>R. eglanteria</i> L.)	Eglantine, Sweetbriar	1b	
306.	<i>Rubus cuneifolius</i> Pursh and hybrid <i>R. × proteus</i> C.H.Stirt.	American bramble	1b	
307.	<i>Rubus ellipticus</i> Sm.	Asian wild raspberry, Yellow Himalayan raspberry	1a	
308.	<i>Rubus flagellaris</i> Willd.	Bramble	1b.	
309.	<i>Rubus fruticosus</i> L. agg.	European blackberry	a. 2 b. The fruit of the European blackberry is not listed if used for human consumption.	
310.	<i>Rubus immixtus</i> Gust.	Hogsback raspberry	1b	
311.	<i>Rubus niveus</i> Thunb.	Ceylon raspberry, Mysore raspberry	1b	
312.	<i>Rumex acetosella</i> L.	Sheep sorrel, Red sorrel	a. 1a Prince Edward and Marion Islands. b. Not listed on mainland or other off-shore islands.	
313.	<i>Rumex usambarensis</i> (Dammer) Dammer (= <i>R. nervosus</i> Vahl var. <i>usambarensis</i> Dammer)	East African dock	1b	
314.	<i>Sagina procumbens</i> L.	Birdeye pearlwort	a. 1b Prince Edward and Marion Islands. b. Not listed on mainland or other off-shore islands.	
315.	<i>Sagittaria platyphylla</i> (Engelm.) J.G.Sm.	Delta arrowhead, Slender arrowhead	1a	
316.	<i>Salsola kali</i> L.	Tumbleweed	1b	
317.	<i>Salsola tragus</i> L.	Russian tumbleweed	1b	

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	(= <i>S. australis</i> R.Br.)			
318.	<i>Salvia triifolia</i> Vahl	Lindenleaf sage	1b	
319.	<i>Salvinia minima</i> Baker	Small salvinia	1b	
320.	<i>Salvinia molesta</i> D.S.Mitch. and other species of the Family Salviniaceae	Kariba weed, Salvinia	1b	
321.	<i>Sambucus canadensis</i> L.	Canadian elder	1b	
322.	(= <i>S. nigra</i> L. subsp. <i>canadensis</i> (L.) Bolli <i>Sambucus nigra</i> L.	European elder	1b	
323.	<i>Sasa ramosa</i> (Makino) Makino & Shibata (= <i>Arundinaria vagans</i> Gamble)	Dwarf yellow-striped bamboo	3	
324.	<i>Schefflera actinophylla</i> (Endl.) Harms	Australian cabbage tree, Queensland umbrella tree	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. Not listed elsewhere.	
325.	<i>Schefflera arboricola</i> (Hayata) Merr.	Dwarf umbrella tree	a. 3 in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. Not listed elsewhere.	
326.	<i>Schefflera elegantissima</i> (hort. Veitch ex Mast.) Lowry & Frodin (= <i>Dizygotheca elegantissima</i> (hort. Veitch ex Mast.) R.Vig. & Guillaumin	False aralia	a. 3 in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. Not listed elsewhere.	
327.	<i>Schinus terebinthifolius</i> Raddi	Brazilian pepper tree	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. 3 in Free State, Gauteng, North-West, Northern Cape and Western Cape.	
328.	<i>Senna bicapsularis</i> (L.) Roxb. (= <i>Cassia bicapsularis</i> L.)	Rambling cassia	1b	
329.	<i>Senna didymobotrya</i> (Fresen.) H.S.Irwin & Barneby (= <i>Cassia didymobotrya</i> Fresen.)	Peanut butter cassia	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga and Western Cape. b. Not listed elsewhere.	
330.	<i>Senna hirsuta</i> (L.) H.S.Irwin & Barneby (= <i>Cassia hirsuta</i> L.)	Hairy senna, Woolly senna	1b	
331.	<i>Senna occidentalis</i> (L.) Link (= <i>Cassia occidentalis</i> L.)	Stinking weed, Wild coffee	1b	
332.	<i>Senna pendula</i> (Willd.) H.S.Irwin & Barneby var. <i>glabrata</i> (Vogel) H.S.Irwin & Barneby (= <i>Cassia coluteoides</i> Collad.)	Climbing cassia, Easter cassia	1b	
333.	<i>Senna septemtrionalis</i> (Viv.) H.S.Irwin & Barneby (= <i>Cassia floribunda</i> sensu Brenan, C.	Arsenic bush, Smooth senna	1b	

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	<i>laevigata</i> Willd.)			
334.	<i>Sesbania punicea</i> (Cav.) Benth.	Red sesbania	1b	
335.	<i>Solanum betaceum</i> Cav. (= <i>Cyphomandra betacea</i> (Cav.) Sendtn.)	Tree tomato	a. 3 in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. The fruit of the tree tomato is not listed if used for human consumption, in the Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. c. Not listed elsewhere.	
336.	<i>Solanum chrysostrichum</i> Schlttdl. ( <i>S. hispidum</i> misapplied in South Africa)	Giant devil's fig	1b	
337.	<i>Solanum elaeagnifolium</i> Cav.	Silver-leaf bitter apple	1b	
338.	<i>Solanum mauritianum</i> Scop.	Bugweed	1b	
339.	<i>Solanum pseudocapsicum</i> L.	Jerusalem cherry	1b	
340.	<i>Solanum seaforthianum</i> Andrews	Potato creeper	1b	
341.	<i>Solanum sisymbriifolium</i> Lam.	Wild tomato, Dense-thorned bitter apple	1b	
342.	<i>Sorghum halepense</i> (L.) Pers.	Johnson grass, Aleppo grass	2	
343.	<i>Spartina alterniflora</i> Loisel.	Smooth cordgrass, Salt-water cordgrass	1a	
344.	<i>Spartium junceum</i> L.	Spanish broom	a. 1b in Eastern Cape and Western Cape. b. 3 in Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, North-West and Northern Cape.	
345.	<i>Spathodea campanulata</i> P.Beauv.	African flame tree	a. 3 in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. Not listed elsewhere.	
346.	<i>Sphagnetocola trilobata</i> (L.) Pruski (= <i>Thelechitonia trilobata</i> (L.) H.Rob. & Cuatrec., <i>Wedelia trilobata</i> (L.) Hitchc.)	Singapore daisy	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. 3 in Free State, Gauteng, North-West, Northern Cape and Western Cape.	
347.	<i>Stachytarpheta cayennensis</i> (Rich.) Vahl (= <i>S. urticifolia</i> Sims)	Blue snakeweed, Cayenne snakeweed	3	
348.	<i>Stachytarpheta mutabilis</i> (Jacq.) Vahl	Pink snakeweed	3	
349.	<i>Stellaria media</i> (L.) Vill.	Common chickweed	a. 1a Prince Edward Island. b. 1b Marion Island. c. Not listed on mainland or other off-shore islands.	
350.	<i>Syngonium podophyllum</i> Schott	Goose foot, Arrow-head vine	a. 1b in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. 2 for breeding in nurseries in in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga, but may not be transferred within these Provincial boundaries. c. Not listed elsewhere.	

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
351.	<i>Syzygium cumini</i> (L.) Skeels	Jambolan	a. 1b b. The fruit of the jambolan is not listed if used for human consumption.	
352.	<i>Syzygium jambos</i> (L.) Alston	Rose apple	3	
353.	<i>Tamarix aphylla</i> (L.) H.Karst. Not to be confused with indigenous <i>Tamarix usneoides</i> E.Mey. ex Bunge	Athel tree, Desert tamarisk	1b	
354.	<i>Tamarix chinensis</i> Lour. Not to be confused with indigenous <i>Tamarix usneoides</i> E.Mey. ex Bunge	Chinese tamarisk	1b	
355.	<i>Tamarix gallica</i> L. Not to be confused with indigenous <i>Tamarix usneoides</i> E.Mey. ex Bunge	French tamarisk	1b	
356.	<i>Tamarix ramosissima</i> Ledeb. Not to be confused with indigenous <i>Tamarix usneoides</i> E.Mey. ex Bunge	Pink tamarisk	1b	
357.	<i>Tecoma stans</i> (L.) Juss. ex Kunth	Yellow bells	1b	
358.	<i>Tephrocactus articulatus</i> (Pfeiff.) Backeb. (= <i>Opuntia articulata</i> (Pfeiff.) D.R.Hunt	Pine cone cactus, Paper-spine cholla	1a	
359.	<i>Thevetia peruviana</i> (Pers.) K.Schum. (= <i>T. nerifolia</i> Juss. ex Steud.)	Yellow oleander	1b	
360.	<i>Tipuana tipu</i> (Benth.) Kuntze (= <i>T. speciosa</i> Benth.)	Tipu tree	3	
361.	<i>Titonia diversifolia</i> (Hemsl.) A.Gray	Mexican sunflower	1b	
362.	<i>Titonia rotundifolia</i> (Mill.) S.F.Blake	Red sunflower	1b	
363.	<i>Toona ciliata</i> M.Roem. (= <i>Cedrela toona</i> Roxb. ex Willd.)	Toon tree	3	
364.	<i>Toxicodendron succedaneum</i> (L.) Kuntze (= <i>Rhus succedanea</i> L.)	Wax tree	1b	
365.	<i>Tradescantia fluminensis</i> Vell.	Wandering Jew	1b	
366.	<i>Tradescantia zebrina</i> hort. ex Bosse (= <i>Zebrina pendula</i> Schnizl.)	Wandering Jew	1b	
367.	<i>Trichocereus spachianus</i> Riccob. (= <i>Echinopsis spachiana</i> )	Torch cactus	1b	
368.	<i>Triplaris americana</i> L.	Ant tree, Triplaris	1a	
369.	<i>Tropaeolum speciosum</i> Poepp. & Endl.	Chilean flame creeper, Flame nasturtium	3	
370.	<i>Ulex europaeus</i> L.	European gorse	1a	
371.	<i>Verbena bonariensis</i> L.	Wild verbena, Tall verbena,	1b	



NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
		Purple top		
372.	<i>Verbena brasiliensis</i> Vell.	Brazilian verbena	1b	
373.	<i>Verbena rigida</i> Spreng. (= <i>V. venosa</i> Gillies & Hook.) <i>Vinca major</i> L.	Veined verbena Greater periwinkle	1b 1b	
374.	<i>Vinca minor</i> L.	Lesser periwinkle	a. 1b b. Sterile cultivars or hybrids are not listed.	
375.	<i>Vitex trifolia</i> L.	Indian three-leaf vitex	1b	
376.	<i>Wigandia urens</i> (Ruiz & Pav.) Kunth var. <i>caracasana</i> (Kunth) D.N.Gibson (= <i>W. caracasana</i> Kunth)	Wigandia	3	
377.	<i>Xanthium spinosum</i> L.	Spiny cocklebur	1b	
378.	<i>Xanthium strumarium</i> L.	Large cocklebur	1b	
379.				

List 2: National List of Invasive Marine Plant Species

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
1.	<i>Asparagopsis armata</i> Harvey	Harpoon weed	3	
2.	<i>Asparagopsis taxiformis</i> (Dellile) Trevisan de Saint-Léon	Pleasing seaweed	3	
3.	<i>Schimmelmannia elegans</i> Baardseth	Red algae	1b	
4.	<i>Undaria pinnatifida</i> (Harvey) Suringar	Asian kelp	1b	

List 3: National List of Invasive Mammal Species

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
1.	<i>Addax nasomaculatus</i> (de Blainville, 1816)	Addax	2	
2.	<i>Aepyceros melampus petersi</i> Bocage, 1879	Black-faced impala	2	
3.	<i>Ammotragus lervia</i> (Pallas, 1777)	Barbary sheep	2	
4.	<i>Antilope cervicapra</i> (Linnaeus, 1758)	Indian blackbuck	2	
5.	<i>Axis axis</i> (Erxleben, 1777)	Axis deer (Chital)	2	
6.	<i>Axis porcinus</i> (Zimmermann, 1780)	Hog deer	2	
7.	<i>Bos frontalis</i> Lambert, 1804	Gaur	2	
8.	<i>Boselaphus tragocamelus</i> (Pallas, 1766)	Nilgai	2	
9.	<i>Capra hircus</i> Linnaeus, 1758	Feral goat	a. 1a for off-shore islands. b. Not listed elsewhere.	
10.	<i>Cervus elaphus</i> Linnaeus, 1758	Red deer	2	
11.	<i>Cervus nippon</i> Temminick, 1838	Sika deer	2	
12.	<i>Dama dama</i> (Linnaeus, 1758)	Fallow deer	2	
13.	<i>Elaphurus davidianus</i> Milne-Edwards, 1866	Père David's deer	2	
14.	<i>Erythrocebus patas</i> (Schreber, 1775)	Patas monkey	a. 1a in KwaZulu-Natal. b. 1b elsewhere. c. 2 if bred for export.	
15.	<i>Felis catus</i> Linnaeus, 1758	Domestic cat	a. 1a for off-shore islands. b. Not listed elsewhere.	
16.	<i>Giraffa camelopardalis</i> (Linnaeus, 1758) (all subspecies with the exception of giraffa)	Giraffe (except the South African giraffe)	2	
17.	<i>Hemitragus jemlahicus</i> (C.H. Smith, 1826)	Himalayan tahr	1b	
18.	<i>Hippotragus equinus koba</i> (Gray, 1872)	Western roan	2	
19.	<i>Hippotragus niger</i> Harris, 1838 (all subspecies except of <i>H. n. niger</i> )	Sable	2	
20.	<i>Hydrochoerus hydrochaeris</i> (Linnaeus, 1766)	Capybara	2	Prohibited for Restricted Activity (c): "Growing, breeding or in any other way propagating any specimen of a listed invasive species, or causing it to multiply."
21.	<i>Kobus leche kufuensis</i> Haltenorth, 1963	Kafue lechwe	2	
22.	<i>Kobus ellipsiprymnus crawshayi</i> (P. L. Sclater, 1894)	Crawshay's waterbuck (Zambia)	2	

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
23.	<i>Kobus ellipsiprymnus defassa</i> (Rüppell, 1835).	Defassa waterbuck (Kenya)	2	
24.	<i>Kobus leche</i> leche Gray, 1850	Red lechwe	2	
25.	<i>Kobus vardonii</i> (Livingstone, 1857)	Puku	2	
26.	<i>Madoqua kirkii</i> Günther, 1880	Damara dik-dik	3	
27.	<i>Macaca fascicularis</i> Raffles, 1821	Crab-eating macaque	2	
28.	<i>Mus musculus</i> Linnaeus, 1758	House mouse	a. 1a for Marion Island b. 1b for off-shore islands. c. Not listed elsewhere.	
29.	<i>Myocastor coypus</i> (Molina, 1782)	Coypu	2	Prohibited for Restricted Activity (c): "Growing, breeding or in any other way propagating any specimen of a listed invasive species, or causing it to multiply."
30.	<i>Oryctolagus cuniculus</i> (Linnaeus, 1758)	European rabbit	a. 1b for off-shore islands. b. Not listed elsewhere.	
31.	<i>Oryx dammah</i> (Cretzschmar, 1827)	Oryx, scimitar-horned	2	
32.	<i>Ovis aries musimon</i> Pallas, 1762	Mouflon	2	
33.	<i>Rattus norvegicus</i> (Berkenhout, 1769)	Brown rat	a. 1b for off-shore islands. b. Not listed elsewhere.	
34.	<i>Rattus rattus</i> (Linnaeus, 1758)	House rat	a. 1b for off-shore islands. b. Not listed elsewhere.	
35.	<i>Rattus tanezumi</i> Temminck, 1844	Asian house rat	a. 1b for off-shore islands. b. Not listed elsewhere.	
36.	<i>Rusa unicorn</i> (Kerr, 1792)	Sambar deer	2	
37.	<i>Sciurus carolinensis</i> Gmelin, 1788	Grey squirrel	a. 1a in KwaZulu-Natal. b. 3 elsewhere.	
38.	<i>Sus scrofa</i> Linnaeus, 1758	Wild boar	a. 1b b. Not listed when not feral.	
39.	<i>Tragelaphus derbianus</i> (Gray, 1847)	Derby eland	2	
40.	<i>Tragelaphus euryceros</i> (Ogilby, 1837)	Bongo	1a	
41.	<i>Tragelaphus imberbis</i> (Blyth, 1869)	Lesser kudu	1a	
42.	<i>Tragelaphus spekii</i> P.L. Sclater, 1863	Sitatunga	2	
43.	All hybrids of mammal species or sub-species listed in this Notice		a. 1a b. 2 for hybrids of western roan for back-breeding purposes.	

List 4: National List of Invasive Bird Species

NO.	SPECIES	COMMON NAME	CATEGORY	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
1.	<i>Acridotheres tristis</i> (Linnaeus, 1766)	Indian mynah	3	
2.	<i>Alectoris chukar</i> (J. E. Gray, 1830)	Chukar partridge	2 on mainland. 1b on off-shore islands.	
3.	<i>Anas platyrhynchos</i> (Mallard)	Mallard duck	2	
4.	<i>Columba livia</i> (Gmelin, 1789)	Rock dove/pigeon	a. 3 b. 2 for all restricted activities relating to racing and showing of pigeons.	Any person undertaking pigeon racing or pigeon showing registered with the relevant industry Association is exempted from requiring a permit for all restricted activities, provided such Association is in possession of a valid permit in terms of the Act or the Alien and Invasive Species Regulation, 2014 for any restricted activity relating to pigeon racing or pigeon showing and provided such person complies with all permit conditions in the relevant Association's permit.  The above exemption does not apply to restricted activity "a" in Notice 1: "Importing into the Republic, including introducing from the sea, any specimen of a listed invasive species" and any person engaging in this activity must apply for a permit from the Issuing Authority.
5.	<i>Corvus splendens</i> Vieillot, 1817	Indian house crow	1a	
6.	<i>Fringilla coelebs</i> Linnaeus, 1758	Chaffinch	2	
7.	<i>Numida meleagris galeata</i> (Pallas, 1767)	West African helmeted guineafowl	3	
8.	<i>Oxyura jamaicensis</i> (Gmelin, 1789)	Northern ruddy duck	2	
9.	<i>Passer domesticus</i> (Linnaeus, 1758)	House sparrow	3	
10.	<i>Psittacula krameri</i> (Scopoli, 1769)	Rose-ringed parakeet	2	Any person undertaking rose-ringed parakeet breeding registered with the relevant industry Association is exempted from requiring a permit for all restricted activities, provided such Association is in possession of a valid permit in terms of the Act or the Alien and Invasive Species Regulation, 2014 for any restricted activity relating to rose-ringed parakeet breeding and provided such person complies with all permit conditions in the

NO.	SPECIES	COMMON NAME	CATEGORY	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
				relevant Association's permit.
	11. <i>Pycnonotus cafer</i> (Linnaeus, 1766)	Red-vented bulbul	2	The above exemption does not apply to restricted activity "a" in Notice 1: "Importing into the Republic, including introducing from the sea, any specimen of a listed invasive species" and any person engaging in this activity must apply for a permit from the Issuing Authority.
	12. <i>Streptopelia picturata</i> (Temminck, 1813)	Madagascar (Malagasy) turtle-dove	2	
	13. <i>Struthio camelus molybdophanes</i> Reichenow, 1883	North African (Somali) ostrich	2	
	14. <i>Sturnus vulgaris</i> Linnaeus, 1758	Eurasian/Common starling	3	
	15. All hybrids between indigenous and alien (excluding extra-limital) species		1a	

List 5: National List of Invasive Reptile Species

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
1.	<i>Anolis carolinensis</i> Voigt, 1832	Green anole	a. 2 in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. Not listed elsewhere.	
2.	<i>Apalone</i> species Rafinesque, 1832	Soft-shell terrapins	2	
3.	<i>Basiliscus plumifrons</i> (Cope, 1876)	Plumed basilisk, Green basilisk	a. 2 in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. Not listed elsewhere.	
4.	<i>Bitis gabonica</i> (A.M.C. Duméril, Bibron & A.H.A. Duméril, 1854) x <i>Bitis</i> sp.	Gaboon adder x Any other <i>Bitis</i> species	1b	
5.	<i>Basiliscus vittatus</i> Wiegmann, 1828	Basilisk, Brown basilisk	2	
6.	<i>Bitis nasicornis</i> (Shaw, 1792)	Rhinoceros viper, River jack	a. 2 in KwaZulu-Natal, Mpumalanga, Eastern Cape and Limpopo. b. Not listed elsewhere.	
7.	<i>Bitis rhinoceros</i> (Schlegel, 1855)	Rhinoceros viper	a. 2 in KwaZulu-Natal, Mpumalanga, Eastern Cape, and Limpopo. b. Not listed elsewhere.	
8.	<i>Boa constrictor</i> Linnaeus, 1758	Common boa	a. 2 in KwaZulu-Natal, Mpumalanga, Eastern Cape and Limpopo. b. Not listed elsewhere.	
9.	<i>Calotes versicolor</i> (Daudin, 1802)	Changeable lizard	1b	
10.	<i>Centrochelys sulcata</i> Gray, 1873	Spur-thighed tortoise, African spurred tortoise	2	
11.	<i>Chelydra serpentina</i> (Linnaeus, 1758)	Common snapping turtle	2	
12.	<i>Cuora</i> species Gray, 1856	Chinese/ Asian box terrapins	1b	
13.	<i>Emys orbicularis</i> (Linnaeus, 1758)	European pond turtle	1b	
14.	<i>Furcifer oustaletii</i> (Mocquard, 1894)	Oustalet's chameleon	2	
15.	<i>Furcifer pardalis</i> (Cuvier, 1829)	Panther chameleon	2	
16.	<i>Gehyra mutilata</i> (Wiegmann, 1834)	Stump-tailed gecko	3	
17.	<i>Gekko gekko</i> (Linnaeus, 1758)	Tokay gecko	2	
18.	<i>Iguana iguana</i> (Linnaeus, 1758)	Green iguana	a. 1b in KwaZulu-Natal and Northern Cape b. 2 in Mpumalanga, Eastern Cape and Limpopo.	

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
			c. Not listed elsewhere.	
19.	<i>Lepidodactylus lugubris</i> (Duméril and Bibrón, 1836)	Mourning gecko; Common smooth-scaled gecko	1b	
20.	<i>Macrochelys temminckii</i> Troost in Harlan, 1835)	Alligator snapper turtle	2	
21.	<i>Morelia amethystina</i> (Schneider, 1801)	Amethystine python	a. 2 in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. Not listed elsewhere.	
22.	<i>Morelia spilota</i> (Lacépède, 1804)	Carpet/diamond python	2	
23.	<i>Reiodesmus</i> species (Wiegmann, 1835)	Chinese softshell terrapins	1b	
24.	<i>Python bivittatus</i> (Kuhl, 1820)	Burmese python	2	
25.	<i>Python natalensis</i> x <i>Python molurus</i>	Southern African python x Burmese python	1a	
26.	<i>Trachemys</i> species	Turtles / Sliders native to the Americas	2	Restricted activities "a", "c" and "e" to "f" in Notice 1 are prohibited.
27.	<i>Trioceros (Chamaeleo) jacksonii</i> (Boulenger, 1896)	Jackson's chameleon	a. 2 in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. Not listed elsewhere.	
28.	<i>Trioceros (Chamaeleo) melleri</i> (Gray, 1865)	Meller's chameleon	a. 2 in Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga. b. Not listed elsewhere.	
29.	<i>Varanus salvator</i> (Laurenti, 1768)	Indonesian/Common water monitor	3	
30.	Unless otherwise listed, all introduced species of reptiles	hybrids between indigenous and	1b	



List 6: National List of Invasive Amphibian Species

NO.	SPECIES	COMMON NAME	CATEGORY / AREAS	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
1.	<i>Amietophrynus gutturalis</i> (Power, 1927)	Guttural (African common) toad	a. 1b in Western Cape. b. Not listed elsewhere.	
2.	<i>Dendrobatidae</i> species	Poison arrow (or dart) frogs	2	
3.	<i>Hyperolius marmoratus</i> Rapp, 1842	Painted reed frog	a. 3 in Western Cape. b. Not listed elsewhere.	
4.	<i>Pelophylax</i> species	Marsh frog; Edible frog; Pool frog	1b	
5.	<i>Triturus carnifex</i> (Laurenti, 1768)	Italian crested newt	1b	
6.	<i>Xenopus laevis</i> Daudin, 1802 x <i>Xenopus gilli</i> Rose & Hewitt, 1927	African clawed toad x Cape (Gill's) platanna	1b	
7.	Unless otherwise listed, all hybrids between indigenous and introduced species of amphibians		1b	

List 7: National List of Invasive Fresh-water Fish Species

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
1.	<i>Arapaima gigas</i> (Schinz, 1822)	Arapaima	3	
2.	<i>Cichla</i> species	Peacock cichlid/Bass	3	
3.	<i>Clarias gariepinus</i> (Burchell, 1822)	African sharp-tooth catfish	a. 2 in Northern Cape, Western Cape and Eastern Cape b. Not listed elsewhere	
4.	<i>Colossoma</i> species	Pacu	3	
5.	<i>Ctenopharyngodon idella</i> (Valenciennes, 1844)	Grass carp	a. 1b in National Parks, Provincial Reserves, Mountain Catchment Areas and Forestry Reserves declared in terms of the Protected Areas Act. 2 for breeding of triploid grass carp. b. 3 in all other discrete catchment systems in which it occurs.	a. The transfer or release of a specimen of grass carp from one discrete catchment system in which it occurs, to another discrete catchment system in which it does not occur; or, from within a part of a discrete catchment system where it does occur to another part where it does not occur as a result of a natural or artificial barrier, is prohibited. b. Catch and release of grass carp is exempted in discrete catchment systems in which it occurs.
6.	<i>Ctenopharyngodon idella</i> (Valenciennes in Cuvier & Valenciennes, 1844)	Triploid grass carp	a. Triploid grass carp is not listed for dams within discrete catchment systems in which it occurs. b. 2 for release of triploid grass carp into dams in discrete catchment systems in which it does not occur. c. 2 for release of triploid grass carp into rivers, wetlands, lakes and estuaries in which it occurs. 3 in all rivers, wetlands, lakes and estuaries in which it occurs.	a. The transfer or release of a specimen of triploid grass carp from one discrete catchment system in which it occurs, to a river, wetland, lake or estuary in another discrete catchment system in which it does not occur; or, from within a part of a discrete catchment system where it does occur to a river, wetland, lake or estuary in another part where it does not occur as a result of a natural or artificial barrier, is prohibited. b. Triploid grass carp listed as Category 2 are exempted for a period of two years from the date upon which this notice takes effect, from requiring a Permit for any restricted activity in terms of the Act or Alien and Invasive Species Regulations, 2014, provided a person is in possession of a valid Provincial Permit issued in terms of Provincial legislation where required for triploid grass carp. c. Catch and release of triploid grass carp is exempted in discrete catchment systems in which it occurs.
7.	<i>Cyprinus carpio</i> (Linnaeus, 1758)	Common carp	a. 1b in National Parks, Provincial Reserves, Mountain Catchment Areas and Forestry Reserves declared in terms of the Protected Areas Act. b. 2 for release into a dam within a discrete catchment system in which it does not occur.	a. The transfer or release of a specimen of common carp from one discrete catchment system in which it occurs, to another discrete catchment system in which it does not occur; or, from within a part of a discrete catchment system where it does occur to another part where it does not occur as a result of a natural or artificial barrier, is prohibited. b. Release of Common carp in National Parks, Provincial Reserves, Mountain Catchment Areas and Forestry Reserves declared in terms of the Protected Areas Act is prohibited. c. Release of Common carp in any rivers, wetlands, natural lakes and estuaries is prohibited.

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
8.	<i>Electrophorus electricus</i> (Linnaeus, 1766)	Electric eel	c. 3 in all rivers, wetlands, natural lakes and estuaries in which it occurs. d. Subject to b above, common carp is not listed for dams within discrete catchment systems in which it occurs.	d. Common carp are exempted where listed as Category 2 for a period of two years from the date upon which this notice takes effect, from requiring a Permit for any restricted activity in terms of the Act or Alien and Invasive Species Regulations, 2014, provided a person is in possession of a valid Provincial Permit issued in terms of Provincial legislation where required for common carp. e. Except for those areas detailed in b above, catch and release of common carp is exempted in discrete catchment systems in which it occurs. f. Ornamental koi carp are exempt from requiring a permit for all restricted activities except for restricted activity 'g' in Notice 1: "Releasing any specimen of a listed invasive species."
9.	<i>Gambusia affinis</i> (Baird and Girard, 1853)	Mosquito-fish	a. 1b in National Parks, Provincial Reserves, Mountain Catchment Areas and Forestry Reserves declared in terms of the Protected Areas Act. b. 3 for all other discrete catchment systems in which it occurs. c. 2 for breeding for the purpose of feeding stock for zoos and animal breeders.	a. The transfer or release of a specimen of mosquito-fish from one discrete catchment system in which it occurs, to another discrete catchment system in which it does not occur; or, from within a part of a discrete catchment system where it does occur to another part where it does not occur as a result of a natural or artificial barrier, is prohibited. b. Catch and release of mosquito-fish is exempted in discrete catchment systems in which it occurs.
10.	<i>Hypophthalmichthys molitrix</i> (Valenciennes, 1844)	Silver carp	a. 1b in National Parks, Provincial Reserves, Mountain Catchment Areas and Forestry Reserves declared in terms of the Protected Areas Act. b. 3 in all other discrete catchment systems in which it occurs.	a. The transfer or release of a specimen of silver carp from one discrete catchment system in which it occurs, to another discrete catchment system in which it does not occur; or, from within a part of a discrete catchment system where it does occur to another part where it does not occur as a result of a natural or artificial barrier, is prohibited. b. Catch and release of silver carp is exempted in discrete catchment systems in which it occurs.
11.	<i>Lates calcarifer</i> (Blotch, 1790)	Barramundi	2	
12.	<i>Lepomis macrochirus</i> (Rafinesque, 1819)	Bluegill	a. 1b in National Parks, Provincial Reserves, Mountain Catchment Areas and Forestry Reserves declared in terms of the Protected Areas Act. b. 3 for all other discrete catchment systems in which it occurs.	a. The transfer or release of a specimen of bluegill from one discrete catchment system in which it occurs, to another discrete catchment system in which it does not occur; or, from within a part of a discrete catchment system where it does occur to another part where it does not occur as a result of a natural or artificial barrier, is prohibited. b. Catch and release of bluegill is exempted in discrete catchment systems in which it occurs.

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
13.	<i>Micropterus dolomieu</i> (Lacepède, 1802)	Small-mouth bass	a. 1b in National Parks, Provincial Reserves, Mountain Catchment Areas and Forestry Reserves declared in terms of the Protected Areas Act.	a. The transfer or release of a specimen of a listed bass species from one discrete catchment system in which it occurs, to another discrete catchment system in which it does not occur; or, from within a part of a discrete catchment system where it does occur to another part where it does not occur as a result of a natural or artificial barrier, is prohibited.
14.	<i>Micropterus floridanus</i> (Lesueur, 1822)	Florida bass	b. 2 for release into dams within discrete catchment systems in which it occurs	b. The release of the listed bass species in National Parks, Provincial Reserves, Mountain Catchment Areas and Forestry Reserves declared in terms of the Protected Areas Act is prohibited.
15.	<i>Micropterus floridanus</i> (Lesueur, 1822) x <i>Micropterus salmoides</i> (Lacepède, 1802)	Hybrids of the Florida bass and the large-mouth bass	c. 3 in all rivers, wetlands, lakes and estuaries in which it occurs.	c. Each listed bass species listed as Category 2 is exempted for a period of two years from the date upon which this notice takes effect, from requiring a Permit for any restricted activity in terms of the Act or Alien and Invasive Species Regulations, 2014, provided a person is in possession of a valid Provincial Permit issued in terms of Provincial legislation where required for the specific listed bass species.
16.	<i>Micropterus punctulatus</i> (Rafinesque, 1819)	Spotted bass	d. Subject to (b), each listed bass species is not listed for dams within discrete catchment systems in which it (the specific listed bass species) occurs.	d. Catch and release of the listed bass species is exempted in discrete catchment systems in which they occur.
17.	<i>Micropterus salmoides</i> (Lacepède, 1802)	Large-mouth bass	a. 2 in National Parks, Provincial Reserves, Mountain Catchment Areas and Forestry Reserves declared in terms of the Protected Areas Act.	a. The transfer or release of a specimen of large-mouth bass from one discrete catchment system in which it occurs, to another discrete catchment system in which it does not occur; or, from within a part of a discrete catchment system where it does occur to another part where it does not occur as a result of a natural or artificial barrier, is prohibited.
18.	<i>Myxus species</i>	Brown metynnis	b. 3 in all rivers, wetlands, lakes and estuaries in which it occurs.	b. The release of Large-mouth bass in any rivers, wetlands, lakes and estuaries is prohibited.
19.	<i>Oncorhynchus kisutch</i> (Walbaum, 1792)	Coho salmon	c. Large-mouth bass is not listed for dams (including for release in dams) within discrete catchment systems in which it occurs.	c. Large-mouth bass listed as category 2 are exempted for a period of two years from the date upon which this notice takes effect, from requiring a Permit for any restricted activity in terms of the Act or Alien and Invasive Species Regulations, 2014, provided a person is in possession of a valid Provincial Permit issued in terms of Provincial legislation where required for large-mouth bass.
20.	<i>Oncorhynchus mykiss</i> (Walbaum, 1792)	Rainbow Trout	2	d. Catch and release of large-mouth bass is exempted in discrete catchment systems in which it occurs.
21.	<i>Oncorhynchus tshawytscha</i> (Walbaum, 1792)	King salmon	2	All persons are exempted from requiring a permit for restricted activities "b" and "j" in Notice 1.

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
22.	<i>Oreochromis</i> species excluding <i>Oreochromis mossambicus</i> and <i>Oreochromis placidus</i>	Tilapia	a. 3 b. 2 for permitted aquaculture facilities	a. Catch and release of tilapia b. Hybrids of tilapia species are treated as the listed tilapia species. c. The sale and transport of live tilapia is prohibited, except from accredited hatcheries. d. The import of live tilapia is prohibited, except by hatcheries with a permit, or from international hatcheries accredited by the Department of Agriculture, Forestry and Fisheries.
23.	<i>Perca fluviatilis</i> (Linnaeus, 1758)	Perch	a. 1b in National Parks, Provincial Reserves, Mountain Catchment Areas and Forestry Reserves declared in terms of the Protected Areas Act. b. 3 for all other discrete catchment systems in which it occurs.	a. The transfer or release of a specimen of perch from one discrete catchment system in which it occurs, to another discrete catchment system in which it does not occur; or, from within a part of a discrete catchment system where it does occur to another part where it does not occur as a result of a natural or artificial barrier, is prohibited. b. Catch and release of perch is exempted in discrete catchment systems in which it occurs.
24.	<i>Pterygoplichthys disjunctivus</i> (Weber, 1991)	Vermiculated sailfin catfish	a. 1b in National Parks, Provincial Reserves, Mountain Catchment Areas and Forestry Reserves declared in terms of the Protected Areas Act. b. 3 for all other discrete catchment systems in which it occurs.	a. The transfer or release of a specimen of vermiculated sailfin catfish from one discrete catchment system in which it occurs, to another discrete catchment system in which it does not occur; or, from within a part of a discrete catchment system where it does occur to another part where it does not occur as a result of a natural or artificial barrier, is prohibited. b. Catch and release of vermiculated sailfin catfish is exempted in discrete catchment systems in which it occurs.
25.	<i>Pygocentrus</i> species	Piranha	3	
26.	<i>Rooseveltiella</i> species	Piranha	3	
27.	<i>Schilbe</i> species (except those that are indigenous to South Africa)	Schilbid catfish	3	
28.	<i>Serrasalmus</i> species	Piranha	3	
29.	<i>Salmo trutta</i> (Linnaeus, 1758)	Brown Trout	2	a. All persons are exempted from requiring a permit for restricted activities "b" and "j" in Notice 1.
30.	<i>Tinca tinca</i> (Linnaeus, 1758)	Tench	a. 1b in National Parks, Provincial Reserves, Mountain Catchment Areas and Forestry Reserves declared in terms of the Protected Areas Act. b. 3 for all other discrete catchment systems in which it occurs.	a. The transfer or release of a specimen of tench from one discrete catchment system in which it occurs, to another discrete catchment system in which it does not occur; or, from within a part of a discrete catchment system where it does occur to another part where it does not occur as a result of a natural or artificial barrier, is prohibited. b. Catch and release of tench is exempted in discrete catchment systems in which it occurs.

List 8: National List of Terrestrial Invasive Invertebrate Species

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
1.	<i>Acarapis woodi</i> (Rennie, 1921)	Tracheal mite	1b	
2.	<i>Achatina fulica</i> Bowditch, 1822	Giant African snail	3	
3.	<i>Anoplolepis gracilipes</i> (Smith, 1857)	Crazy ant	1b	
4.	<i>Bactrocera dorsalis</i> (Hendel, 1912)	Oriental fruit fly	1a	
5.	<i>Bemisia tabaci</i> (Gennadius, 1889)	Sweet potato whitefly	1b	
6.	<i>Cinara cupressi</i> (Buckton, 1881)	Cypress aphid	1b	
7.	<i>Coptotermes formosanus</i> (Shiraki, 1909)	Formosan subterranean termite	1b	
8.	<i>Cosmopolites sordidus</i> (Germar, 1824)	Banana root borer	1b	
9.	<i>Dirofilaria immitis</i> Leidy, 1856	Heartworm nematode	1b	
10.	<i>Ditylenchus destructor</i> Thorne, 1945	Potato rot nematode	1b	
11.	<i>Ditylenchus dipsaci</i> (Kühn, 1857) Filip'ev, 1936	Stem and bulb nematode	1b	
12.	<i>Globodera rostochiensis</i> (Wollenweber, 1923), Behrens, 1975	Golden cyst nematode; potato cyst nematode	1b	
13.	<i>Harmonia axyridis</i> (Pallas, 1773)	Asian ladybeetle	1b	
14.	<i>Linepithema humile</i> (Mayr, 1868)	Argentine ant	1b	
15.	<i>Meloidogyne paritityla</i> Kleynhans, 1986	"Pecan nut" nematode	1b	
16.	<i>Phasmatodea</i> species (Jacobson and Blanchi, 1902)	Stick insect	1b	
17.	<i>Polistes dominula</i> (Christ, 1791)	European Paper Wasp	1b	
18.	<i>Prostephanus truncatus</i> (Horn, 1878)	Larger grain borer	1a	
19.	<i>Phenacoccus madeirensis</i> (Green, 1925)	Madeira mealybug	1b	
20.	<i>Pseudococcus calceolariae</i> (Maskell, 1879)	Citrophilus mealybug	1b	
21.	<i>Radopholus similis</i> (Cobb, 1893) Thorne, 1949	Burrowing nematode	1b	
22.	<i>Trogoderma granarium</i> (Everts, 1899)	Khapra beetle	1b	
23.	<i>Varroa destructor</i> Anderson & Trueman, 2000	Varroa mite	1b	
24.	<i>Vespa germanica</i> (Fabricius, 1793)	European wasp, German wasp, German yellow-jacket	1b	

List 9: National List of Invasive Fresh-water Invertebrate Species

NO	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
1.	<i>Aedes albopictus</i> (Skuse, 1895)	Asian tiger mosquito	1b	
2.	<i>Aplexa marmorata</i> (Guilding, 1828)	Marbled tadpole snail/ Slender bladder snail	1b	
3.	<i>Astacius leptodactylus</i> (Eschscholtz, 1823)	Danube/Galician/Turkish/Narrow-clawed crayfish	1a	Catch and release is prohibited
4.	<i>Cherax destructor</i> Clark, 1936	Yabby	1a	Catch and release is prohibited
5.	<i>Cherax quadricarinatus</i> (Von Martens, 1868)	Redclaw crayfish/Tropical blue crayfish	1b	Catch and release is prohibited
6.	<i>Cherax cainii</i> (Austin & Ryan, 2002)	Smooth marron	2	Catch and release is prohibited
7.	<i>Cherax tenuimanus</i> (Smith, 1912)	Hairy marron	2	Catch and release is prohibited
8.	<i>Lymnaea columella</i> (Say, 1817)	Amphibious pond snail	1b	
9.	<i>Orconectes limosus</i> (Rafinesque, 1817)	North American spiny cheek crayfish	1a	
10.	<i>Orconectes rusticus</i> (Girard, 1852)	Rusty crayfish	1a	
11.	<i>Pacifastacus leniusculus</i> (Dana, 1852)	North American signal crayfish	1a	
12.	<i>Tarebia granifera</i> (Lamarck, 1822)	Quilted melania snail	1b	

List 10: National List of Invasive Marine Invertebrate Species

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
1.	<i>Balanus glandula</i> (Darwin 1854)	Pacific barnacle	3	
2.	<i>Boccardia proboscidea</i> Hartman, 1940	Shell worm	1b	
3.	<i>Carcinus maenas</i> (Linnaeus, 1758)	European shore crab/ Green crab	1b	
4.	<i>Ciona intestinalis</i> (Linnaeus, 1767)	Sea vase, Ascidian	3	
5.	<i>Crassostrea gigas</i> (Thunberg, 1793)	Japanese oyster, Pacific oyster	2	<p>a. Aquaculture facilities within the following areas are exempted from requiring a Permit for all restricted activities except for restricted activity "a" in Notice 1; provided they have a valid Permit from the Department responsible for Fisheries:</p> <p>i. Algoa Bay: landwards of a straight boundary line with endpoints at the GPS coordinates 33° 51' 24.82" S 25° 38' 11.01" E and 33° 59' 20.68" S 25° 40' 26.31" E.</p> <p>ii. Upstream of the mouth of the Keisikamma River at the the GPS coordinates 33° 16' 54.26" S 27° 29' 26.35" E.</p> <p>iii. Kleinsee: land-based operations with water outflows on the stretch of coast marked in the North by GPS coordinates 29° 39' 13.44" S 17° 02' 20.15" E and in the South 29° 40' 15.12" S 17° 02' 40.18" E.</p> <p>iv. Knysna River: upstream of the mouth at GPS 34° 4' 55.64" S 23° 3' 36.39" E</p> <p>v. Within the Marina Martinique, landwards of the mouth of the Marina marked as by the GPS coordinates 34° 04' 37.23" S 24° 55' 21.13" E</p> <p>vi. Paternoster: land-based operation with water outflows on the stretch of coast marked in the North by GPS coordinates 32° 46' 41.56" S 17° 54' 28.37" E and in the South by 32° 47' 14.33" S 17° 54' 27.75" E.</p> <p>vii. Port Alfred: Kowie River, upstream of GPS coordinates 33° 36' 21.59" S 26° 53' 50.20" E.</p> <p>viii. Saldanha Bay: within the Bay, north-eastward of a straight boundary line with endpoints at the GPS coordinates 33° 02' 59.26" S 17° 54' 41.34" E and 33° 06' 17.54" S 17° 57' 09.53" E</p> <p>ix. Hamburg 33° 17' 0.78" S; 27° 28' 52.20" E.</p> <p>All other persons including all aquaculture facilities whether located inside or outside the areas identified in (a) above are:</p> <p>b. exempted from restricted activity (i) in Notice 1: "Discharging of or disposing into any waterway or the ocean, water from an aquarium, tank or other receptacle that has been used to keep a prohibited alien species or a listed invasive species."</p> <p>c. exempted from restricted activity (e) in Notice 1: "Selling or otherwise trading in, buying, receiving, giving, donating or accepting as a gift, or in any way acquiring or disposing of any live specimen of a listed invasive species."</p>



NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
6.	<i>Disciniscia tenuis</i> (Sowerby)	Disc lamp shell	1b	
7.	<i>Dodecacera fewkesi</i> Berkeley & Berkeley, 1954	Black coral worm	1b	
8.	<i>Fenneropenaeus indicus</i> (H. Milne Edwards, 1837)	Indian/White prawn	a. 2 in all provinces except KwaZulu-Natal. b. Indigenous to KwaZulu-Natal, and therefore not listed there.	
9.	<i>Ficopomatus enigmaticus</i> (Fauvel, 1923)	Estuarine tube-worm	1b	
10.	<i>Litopenaeus vannamei</i> (Boone, 1931)	White shrimp, Whiteleg shrimp	2	a. Exempted from requiring a Permit for all restricted activities for existing aquaculture facilities that have a valid Permit from the Department of Agriculture, Forestry and Fisheries. b. Exempted from restricted activity (i) in Notice 1: "Discharging of or disposing into any waterway or the ocean, water from an aquarium, tank or other receptacle that has been used to keep a prohibited alien species or a listed invasive species."
11.	<i>Metridium senile</i> (Linnaeus, 1761)	Feather-duster anemone, Plumose anemone	3	a. Aquaculture facilities are exempted from requiring a Permit for all restricted activities except for restricted activities a, f, g, and k in Notice 1. All other persons are: b. Exempted from restricted activity (i) in Notice 1: "Discharging of or disposing into any waterway or the ocean, water from an aquarium, tank or other receptacle that has been used to keep a prohibited alien species or a listed invasive species." c. Exempted from restricted activity (e) in Notice 1: "Selling or otherwise trading in, buying, receiving, giving, donating or accepting as a gift, or in any way acquiring or disposing of any live specimen of a listed invasive species."
12.	<i>Mytilus galloprovincialis</i> (Lamarck, 1819)	Mediterranean mussel, Blue mussel	2	
13.	<i>Ostrea edulis</i> Linnaeus, 1758	European flat oyster	3	
14.	<i>Penaeus monodon</i> Fabricius, 1798	Giant tiger prawn/Tiger prawn	a. 2 in all provinces except KwaZulu-Natal. b. Indigenous to KwaZulu-Natal, and therefore not listed there.	a. Exempted from requiring a Permit for all restricted activities for existing aquaculture facilities outside of KwaZulu-Natal that have a valid Permit from the Department of Agriculture, Forestry and Fisheries. b. Exempted from restricted activity (i) in Notice 1: "Discharging of or disposing into any waterway or the ocean, water from an aquarium, tank or other receptacle that has been used to keep a prohibited alien species or a listed invasive species."
15.	<i>Sagartia ornata</i> (Holdsworth, 1855)	Brooding sea anemone	3	
16.	<i>Semimytilus algosus</i> (Gould, 1850)	Pacific mussel	1b	

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
17.	<i>Tetrapygus niger</i> (Molina, 1782)	Black sea-urchin	1a	

List 11: National List of Invasive Microbial Species

NO.	SPECIES	COMMON NAME	CATEGORY / AREA	SCOPE OF EXEMPTION FROM THE PROVISIONS OF SECTION 71(3) / PROHIBITION IN TERMS OF SECTION 71A(1)
1.	<i>Kirramyces destructans</i>		1b	
2.	<i>Kirramyces eucalypti</i> (Cooke & Massee) J. Walker, B. Sutton & Pascoe 1992		1b	
3.	<i>Phytophthora kernoviae</i>	Fungus-like pathogen	1b	
4.	<i>Phytophthora pinifolia</i> Alv. Durán, Gryzenh. & M.J. Wingf.	Fungus-like pathogen	1b	
5.	<i>Phytophthora cinnamomi</i>	Fungus-like pathogen	1b	
6.	<i>Teratosphaeria cryptica</i>	Eucalyptus leaf blotch pathogen	1b	
7.	<i>Fusarium circinatum</i> genotypes		1b	

APPENDIX 4. Working for Water: Project Operating Standards

# **Working for Water**

## **Project Operating Standards**

(Previously the Self-assessment Standards)

**May 2007: Version 3**

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**B. Introduction to the Working for Water Project Operating Standards**

1. **The Project Operating Standards (POS)** were previously the Self-assessment Standards, and incorporate the Aquatic, Bio-Control and Environmental standards.
2. The POS are the **standards** by which projects must be run and against which their **performance must be measured**.
3. Copies of the POS must be carried, understood and implemented by all **Project Managers** and **Contractors**.
4. **Regions** must **measure** Project and Contract **compliance** to the POS by ensuring that regular assessments are carried out using the **Self-Assessment Checklist** in Excel format.
5. **Contractors** must demonstrate their commitment to continuous improvement against the Standards by completing and attaching a Standards **Field Audit Sheet** to each contract, indicating the level of compliance achieved and items still to improve on.

1. PROJECT OPERATIONAL PLANNING		REFERENCE	
1.1	<b>1:50 000 or better map displayed</b> The map provides an overview of the project and its activities; it must indicate the following:	National Mapping Standards	
1	Management unit / project boundaries clearly identified.	Sample map	
2	Quaternary catchment unit being worked on.		
3	Worker sources indicated.		
4	Bio-control sites displayed, differentiating between terrestrial and aquatic sites with separate colours.		
5	Other features relevant to project or strategy displayed e.g. state land, wetlands, woodlots, demarcated areas, etc.		
6	Landowner cadastral zoning where relevant to strategy.		
7	All rivers and dams in the Region with invasive aquatic plant infestations.		
8	Management units per aquatic plant infestation showing species, control method applied, date of last control activity, current activities and last monitoring evaluation.		
10	Demarcated biological control reserves and breeding stations, with species and number of pools.		
11	Other relevant features, including water return and extraction points, pollution point sources and strategic points.		
1.2	<b>Strategic planning</b> Managers must demonstrate the following in relation to their appointment:		Planning Guidelines doc.
1	The Project Manager must show an understanding of the Regional Strategic Plan.		
2	Understanding of the Area Strategic & Management plan (Park or Nature Reserve management plan where applicable).		
3	Understanding of the role of the Project in context of the above.		
4	Inclusion of alien clearing into Integrated Development Plans (IDP's).		
5	Complete the Environmental Screening Checklist (ESC) at Regional Planning Level.	Env. Regulations	
6	Complete the Project Environmental Screening Checklist at Project Level.		
7	The Operating Standards must be included in the contract between WfW and the Contractor.		



8	A Regional strategic control plan must be developed by the Regional Invasive Aquatic Plant Control Committee and reviewed 2X per year (1 annual review prior to financial, APO, planning).	
9	The strategic plan should include the Terms of Reference for the committee and contact details of all relevant stakeholders.	
10	The strategic plan should cover each known infestation.	
11	Infested systems must be divided into management units.	
Each management unit must be listed as a Site Control Plan, indicating:		
1	the agreed temporal or spacial integration of control options.	
2	priorities	
3	timing of activities and	
4	landowner responsibilities	
13	The strategy should aim to implement biological control as a first option, where practical.	
14	The strategy should aim to prevent aquatic weeds from entering neighbouring countries.	
15	The protection of systems, which are not infested, must be prioritised.	
16	The strategy should aim to promote landowner cooperation.	
17	Emerging and potential weeds must be reported to the National Implementation manager.	
18	The Strategic Plan and revisions must be communicated to the Regional DWAF manager, Regional Programme Leader and WfW National Implementation Manager.	
<b>1.3</b>	<b>Management Unit (Project) Clearing Plan (MUCP)</b> A management unit clearing plan must be completed with vegetation unit mapping and schedule:	MUCP guideline with sample
1	It must be up to date (annual update completed prior to APO compilation).	
2	A clearing strategy must be evident and supported by the planned priorities.	
3	It must guide pro-active landowner interventions.	
4	Bio-control options must be considered as an integrated part of clearing.	

<b>1.4</b>	<b>Phased Annual Plan of Operations (APO)</b> Requirements for a current Project APO:	APO guidelines and standard format
1	APO must be an approved current version and available in the local office and referred to monthly.	
2	A copy of the approval 'green' form must be in the Area / Project office, by the 1st of April of the current financial year.	
3	It must be based on the MUCP schedule of priorities.	
4	The APO must relate directly to the Site Control Plan	
5	It must be drawn up and understood by the Project manager.	
<b>1.5</b>	<b>Phased Annual Budget</b> Requirements for a current Project Budget:	APO guidelines and standard format
1	It must be an approved current version and available in the local office.	
2	A copy of the approval 'green' form must be in the Area / Project office, by the 1st of April of the current financial year.	
3	It must be derived from the phased APO.	
4	It must be drawn up and understood by the Project manager.	
<b>1.6</b>	<b>APO implementation</b>	
1	Managers must be able to show actual work done vs. planned work, supported by fixed point photographs.	
2	If significant deviations occur between planned vs. completed work, this must be motivated, with photographic support, and corrective steps must be outlined on a monthly basis.	
3	Changes to the APO must be in line with changes to and review of the Regional Strategic Plan, approved by the Regional Director and a new 'green' form issued and available, changes must be communicated to the National Implementation Manager.	
<b>1.7</b>	<b>Monthly KPI report</b>	Sample
1	Copies of handheld, cash-flow, narrative and H&S reports available in the office.	
2	The IA / Project Manager must submit the op-to-date report in the prescribed format, at the prescribed time to, RPL, Regional Dwaf Manager and the WfW National Implementation Manager.	
3	Summary of report submitted and presented at Area KPI / IA meeting.	
4	Incomplete or inconsistent information must be explained.	

5	Relevant lessons experienced must be narrated and shared with colleagues.	
6	Quarterly reports must be presented at the National Advisory Committee meetings.	
<b>1.8</b>	<b>Management structure adequate for project size</b>	
1	A Regional organogram must be available.	
2	A project / area organogram must be available.	
3	Project management capacity must be adequate to deal with the size of project. (A maximum of 1 Project Manager to 8 contractors; with a ratio of 1:6 recommended.)	
<b>1.9</b>	<b>Administrative and Occupational Health and Safety requirements</b>	
1	The contractor/sub-contractor needs to have a Letter of Good Standing available on site/regional office in the site safety file.	Admin. & Safety Policies
2	Where practical an on-site Notice Board should be provided.	
3	Safety Audit Reports / Evaluations need to be filed on site/regional office and a daily diary kept.	
4	A work Instruction book needs to be available that includes a method statement of how the work will be done.	WSWP
5	A copy of the clients emergency plan and procedure need to be filed on-site and communicated to the workers.	
6	A competent person needs to be appointed as an Accident / Incident Investigator the appointment filed on site/regional office.	
7	A First Aid Attendant is to be officially appointed and the letter of appointment and competency certificate kept on-site.	
8	A valid Emergency Telephone lists with detail of the contractors, sub-contractors, local police and medical assistance must be kept on site.	
9	Danger and warning signs must be posted at the entrance of the site.	
10	Signage restricting unauthorised access needs to be displayed.	
11	Where relevant, speed limit signs need to be posted on the site.	
<b>1.10</b>	<b>Environmental requirements</b>	
1	All employees must attend an environmental training programme prior to commencement of work.	
2	A copy of the Operating Standards (with environmental conditions), must be kept on site, and be available to workers at all times.	

3	The Contractor must create a complaints register.	
1.11	<b>Aerial Survey</b> Only companies on National tender and / or in partnership may be considered	
1	The Project Manager must ensure that the helicopter pilots possess at least a valid commercial license for the task to be performed and have not less than 500 or Rottowing command hours flying experience on helicopters of which 50 must be on time.	
2	The Project Manager must ensure that the pilot is familiar with the routes to be flown.	
3	The Project Manager must obtain a proof of insurance and the renewal of annual premiums from the company to ensure that passengers are covered by insurance.	

2. CONTRACT / TREATMENT AREA ADMINISTRATION		REFERENCE
<b>2.1</b>	<b>NBAL (Natural Biological Alien) contract basis</b>	National Mapping Standards
1	Vegetation to be cleared must be mapped and recorded as NBAL units.	
2	NBAL units to be assigned a unique identity number on the WIMS database. (10 digits)	
3	NBAL data records must be available to the project.	
4	The IA / Project Manager is responsible for keeping the NBAL database updated.	
5	Bio-control sites must be entered into the management database.	
6	Areas not to be cleared (e.g. shade trees, demarcation i.t.o. CARA) must still be mapped and entered into database with relevant annotation.	
7	Demarcation permits to be in place prior to commencement of work.	
8	Areas are mapped on a fence-to-fence basis. (boundary to boundary)	
<b>2.2</b>	<b>Landowner Agreements (Request for Clearing Assistance)</b>	Standard Landowner Agreement
1	Landowner application for clearing assistance must be completed prior to the clearing contract being generated.	
2	Landowner agreements must be completed for the properties for which a clearing contract is issued.	
3	The original landowner agreement must be filed in the IA or Regional Office for safe-keeping.	
4	Copies of the landowner agreements to be available in the Project / Area office.	
5	Landowner agreement information must be captured in the WIMS database.	
6	PM must put measures in place to prove that LO agreements were submitted to the Regional Office.	
7	Copies of directives with regard to land handed back to land users must be available and information captured on the PM's working map.	
<b>2.3</b>	<b>Clearing contracts / Treatment Area document.</b>	Quotation package & contract
1	The contract document must be readily accessible to IA / Project Managers and Contractors. It's content must be understood by all affected parties.	

2	Clearing contract must be allocated a WIMS treatment area identity number. (13 digits).	
3	Clearing / control specifications (methods, standards and results) must form part of the contract document Part D (Page 3.3).	
4	A treatment area map must be attached to the contract. The map must be clear, legible and printed at a suitable scale.	
5	Distinctive features must be recorded on the map to define boundaries and to locate the area.	
6	Boundaries must be marked and pointed out in the field to contractors.	
<b>2.4 Clearing contract records, data and quality control.</b>		
1	A timesheet must be kept of daily worker attendance. It must be current, up to date and original.	WIMS Timesheet
2	Details of new appointments must be submitted to the WIMS.	Production Sheet
3	A record must be kept of equipment and consumables (including herbicides, fuels, blades etc) issued by WfW for a treatment area. Issues must be recorded to the relevant treatment area number.	
4	A quality control sheet signed and certified by the Project Manager must record ongoing quality checks and the final check before payment. This must certify that the work done complies with contract specifications.	Quality Control form
5	The Area manager must authorise the invoice payment and ensure that the quality control / completion sheet signed by project manager, is attached.	
6	The rules and regulations document must be signed and readily accessible to the PM and contractor. It's content must be understood by both parties.	Contract rules and regulations doc.
7	Copies of all workers ID must be in the contractors possession.	
<b>2.5 Cleared area verification.</b>		
1	Actual areas cleared (size and work done) must be verified and recorded by the IA / Project Manager	Verification register
2	The WMA Area Manager must verify a minimum of 10% of the cleared areas monthly and record these checks.	
3	The Project Manager must monitor all aquatic weed sites, at least bi-monthly and record their status.	
<b>2.6 Corrective Action for sub-standard work.</b>		

1	Payment must be made 30-35 days from date of invoice, failing which the RPL and National Implementation Manager must be informed, in writing. This must be recorded and included in the RPL's monthly report.	Quality Control Record
2	Payment must not be made for work that does not comply with contract specifications.	
3	A record must be kept of non-compliance to standards and poor performance.	
4	Copies of instructions issued to contractors to correct deficiencies must be kept.	
<b>2.7</b>	<b>Environmental Screening Assessments (ESAs).</b>	Env. Regulations
1	An overall ESA must be done per Project, and a copy available at regional and Project level.	
2	An ESA must be done per Contract and available on site and filed with the contract documentation.	
3	Where an ESA indicates relevant site-disturbing activity is required and unavoidable, an Environmental Impact Assessment (EIA) must first be submitted to the relevant authority, and approval obtained before commencement of the site-disturbing activity.	
4	Regular environmental audits must be conducted to ensure compliance against the ESA / EIA. Mitigation measures must be implemented to ensure continuous improvement.	

3. PROJECT CONTRACTOR ADMINISTRATION		REFERENCE
<b>3.1</b>	<b>Project communication system</b>	
1	There must be a formal system for distributing National / Regional office instructions and information within the project / area / region.	Circular procedure
2	Communications with any press reporters and authors of publications must be approved by the National WfW Communications Manager.	Communication Policy
3	Programme promotional material must be available in the Project / Area office.	
4	Guidelines, standards, policies and circulars must be available at Area / Project offices. These include, among others: OHS Act, H&S regulations, Operating Standards, Employment Act etc.	
5	Supervisory staff of the Contractor or his sub-contractors must not direct any person to undertake any activities which would place such person in contravention of the specifications of this document, endanger his/her life or cause him/her to damage the environment.	
6	The Contractor must maintain a detailed complaints register. This must be forwarded, together with solutions, to the authorities when requested.	
<b>3.2</b>	<b>Bookkeeping &amp; records</b>	
1	Contractors must have monthly balance sheet and pay sheets available	
2	Contractors must be registered with a bookkeeper and the MOU, must be accessible, signed and understood.	
3	PM must have proof of contractors registration with a bookkeeper and it must be available.	
<b>3.3</b>	<b>Contractor evaluations</b>	
1	Quarterly / after R200 000 tender contractor evaluations must be available in the Project Managers office.	
2	IA / PM's need to evaluate each contract per management unit number to make sure that the project is paying the contractor what is really needed for that specific contract, alterations must be recorded and available.	
3	IA / PM's need to evaluate contractors to be on higher value contracts and these evaluations must be accessible.	



3.4	<b>Tender/contract Recommendations</b>	Evaluation Committee Guidelines
1	Project evaluation committee must recommend quotations received.	
2	Evaluation committee must consist of 3 people, the Project Manager and two others, taking into account race and gender composition.	
3	Minutes must be kept of these meetings and must be available at the IA / Project office.	

4.TRANSPORT		REFERENCE
<b>4.1</b>	<b>All vehicles used in the Programme must be roadworthy and licensed.</b>	National Road Traffic regulations extract
1	Vehicles and trailers must comply with the roadworthy requirements of the National Road Traffic regulations for trailers, including SABS reflector strips along 80% of each side and back.	
2	All vehicles and trailers must display a valid license.	
3	All vehicle operators must display a valid Certificate of Fitness, or Roadworthy Certificate.	
4	All heavy (vehicle) machinery must be fitted with an acoustic signalling device, e.g. a reverse beeper.	
5	Site vehicles must be fitted with a fire extinguisher.	
6	Tyres must be checked regularly and be in a safe condition. (No retreads, recapped or regrooved tyres are permitted)	
4	All contractor vehicles must be pre-authorised prior to the commencement of each contract.	
<b>4.2</b>	<b>Daily vehicle checklist</b>	Vehicle Checklist H&S element 2.18
1	A daily pre-trip vehicle and trailer check must be done on all vehicles used in a project, and recorded by the driver on a standard checklist. Faults must be recorded.	
2	Faults affecting the roadworthiness of the vehicle must be repaired immediately or alternative transport used.	
3	The checklist must be up to date and in the vehicle.	
4	The Project Manager must verify and sign the checklists, at least twice per month.	
7	There must be a workers (passengers) checklist on the driver, up to date and with the contractor.	
<b>4.3</b>	<b>Driver's licenses and permits.</b>	Driver's License register
1	All drivers must have a valid driver's license for the vehicle category used. All drivers in the Project must be assessed at employment, then annually for driving competence by the PM or another competent person.	
2	All contractor drivers / drivers transporting workers must be in possession of a valid Professional Driving Permit (PDP) of the appropriate category for the vehicle used when transporting 12 or more people.	
3	Drivers must undergo a bi-annual medical check and the results filed.	
4	Drivers licenses must be verified annually by the local traffic authority.	

5	PM must ensure that a copy of the PDP license is submitted to Water works and copies must be available in the PM's project files.		
<b>4.4</b>	<b>Vehicle logbooks.</b>		
1	There must be a up to date logbook for all vehicles used in the Programme, for which a km allowance is paid, or which the Programme provides.		Logbook sample
<b>4.5</b>	<b>Trip authorisations.</b>		
1	Valid trip authorisations must be issued for and carried in all vehicles provided by the Programme.		Trip authority sample
<b>4.6</b>	<b>Vehicle size must be suitable for the number of passengers to be transported.</b>		
	Based on the minimum space required per person, this guideline applies to bakkies (front & back):		National Road Traffic regulations extract
1	1	SWB bakkie - <b>no</b> persons standing, seated = 11 max. front & back with at least 40cm seat width each.	H&S element 2.18
	2	LWB bakkie - <b>no</b> persons standing, seated = 13 max. front & back with at least 40cm seat width each.	
2	The maximum tare (average 70kg per person) including loads and towing mass of the vehicle must be adhered to.		
3	All vehicles must only carry the number of people they are certified for. A sign must be displayed toward the rear, stating " <b>Certified to carry ... passengers seated</b> " in letters at least 75mm high.		
<b>4.7</b>	<b>Passenger safety.</b> Vehicles used for transporting workers must have suitable passenger facilities:		
1	Benches are secured - where required / fitted.		
2	Canopies or tarpaulins are properly secured and ventilated.		
3	Sufficiently strong railings provided to a height of 350mm above seat surface.		
4	Tools, equipment, herbicides and containers must be suitably secured and isolated from passengers in a fixed bin on the vehicle or in a towed trailer.		
<b>4.8</b>	<b>Boats</b>		
1	Boats must be suited for the specific sites within the project (I.e. dams and type of rivers).		
2	Boats procured by the project must follow guidelines to ensuring that the correct boat is procured for the specific type of river / dam within the project.		

3	Boats must be washed down at the site to ensure that aquatic weeds are not accidentally distributed to other sites.
4	Boats used by WfW are a DWAF asset and must be maintained and correctly operated to prevent damage and resulting expenses.
Boat handlers must receive boat handling training:	
1	<b>Boats being used</b> on inland waters with engine outputs of 15 Horsepower or more must be registered with SAMSA (DWAF has an approved registration system).
2	<b>Persons operating boats</b> with engine outputs of 15 Horsepower or more on inland waters must have, at least, a Category R Certificate of Competency, issued by SAMSA.
3	To obtain the required Certificate, the operator must be trained by a SAMSA authorized agency (DWAF is approved through the internal course offered by Hydrology).
4	Boats with engine outputs under 15Hp are not regulated but, in terms of safety and asset management, will require a course ( proposed 2 days) including maintenance, steering, fuel mix and Safety. (This course will have to be developed).
5	5 All persons going onto DWAF-WfW boats must wear an SABS approved-life jacket.
6	6 All boat operators must have demonstrated the ability to float, comfortably, with the life-jacket on. (Compulsory swimming training can be considered under this standard).
7	7 All boat engines must be equipped with an ignition safety kill-switch and lanyard, which attaches to the operator, and will stop the engine in the event of the operator being thrown overboard.
8	8 Operators who will be required to take a boat into rough water and fast-flowing rivers will be required to attend an advanced SAMSA course and have a Category E Certificate of Competency.
9	9 No certification is required for boats not equipped with motors. WfW boat users must comply with Life-jacket requirements and have completed a 1day safety course.
<b>4.9</b>	<b>Boat trailers</b>
1	Trailers must comply with the roadworthy requirements of the NRT regulations, including SABS reflector strips allong 80% of each side and back.
2	Trailers must display a valid licence.
3	Trailers must be suited to the boat that is transported.
4	No persons are to be transported in the boat while it is either loaded on the trailer or on a vehicle.

<b>5. TOOLS AND EQUIPMENT</b>		<b>REFERENCE</b>
<b>5.1</b>	<b>Hand tools in good, safe condition and used correctly.</b>	
1	Hand tools must be best suited to the work and the size of plants being cleared.	Tool checklists
2	The tools must have correct and properly secured handles and must be in safe working order.	H&S elements
3	They must be properly maintained and sharpened correctly and regularly. Gloves must be worn when sharpening tools.	
4	A suitable sharpening stone/file must be on site, with a suitable hand grip and guard.	
5	The tools must be used in the correct and safe manner; clearing must be done using the correct techniques.	
6	Safe working distances must be maintained. At least two tool-reach lengths apart. (e.g. 3m +)	
<b>5.2</b>	<b>Chainsaws and clearing saws in good, safe working condition and used correctly.</b>	
1	The chainsaws must be best suited to the clearing work and timber size.	Chainsaw maintenance schedule & checklist
2	The clearing-saws and the cutting blade type must be best suited to the clearing work and timber size.	
3	There must be a maintenance schedule / record and logbook for all chainsaws and clearing saws, project or contractor owned. Services (daily, weekly, monthly) are done and recorded.	Chainsaw logbook
4	Safety and operational features must be in good order as per standard checklist. On clearing saws a properly fitted harness must be used.	
5	Chainsaw and clearing saw work is planned and executed for safe and efficient production.	
6	Correct felling / clearing techniques are applied.	H&S elements
7	Correct cross-cutting and de-branching techniques are applied.	
8	Correct re-fuelling procedures are followed to prevent spillages, e.g. the use of a funnel, and proper containers are used for fuel.	FESA Chainsaw Safety & Operating Handbook
9	Chain or saw blade sharpening is correctly done at each refuelling.	
10	Operators have the required and correct tools.	
11	Operators have received certified training / have been assessed for competence & proficiency, and have received a six monthly refresher course.	

12	Spills and leaks at daily service sites in-field must be contained by the use of absorbant drip-mats or drip-trays.	
<b>5.3</b>	<b>In-field fuel site</b>	
1	A cleared area must be used to store fuel, with correct signage and demarcated with hazard tape.	H&S element
2	The site must be at least 6m distant from rest areas.	
3	Fire-fighting equipment must be at least 3m distant from the fuel site and clearly indicated.	
4	Fuel and oil containers at the in-field fuel site must be stored on an absorbant drip-mat or drip-tray.	

6. STORES, WORKSHOPS AND OFFICES		REFERENCE
<b>6.1</b>	<b>Equipment / supplies stores, workshops and offices.</b>	H&S element
1	Buildings and containers must be secure and provide safe storage space where equipment / supplies will not deteriorate. (Not too hot; not wet.)	
2	The stores / workshops / offices must comply with the WfW H&S standards, Herbicide Policy notes and OHS Act and Regs.	
3	The office / stores area must show a high standard of housekeeping. (A place for everything, everything in its place.)	
4	Suitable PPE provided and used.	
<b>6.2</b>	<b>Herbicide stores</b>	Herbicide Policy  H&S element
The building / container must meet the Herbicide Policy standards:		
1	1 Suitable location.	
	2 Adequate lighting and ventilation.	
	3 Suitable construction for safe and secure storage.	
	4 Have a bunding capacity of 10% more than the storage capacity to contain leaks.	
	5 Proper facilities for handling and mixing of herbicides.	
	6 Adequate measures to deal with spillage and contamination. Spill kit available.	
2	Herbicides must be issued with reference to the WIMS treatment area number.	
3	There must be stock control of empty containers.	
4	Empty containers must be returned to the herbicide supplier; or destroyed as prescribed on the label.	
5	Excess, undiluted herbicide must be returned to the stores and noted on the stock sheet. Excess, diluted herbicide must be stored in a uv-resistant container and allocated to another treatment within 2 days or return to the stores.	
6	A MSDS and Label must be on site for each stock category of herbicide stored. (Each product.)	
<b>6.3</b>	<b>Fuel and flammable liquids stores.</b>	
1	The building / container must meet the H&S standards.	

Quantities limited to allowed maximum per class where proper storage facilities are not available (e.g. contractor / farm store):		H&S element				
2	<table border="1"> <tr> <td>1</td> <td>Class I – 45L (petrol, thinners)</td> </tr> <tr> <td>2</td> <td>Class II – 270L (diesel, lube oils)</td> </tr> </table>		1	Class I – 45L (petrol, thinners)	2	Class II – 270L (diesel, lube oils)
1	Class I – 45L (petrol, thinners)					
2	Class II – 270L (diesel, lube oils)					
3	Suitable, safe location.					
4	Suitable construction for safe and secure storage,					
5	Safe lighting, wiring, earthing and ventilation.					
6	Have a bunding capacity of 10% more than the storage capacity.					
7	Proper housekeeping and handling procedures.					
8	Adequate measures to deal with spillage and contamination. Spill kit available.					
9	Correct signs and fire-fighting equipment.					
<b>6.4</b>	<b>Stock control.</b> There must be proper control / records of receipts & issues of all equipment and supplies.	Stock control sheet & asset register samples				
1	There must be a stock record for each category of stock stored and issued.					
2	All issues and receipts must be recorded immediately, and the stock movement and balance record must be available for inspection.					
3	The balance of stock recorded must correspond at all times with stock in the stores.					
4	All equipment & capital items must be listed in an asset register.					
5	Designated managers must verify stock periodically and an annual stocktaking must be done.					
6	The proper procedures must be followed in disposing of unserviceable or surplus items.					
7	Surplus equipment and supplies must be declared and offered to other WfW projects / stores.					
8	WfW equipment must be permanently marked.					
<b>6.5</b>	<b>Storage at contractor stores / houses.</b> Where contractors cannot make use of proper dedicated stores, the following standards apply:	H&S elements				
1	All equipment, supplies, herbicides, fuel and oils must be safely and securely stored with controlled access, in a suitable lockable building, container or a lockable trailer.					
2	Fuel must be stored in sealed steel containers and no more than the quantity required for one day's work (max. 45L) separate from herbicides. A max. of 270L of oils can be stored.					



3	A 2,25kg dry powder fire extinguisher must be kept available outside the store / container.	
4	Store away from sleeping, cooking areas and naked flames.	
5	Herbicides to be stored in sealed locked steel containers separate from fuels.	
6	PM to verify and keep record of inspection of compliance regarding storing facilities at contractors store / house.	

7. HERBICIDES		REFERENCE
<b>7.1</b>	<b>Herbicides and correct application methods.</b>	Herbicide Policy
1	Workers shall be informed of the risk of working with the selected chemicals and how to avoid that risk.	
2	On Aquatic Weeds - only Glyphosate based, registered herbicides may be used as detailed in the WfW herbicide policy.	
3	Only registered herbicides and application methods may be used, as detailed in the WfW herbicide policy.	
4	The method and rate of application must be done according to label / herbicide policy specification or under strict supervision of a qualified pest control operator for Aquatic Weeds.	
5	Spray mix adjuvants (wettters, buffers, dyes) must be used according to label instructions.	
6	Where there is no herbicide registered for a particular species or situation, consult the WMA Manager, National Technical Advisor (021 441 2700) or National Implementation Manager. When an unregistered herbicide / method is used, records must be kept of the species, herbicide and application rate, and the results monitored, recorded and communicated to Nat.Office.	
7	Clean good quality water must be used.	
8	A suitable dye must be used in all applications.	
9	Herbicide application must not take place in unsuitable weather conditions; e.g. foliar application in windy conditions.	
10	Application methods must be monitored for correct targeting, rates and to avoid spray drift. ( Part of Service Invoice)	
11	Where there is a risk of herbicide applicators entering the water, knapsacks should be filled only half full.	
12	Use water provided on site - do not collect or dispose of water into a natural watercourse.	
13	PM must supply control sheet for every management unit number to WIMS with regards to herbicide issued and actual herbicide used.	
<b>7.2</b>	<b>Calibrated application of herbicides.</b>	Herbicide Policy
1	All herbicide applications must be calibrated to achieve the correct application quantity per stump or per hectare.  For broadcast spraying a calibration test must be carried out to achieve the correct flow rate, walking speed and spraying rate / pattern. Tests must be recorded and available.	

2	PM to verify calibration checks when visiting the contract area.	
3	For spot spraying the spray pattern must be checked daily.	
4	For stump / frill / ring-barking / basal bark application, coverage must be even and spraying must be monitored to limit excessive run-off.	
<b>7.3</b>	<b>Equipment for herbicide application.</b>	
1	All equipment must not leak.	
2	All equipment must be properly maintained according to regular scheduled services.	
3	Filters must be cleaned daily.	
Equipment appropriate to the application method and treatment must be used.		Herbicide Policy
1	Knapsack sprayers must be fitted with pressure regulators set to the correct pressure (1bar / 100Kpa) or fitted with a constant flow valve.	
4	2 Knapsack sprayers must be fitted with the correct nozzle in good condition, appropriate for the application method used (e.g. TG1; FL5VS; TFVS2 or equivalent).	
3	The standard thin straps on the knapsack must be replaced with proper padded harnesses that include hip support.	
4	Lances must be secured to prevent damage when transporting.	
Modified high pressure and foaming systems used on waterweeds must be run at lowest practical pressure, not exceeding 20 bar.		
5	1 Trailer mounted systems must be leak-proof, parked at least 20 m from the river or dam, and trailered with no herbicide mix in the tank (water only).	
2	Boat mounted systems must be leak-proof and stable. Extra care must be taken when refilling or emptying the storage tanks.	
6	Washing and maintenance of equipment must take place in a designated area designed for the purpose, using the <b>triple-rinse</b> method.	
<b>7.4</b>	<b>Safe storage and handling of herbicide in-field.</b> Herbicides must be stored and handled in the field in the following manner:	
In a designated, demarcated site –		Herbicide Policy
1	1 Away from rest / eating areas.	
2	At least 20m from any water body (rivers, vleis).	
3	Away from indigenous vegetation/crops/gardens etc.	

2	Containers must be leak-proof.	
3	Containers must be UV resistant and stored in shade or under cover to prevent degradation of the herbicide.	
4	Containers must be clearly labelled, showing the herbicide concentration of the contents.	
5	A MSDS and Label must be on-site for each stock category of herbicide on hand. (Each product.)	
6	Containers must stand on a suitably absorbent material to absorb accidental drips and leaks.	
7	Refilling must be done using a funnel or spout to prevent spillage and on similar absorbent material.	
8	Refilling and mixing must not be done near natural water bodies or desirable vegetation.	
9	Empty containers and equipment must be rinsed as detailed in the herbicide policy and the rinse water recycled for fresh mixtures.	
10	Washing and rinsing may not be done in natural water bodies or thrown away in a hole.	
11	All empty containers must be punctured and returned to the stores.	
12	Have a bucket, spade and absorbent material available in case of spills.	
13	Contractors must have proper records of daily herbicide mixtures and issues and actual herbicide use in the contracting teams on-site.	
<b>7.5</b>	<b>Adequate operator washing facilities.</b> There must be washing facilities for persons handling herbicides, including:	
1	Sufficient clean water.	
2	A bucket or bowl.	
3	Soap and a hand towel.	
<b>7.6</b>	<b>Herbicide related training.</b> Accredited / approved training must be provided prior to herbicide use, with the following minimum requirements:	
1	Area / Project Managers – Environmental Pest Control Course and apply for a PCO certificate.	
2	A Contractor team member per team – Environmental Pest Control Course and apply for a PCO certificate.	
3	Contractors - Limited Pest Control course.	
4	Herbicide Applicators – WfW Herbicide Applicators course.	Herbicide Policy
5	Other workers – Herbicide Awareness training.	

6	Copies of all herbicide training certificates received and Pest Control Licenses must be available with the PM and contractor on-site.	
7.7	<b>Herbicide costs.</b> Managers must know what herbicide consumption and costs are for typical operations and communicate these to contractors:	
1	Cost per litre for various herbicides used.	
2	Cost / consumption per hectare for initial and follow-up operations.	
7.8	<b>Aerial application of herbicide</b> Only companies on National tender may be considered.	
1	Must be engaged only when it has been approved by the advisory committee / working group and has been included in the Site Control Plan (SCP).	
2	The Company used must comply with the Department of Water Affairs and Forestry as well as Department of Transport's aviation rules.	
3	The PM must ensure that the Company representative is fully licensed as a pest control operator (PCO) in accordance with the Agricultural Remedies Act 36 of 1947 (copy of the valid PCO license must be with the PM on-site).	
4	The PM must ensure that the aircraft application equipment is calibrated to apply the prescribed herbicide at a registered dosage (copy of the calibration certificate supplied by company must be in the PM's file).	
5	The PM must ensure that the Company supplies a print out from on-board equipment, of the area and the volume sprayed.	
6	The PM must ensure that the Company supplies a certified copy of the STC of the spray gear used for the spraying action.	
7	The Company must supply a certified copy of his / her valid agricultural spray rating to the project manager. The PM must ensure that they comply with Air Navigation Regulations of 1976, 2.9C.	
8	Relevant stakeholders, including riparian landowners must be informed prior to aerial applications. (Documentary proof on record)	
9	No aerial applications shall take place on public holidays or weekends, unless by prior arrangement with and approval of stakeholders. (Documentary proof on record)	

8. METHOD OF WORK		REFERENCE
<b>8.1</b>	<b>All teams must be on contract work.</b>	WIMS standards
1	All teams must be on contract, this may be task or time based. Task based work must be supported by norms developed through a work study or activity sampling process.	
<b>8.2</b>	<b>Treatment areas accurately measured and marked.</b>	National Mapping Standards
1	Treatment areas must be mapped and measured using methods complying with the WfW mapping standards.	
2	Treatment area boundaries must be marked on fixed points and in an environmentally friendly manner; e.g. paint on an invasive tree or in the fence-to-fence method. (Boundary to boundary)	
<b>8.3</b>	<b>Appropriate clearing methods and specifications applied.</b> Clearing methods (initial & follow-up) specified for the site must be optimal to achieve the desired results, while maximising cost-efficiency and environmental compatibility.	Treatment Methods doc.
1	A process of appropriate clearing method selection must be followed and recorded. (Options considered, justification for choice and selection panel). Costly felling and logging operations should be avoided where possible.	
2	Bio control considered as an integrated clearing method in the contract area and finding recorded.	
3	Handling / processing of cleared material must be kept to a minimum. If stacking is unavoidable, the brush lines must be planned for site impact & topography.	
7	Method and specifications selected to comply with legal requirements of relevant Acts. (e.g. proximity to water)	
10	The method must comply with Health & Safety requirements.	
11	Where mechanical timber extraction is to be done, an Area Manager approved harvesting plan must be available for the site.	
<b>8.4</b>	<b>Follow-up.</b> Follow-up operations must be done and timed to apply the optimal site / species specific treatment:	Follow-up plan sample
1	An up-to-date follow-up plan, scheduling work and site inspections, must be used to ensure treatment is done on time e.g. before plants seed or fruit.	

2	Foliar applications on seedling regeneration must be done before plants are between knee and hip height.	
3	For foliar treatment of coppice there must be sufficient foliage but plants must not exceed waist height.	
4	When follow-up operations are not done at the most cost-efficient stage, there must be specific planned reasons on record (e.g. repeat cut-stump due to registered method or sensitive surrounding plants).	
5	Try to ensure that the follow-up treatment is done by the same contractor that did the previous treatment.	
<b>8.5</b>	<b>Efficient team operation</b>	
1	Operational planning for the specific site must be evident. Different tasks must be co-ordinated in an efficient manner for optimum productivity.	
2	Tool use and tasks must be adapted to the site-specific requirements.	
3	Daily production tasks must be set and actual production must be measured and recorded. Records of the calculations must be kept for revue.	
<b>8.6</b>	<b>Work methods conform to contract requirements.</b> Work methods, treatments and results must be specified in contract documents and compliance monitored.	
1	Record of inspection of method, quantity and quality according to the contract.	Sample
2	Record of verification of all invasive alien species to be treated listed on the contract documents. This must include all woody alien invasive plants and where relevant herbaceous / aquatic plants too.	
3	Trees or areas to be excluded from clearing must be specified. (Demarcations)	
5	Inspect compliance with Part D (Page 3.3) of the Treatment Area contract: <b>Detailed Description of the Work and Method</b> and <b>Special Site Conditions and Precautions</b> .	

<b>9. BIOLOGICAL CONTROL</b> (The biological control project manager in each region is responsible for the management of bio-control as control method in the aquatic weed project)		REFERENCE
<b>9.1</b>	<b>Identification of biological control sites</b>	
1	Must be done in conjunction with the aquatic weed project manager, where relevant.	
2	Must be done according the Site Control Plan (SCP) and aquatic weed control strategy, where relevant.	
3	Must be in areas where the possible spread of aquatic weeds to new river systems is impossible / unlikely.	
4	Temperature and ecological compatability of agents to sites must determine priorities of release and distribution.	
5	The biological control manager must always inspect a site before it can be considered for biological control as a treatment method.	
6	Biological control sites must be selected, managed or isolated to prevent re-infestation of areas which have been treated by other methods.	
<b>9.2</b>	<b>Release of biological control agents</b>	
1	Appropriate release methods and specifications must be applied. Release methods for the bio-agent must be optimal for the desired results and cost-efficiency. Any queries should be addressed to the researcher or the WfW National Coordinator: Bio-Control Research.	
2	Follow-up releases must be done and timed to achieve optimal results.	
3	An up-to-date follow-up release plan scheduling work and site inspections must be used to ensure releases are done on time.	
4	When follow-up releases are not done, there must be specific reasons on record.	
5	Information should be completed on release forms and available in the biological control manager's office.	
6	Copies of all documents or a summary thereof should be sent to the relevant PPRI researcher, National Coordinator, Regional Office and Aquatic weed Project Manager.	
7	Bio-agents must be released according to specifications in the SCP and Bio-control Business Plan.	
8	Records of all releases must be filed and available in the Biocontrol Manager's Office.	
<b>9.3</b>	<b>Mass Rearing Facility</b>	



1	The mass rearing facilities must be managed by the biological control manager.
2	The pools must be placed at sites which do not pose a threat of infestation to rivers or dams which do not have the particular weed species present.
3	These facilities must be managed according to specifications from PPRI.
4	Records of agents produced and sites to which they are distributed must be kept at the bio-control manager's office.
5	Unless required by the agent, weeds in the mass rearing facility should be prevented from flowering and producing seed.
6	Access to these facilities must be controlled.
7	Mass rearing facilities must be signposted and demarcated.
<b>9.4</b>	<b>Harvesting from field sites</b>
1	Harvesting from field sites must be considered only when establishment of agents at the site in question is certain or the site is due to be treated by other means.
2	The biological project manager must determine, before hand, how many agents can be removed without risking the success of the existing site.
3	Field sites can be defined as those areas where biological control has successfully established as a control method, but it is not of any scientific importance.
4	Biological control reserves are sites which are strategically placed and maintained for the purpose of breeding bio-agents or research, and are required to be demarcated by the bio-control manager.
5	Bio-control sites and reserve positions must not threaten weed free sites or neighbouring countries.
6	Harvesting from field sites can only be considered after a period of 3 years from initial release.
7	The preferred method of distribution of water hyacinth agents is by catching, counting and releasing the agents. Where species require the host plant to be distributed (eg. <i>Salvinia molesta</i> ), the agents and weed must be transported in marked and sealed containers with fine gauze over ventilation holes.
8	The Health & Safety risks in the bio-control agent harvesting process must be assessed and mitigated.
<b>9.5</b>	<b>Monitoring</b>
1	Sites must be monitored monthly and a seasonal status report submitted to the invasive aquatic plant control manager.
2	An estimate of % damage should be calculated on visible feeding evidence.

3	Fixed point digital photographs must be taken at each bio-control site to estimate influence of agents over time.	
4	Water quality information must be available for all monitoring sites.	
5	Monitoring forms must be completed, maintained and available in the biological control manager's office.	
6	Copies of data documents (or a summary thereof) must be sent to the implementation officer (PPRI), National Bio-control Coordinator and the aquatic weed project manager.	
<b>9.6</b>	<b>Biological control records</b>	
1	All release sites in a management unit area must be located, recorded and mapped.	Biological Control Policy
2	These records must be incorporated in the WIMS database.	
3	The release sites must be marked in a standard manner for easy identification.	
4	Release data sheets must be completed for new sites and submitted to the regional biological control manager.	
5	Monitoring data sheets must be completed and submitted to the Regional Biological Control manager, at least annually.	
6	The sites must be pointed out to teams working in the vicinity.	
7	Bio control releases must form part of a current contract.	
<b>9.7</b>	<b>Biological Control knowledge</b>	
1	IA / Area / Project managers must be informed of biological control agents / methods applicable to species in their areas.	Biological control agents summary
2	The managers must be trained to recognise the biological control agents and the effects they have on the alien target species.	
3	PM and contracting team trained in harvesting and releasing bio agents for targeted species.	
<b>9.8</b>	<b>Biological Control planning</b>	
1	When compiling MUCPs the use of bio-control agents as a clearing or containment method, must be considered.	Procedure for deciding on release sites
2	Areas and sites must be identified according to the guidelines in the WfW Bio-Control Policy and applications sent to the bio-control manager.	WfW Bio-Control policy
3	Planned releases must be incorporated in APO compilation and the budget where required.	

4	All biological control activities must take place in close liaison with Regional Bio-Control managers.	
<b>9.9</b>	<b>Risk assessment of biological agents.</b>	
1	Records of risk assessments of each bio-control agent used must be kept in the Regional office with copies to the relevant PM offices. (Bites, stings, irritation etc.)	
2	Following on the risk assessment, PPE requirements must be determined, recorded and used accordingly.	
3	Relevant PPE should be supplied to workers and site visitors, e.g. gloves, masks and hardhats.	
4	Workers and site visitors must be informed of any risks associated with the bio-control agents.	

10. BURNING		REFERENCE
<b>10.1</b>	<b>Regional burning strategy</b>	WfW Burning Policy
1	Evaluate the potential for IAP management by burning in the region.	
2	Compile a localised fire management plan to fit with any sub-regional plan.	
3	Form a relationship with local fire management agencies - FPA, WoF, local fire brigade, others.	
4	Share understanding for capabilities, and resources available to and from the fire management agencies / WfW Regon.	
5	Record of WfW representation at relevant fire management agency meetings.	
<b>10.2</b>	<b>Identification of sites requiring burning</b>	
1	If burning is to be considered, form a focus group to evaluate the status of the vegetation on the target area, and guide the process of decision making according to the standards.	
2	Record a list of objectives to be achieved by the burn.	
3	Record a list of stakeholders to be included in the decision process.	
4	Engage with the leaders of the FPA, WoF and local fire brigade.	
5	Keep a written record of the steps followed and decisions made.	
<b>10.3</b>	<b>Planning a burn</b> The decision to burn must not be made in isolation - landholders and stakeholders must be in agreement	
1	Record a list of stakeholders to be included in the decision process.	
2	Form a fire management committee including the AM, PM, Landholder, WoF leader (or equivalent).	
3	Record of the decision to burn explained to and understood and agreed to by the landholder.	
4	Evaluate and list the fire management resources available.	

5	Evaluate and list the actions to be completed in preparation for the burn.
6	Record a HIRA process for persons, equipment and environment before commencing the burn.
7	Compile and record an Emergency Evacuation plan based on the HIRA and other local knowledge.
8	Communicate the Emergency Evacuation plan to all involved in the planned burn prior to the burn.
9	Record and communicate the day decided on for the burn.
10	Keep a written record of the steps followed and decisions made.
<b>10.4</b>	<b>The burn</b>
1	Assemble the resources necessary for the burn, allocate duties and confirm delegation of authority. Fire boss, second in charge, flank supervisors, team leaders and team groups.
2	Record communication of the plan of action, the HIRA and Emergency Evacuation procedure to all involved persons before proceeding with the burn.
3	The landholder started the burn / signed authorisation and delegation for the burn.
4	Keep a written record of the steps followed and decisions made with a time-line.
<b>10.5</b>	<b>After the burn</b>
1	Fire management committee evaluation of the burn and record of their findings.
2	Communicate record of findings to the stakeholders.
3	Evaluate the level of achievement of the objectives set for the burn.
4	Record plan of follow-up action and responsibilities as a consequence of the burn.
<b>10.6</b>	<b>Burning and fire management training</b>
1	Workers need to be trained in fire awareness, burning and fire prevention methods.
2	AM and PM need to be trained in fire management techniques.
3	Emergency Evacuation procedures need to be communicated to the workers.

11. ENVIRONMENTAL AWARENESS		REFERENCE
<b>11.1</b>	<b>Site clean and free of litter and waste</b>	
1	There must be no litter from WfW activities / personnel on work sites, at any time.	
2	There must be a litter bin or bag on site at the demarcated gathering area, cleared or removed daily.	
3	All existing litter must be removed and disposed of in an acceptable manner, unless specified that it can remain on site.	
4	Where warranted by the quantity, the removal of litter can be catered for by allocating person days to the task.	
5	Soil contaminated with oil must be appropriately treated and disposed of at a permitted landfill site or the soil can be regenerated using bio-remediation methods.	
6	When loose waste material is transported on vehicles it must be adequately tied down / covered and contained.	
<b>11.2</b>	<b>Sanitation</b> Sanitation requirements should be measured against the duration of the work and the number of workers. Sanitation facilities should at least include the following:	
1	As far as practically possible provide formal sanitation (chemical or water-born). Where this is not possible, a spade and toilet paper must be easily accessible on every site.	
2	Human waste and used toilet paper must be buried at least 20m distant from any watercourses or bodies.	
3	In sensitive areas (urban sites, wetlands) a portable toilet must be provided on site and the waste removed and disposed of in an acceptable manner.	
4	Clean water, soap and a towel must be provided and used for hand washing.	
5	Accommodation is to be provided where workers are remote from their homes. (e.g. camping or hostel)	
Where temporary accommodation is supplied, the site should at least have:		
6	1 1x shower/15 workers.	
	2 1x toilet/30 workers.	
	3 Changing rooms per gender.	
	4 A sheltered eating area.	

7	The workers should be informed of personal hygiene and trained to maintain it.
8	Toilets need to be adequately ventilated.
9	Where relevant, sufficient toilets per gender need to be available.
<b>11.3</b>	<b>Access routes</b>
1	Existing access routes must be used. Where new access routes or paths are required, these must be planned and made in co-operation with the landowner / manager and marked with hazard tape.
2	Timber extraction routes must be planned and adhered to and marked with hazard tape.
3	Plan hauling routes to minimise the need to cross-rivers.
4	Where the construction of a temporary access route that alters the stream flow of any watercourse is needed, formal authorisation from the relevant authority must be obtained before construction. e.g. DWAF (NWA) An EIA must be done.
<b>11.4</b>	<b>Indigenous plants and animals</b>
1	Indigenous plants and animals (birds, snakes, mammals, insects and their nesting / breeding / feeding sites) must not be harmed. Records must be kept of sightings and encounters.
2	Alien trees with bird nests must be killed standing where possible. Site records must be kept.
3	Collection of plants, parts of plants or animals for medicinal or other purposes, may only take place with the appropriate permission. Collection records must be kept.
Identify and protect indigenous plants and animals, especially:	
1	Red data species
2	Protected plants
3	Sensitive communities
4	Wetlands
5	No species of animal may be poached, snared, hunted, captured or wilfully harmed, damaged or destroyed.
6	Snakes and other reptiles that may be encountered on the treatment area must not be killed.
7	Anthills and/or termite nests that occur must not be disturbed.
8	Disturbances to nesting sites of birds must be avoided.
9	Keep the foreman / managers informed of dangerous or problem animals. Record sightings and encounters.

10	Keep food and rubbish out of reach of scavengers, e.g. apes and birds.	
<b>11.5</b>	<b>Invasive alien plant identification (IAP)</b>	CARA species list
1	All personnel must be trained in basic alien invasive plant identification with specific reference to aquatic alien plants.	
2	Alien invasive plants including aquatic alien plants must be identified, where required expert assistance must be used.	
3	The relevant species to be removed must be pointed out to contractors and workers on site.	
4	Damage to indigenous / desirable vegetation must be minimised.	
3	Specific NBAL's to be controlled by bio-control methods or research sites, must be pointed out to workers and contractors, and the special conditions explained to them.	
<b>11.6</b>	<b>Alien invasive dispersal.</b> The potential dispersal of alien plant seeds or fruit by WfW activities must be assessed and preventative measures must be taken.	
1	Where cleared material must be moved from the site, measures must be taken to prevent dispersal of reproductive material (e.g. seeds, cuttings).	
2	Chipped plant material must be free of seed if used off-site (e.g. mulch).	
3	Plants which have been removed must not be transported across or near to rivers or dams in which the species is absent.	
4	Removed plants must not be stacked on top of indigenous flora.	
5	Method and specifications chosen with due consideration of impact on the site, natural vegetation & regeneration.	
6	Methods used must ensure that aquatic weeds are not distributed by the contractor and employees.	
7	Measures must be taken to prevent the dispersal of seed etc, by vehicles, clearing personnel & tools.	
<b>11.7</b>	<b>Altering stream flow characteristics</b>	
1	No unauthorised altering or diverting of stream-flows is permitted.	
2	If a stream-flow altering activity is anticipated, an EIA must be done.	



3	Effects of stream-flow altering actions must be anticipated, managed and mitigated in terms of the EIA.	
11.8	<b>Site stabilisation / anti-erosion / rehabilitation measures.</b> Where a site / soil is exposed to erosion by the clearing of vegetation cover, the methods and treatment must be adapted to stabilise the site.	
1	<b>Stack brush</b> along the contour and below shoulder height with 2m gaps at 10 to 15 m intervals (for fire fighting access / escape), to reduce run-off and soil movement, <b>or scatter brush</b> to reduce soil damage by fire.	
2	Preserve indigenous plant cover and adapt treatment methods to allow indigenous plants to colonize the site.	
3	Identify sites requiring additional stabilisation structures / measures / re-vegetation and obtain expert advice & planning to implement.	
4	Take precautionary measures to protect stabilising plants (planted & natural) during follow-up spraying.	
11.9	<b>Site stabilisation / anti-erosion / rehabilitation records.</b> If measures additional to clearing are undertaken (e.g. planting or structures):	
1	Sites must be mapped and a unique Treatment Area number must be assigned. Comprehensive planting / maintenance records must be kept; including dates, species and number of plants and follow-up care.	
2	A record of input costs must be kept, including: materials, plants, seeds, person-days etc.	
11.10	<b>Archaeological and Cultural Sites.</b>	
1	All finds of human remains must be reported to the nearest police station.	
2	Should any historically significant finds (e.g. artefacts, human remains or sites of cultural or archaeological importance) be located, work must cease and the South African Heritage and Resource Agency (SAHRA) must be contacted immediately. Work in the area can only be resumed once the site has been completely investigated.	
3	Under no circumstances must the Contractor, his/her workers, his/her sub-contractors or his/her sub-contractors' workers remove, destroy or interfere with archaeological sites or finds. Any person who causes intentional damage to archaeological or historical sites and/or artefacts could be penalised or legally prosecuted in terms of the National Heritage Resources Act, 25 of 1999.	
4	A fence at least 2m outside the extremities of the site must be erected to protect archaeological sites	

11.11	<b>Permits</b> Activities requiring permits and/or permission.
Strategic planning should foresee any permit requirement to be obtained before the start of work. These, among others, would include:	
1	1 Permission to enter private land.
	2 Permission to work in a nature reserve.
	3 Permit to enter and work in prohibited areas.
	4 Permit for diverting any watercourse.

12. HEALTH AND SAFETY		REFERENCE
<b>12.1</b>	<b>Hazard Identification and Risk Assessments (HIRA)</b>	H&S element 5.02
1	The HIRA process to be developed, on record and available at the project / area and to be understood by every manager.	
2	An Emergency Evacuation Plan must be drafted and communicated to all personnel.	
3	Where relevant, hazards in the working area must be taped off. e.g. trenches, holes etc.	
4	The Written Safe Work Procedures Manual must be available, understood and adhered to by all working staff.	WfW WSWP
<b>12.2</b>	<b>Medical examinations</b> To prevent occupational injuries:	H&S element
1	All workers must have had a base-line medical examination performed by a registered occupational health practitioner.	
2	New workers must have a pre-employment medical examination.	
3	Specific job classes must have annual medical examinations / tests as specified.	
4	Records must be kept at Project offices.	
<b>12.3</b>	<b>First Aid kit</b>	H&S element 5.15 & stock list
1	A first aid kit, fully stocked according to the standard stock list, must be easily accessible at all work sites, and regularly inspected by the PM.	
2	All first aid treatment and usage of stock must be recorded in the dressing book kept on site / regional office.	
3	The First Aid kit must be under control of a trained and competent First Aider with a current certificate.	
4	There must be an alternative trained First Aider in the team.	
5	The name of the registered and competent first-aider must be illustrated on the first aid box.	
6	A copy of the competency certificate of the first-aider must be kept on-site in the H&S-file.	

12.4	<p><b>Personal Protective Equipment and Clothing (PPE)</b> The PPE as prescribed in the WFW PPE matrix must be worn at all times during work, as well as specialized PPE required for work on / near water bodies.</p>	
1	PPE must meet the minimum prescribed standards of quality (EU or SABS).	H&S element 2.41
2	PPE must be replaced when it becomes ineffective through wear & tear.	
3	All people on aquatic weed control sites must wear SABS approved Key-Hole type life jacket with whistle.	
4	PPE must be provided with due consideration to the hazards of exposure to dangerous animals, reflective glare and water.	
5	A record must be kept of all PPE issued to contractors and workers, and signed for by them.	
12.5	<p><b>The Project / Area / Region conforms to the WfW Occupational Health and Safety Guidelines.</b> The OHS standards must be fully implemented in all WfW offices and sites.</p>	
1	There must be copy of the OHS guidelines in all Project offices and revisions must be up to date.	H&S element
2	Safety meetings must be up to date and minutes kept on file.	
3	There must be an up to date Project Incident Summary book in the office.	
4	The Incident Reporting Matrix must be displayed and adhered too.	
5	The COIDA manual and forms must be available and used correctly.	
6	Accident Investigation Dockets must be kept at Area offices.	
7	There must be an appointed Health and Safety Representative in every contract team.	
8	Workplace Inspection Reports must be up to date and available.	
9	Incident Reports must be up to date and available.	
12.6	<p><b>Health and Safety training</b> The following minimum training levels are required:</p>	
1	H&S representatives and contractors must have completed the Phase 1&2 combined H&S course successfully.	H&S element
2	All managers must have completed the Phase 1&2 combined H&S course successfully.	
3	Designated Incident Investigators must have been appointed and must have completed the Incident Investigation training successfully.	

4	All senior managers must have completed the Incident Investigation training successfully.	
Specialized training for the aquatic plant control teams includes:-		
5	1 Water Safety Training	
	2 Life Saving Training	
	3 Waterborne Diseases	
	4 Environmental dangers relating to water bodies (wildlife, floods)	
	5 Boat handling	
6	Induction Training needs to be conducted (Duty to inform) and attendance records thereof kept on-site / regional office.	
7	Site visitors need to be inducted w.r.t. the relevant safety issues when arriving on-site.	
8	Safety toolbox talks must be conducted daily, and registered in the safety file.	
9	Teams to be trained on safe river crossing (not running across), covering of sharpened blades and working in pairs at a safe distance apart (buddy-system).	
10	PM to verify that Toolbox talks are conducted DAILY	
<b>12.7</b>	<b>Substance abuse</b>	
1	The use of any mind altering substances is not allowed on-site (e.g. alcohol, dagga). Managers and contractors must ensure that workers do not perform their duties under the influence of any narcotic, drug or other mind altering substance.	H&S element
2	Persons in the WfW programme must be made aware of the potential dangers of drug use and of the workplace policy regarding the use of drugs.	
<b>12.8</b>	<b>Working in close proximity to water-bodies and steep inclines</b>	
Where there is a possibility of drowning:		
1	1 Lifejackets must be available to the workers at risk of falling into the water.	
	2 Provision must be made to prevent workers from falling into the water.	
	3 Provision must be made for the rescuing of workers if they fall into the water.	
2	Where boats are used, they must comply with the relevant boating regulation, and at least carry the following:	
1	1 Rowing oars	

	2	Life Jackets	
	3	A sponge	
	4	An aluminium bucket	
3	Boats must be of sufficient size and strength to carry the relevant number of workers and their equipment without the risk of capsizing and sinking.		
4	Where work is conducted on steep inclines like high river banks, measures must be taken to prevent workers from falling.		
<b>12.9 Work environment stressors.</b>			H&S element 1.16
1	Assess the occurrence of temperature extremes and record extreme events or time periods and actions taken.		
For heat conditions at and above 30 degrees Celsius potentially for one or more hours:			
2	1	Provide shade.	
	2	Ensure hats are worn.	
	3	The supply of sufficient drinking water to the workers as per the safety standards.	
For cold conditions			
3	1	Ensure adequate clothing is worn.	
	2	If the temperature drops below 6 degrees Celsius for over four hours: stop work!	
	3	The supply of sufficient drinking water to the workers as per the safety standards.	
4	For wet conditions: ensure rainwear is issued.		
<b>12.10 Registers that need to be kept on site and updated daily where relevant and applicable:</b>			
1	Formwork and scaffolding registers.		
2	Biological agent records.		
3	Equipment performance test registers.		
4	Fire equipment registers.		
5	Content of first aid box registers.		
6	First aid treatment registers.		
7	Hand tool inspection register.		
8	Ladder inspection register.		

9	Portable electrical and mechanical equipment register.	
10	PPE register of issue.	
11	Safety induction registers.	
12	Safety inspection registers.	
13	Security / visitor access control register.	
14	Supply depot / stores and issuing registers.	
15	Vehicle inspection registers.	
16	Vehicle maintenance registers.	
<b>12.11</b>	<b>H&amp;S Representation and Meetings.</b>	
1	A H&S representative must be formally appointed per team.	H&S Act
2	Record of Project monthly H&S meetings.	
3	Record of Regional quarterly H&S committee meeting.	

13. FIRE FIGHTING AND PROTECTION - NATURAL & ENVIRONMENTAL HAZARDS		REFERENCE
<b>13.1</b>	<b>Fire Precautions on work sites</b> As a rule fires and smoking should not be allowed on work sites; when exceptions are made the following precautions must be applied:	
1	Smoking and fires only allowed in safe demarcated areas, designated by the contractor / manager / landowner.	
2	The contractor is responsible for ensuring that fires made are never left unattended and are completely extinguished after use.	
3	No fires at all are allowed in prohibited areas (including the working location) and in adverse weather conditions.	
4	Conditions of the landowners agreement and clearing contract i.r.o. fires, must be adhered to.	
5	Site specific reaction / evacuation rules must be applied in the case of wild fires.	
6	Basic appropriate fire fighting equipment must be available at each work site; a minimum of 5 fire beaters and 1 filled knapsack fire-fighting pump, or alternative suitable equipment.	
7	Where fuels and machines are used on site, the prescribed fire extinguishers in working condition must be available.	
8	Fire Fighting & Extinguishing Equipment inspected by the H&S Rep and recorded.	
<b>13.2</b>	<b>Projects in Fire Protection Areas (FPA) and / or involved in Fire Protection</b>	
1	If a project or project team is involved in fire protection, there must be a strategic trained team.	Fire Protection Standard
2	The Area Manager must draw up fire-fighting rules and these must be posted / available in offices and the field.	H&S element 3.06
3	In FPAs no fieldwork may take place during 'red' days.	
4	The project must be on the FPA communication network.	
5	The project must be a member of the FPA and attend meetings.	
<b>13.3</b>	<b>Fire precaution Training</b>	
1	Workers need to be trained in fire awareness and fire prevention methods.	
2	The site clerks need to be trained in incident and accident reporting procedures.	



3	Emergency Evacuation Procedures need to be communicated to the workers.	
<b>13.4</b>	<b>Site offices (where relevant) and Regional Offices.</b>	
1	Fire exit doors must open outwards.	
2	All exits must be clear and unobstructed.	
3	Extinguishers must be available and of the correct type, in case of emergencies.	
4	Fire marshals must be trained and appointed.	
5	The evacuation plan must consider measures for disabled persons and multistory buildings where relevant.	
6	Evacuation plan must be in place with practices recorded in a register.	
<b>13.3</b>	<b>Adverse weather conditions</b>	
1	No work in / near / on water bodies may take place during rain or lightning.	
2	The contractor must be informed concerning the weather conditions for each day infield.	
3	Contractors and teams must be informed of any release of water from dams higher up in the river system before a release takes place, this requires communication between WfW teams and DWAF managers of Dams.	
4	On dams, wind and wave action must be taken into consideration prior to entering the work area.	
<b>13.4</b>	<b>Wildlife</b>	
1	The Project Manager, Contractor and team must identify and record hazardous animals.	
2	Associations for endemic aquatic animals must be informed of activities. (eg. Yellow fish)	
3	Workers may not enter an area when dangerous animals are in the vicinity (closer than 500M) without the presence of a qualified, armed rifleman/guard. (crocodiles, hippopotamus, elephant or buffalo)	
4	The guard must remain on look-out throughout the day.	
5	Qualified guards must be sourced from DEAT, Parks or recognized authorities.	
6	Rifles and ammunition must be of an appropriate caliber, properly maintained and controlled.	
7	One rifleman must be available for every 15 workers.	
8	Rifleman must ensure that all 15 workers are visible at any given time.	

14. SOCIAL DEVELOPMENT		REFERENCE
<b>14.1</b>	<b>Community Profiles</b>	
1	Communities from where workers are sourced indicated on a map in the office.	
	Community profile displayed in the office, indicating:	
1	1 Poverty levels	
2	2 Sanitation	
3	3 Literacy	
4	4 Area-specific social problems	
3	Advisory committees in place.	
4	Local municipal and district boundaries marked.	
<b>14.2</b>	<b>Advisory Committees.</b>	
1	Minutes Indicating Advisory Committee received EPWP induction.	
2	Record of PM contact with municipal IDP forum/officer.	
3	Copy of municipal IDP on file.	
4	Exiting contractors profile documented.	
5	Record of Exiting opportunities explored with the municipal IDP officer.	
6	Exiting beneficiaries training needs profile determined and recorded.	
7	Exiting beneficiaries training completed according to the profile plan and recorded.	
7	Record of Community based project in place - e.g. food garden, craft industry.	
8	Record of Exited Workers and Exited Teams indicating their Exit Destination. (Team work, Individual work, Seasonal work, No work)	
<b>14.3</b>	<b>Gender mainstreaming.</b>	
1	Record of structured targeting of marginalised groups in place - e.g. race, gender, age, disability, single parent households, those living with HIV/Aids, rural areas, fostering orphans.	
2	Record of demographic profile of: each Team, each Project, the Region. (female, youth, disabled)	

<b>14.4</b>	<b>Project office.</b>
	Gantt chart displayed indicating -
1	1 Social Development plan on display in the office.
	2 List of SD events and days on display.
1	3 List of SD events and days - Planned vs Actual progress indicated and on target.
	4 List of clinics displayed for teams to access.
	5 List of registered child care facilities for teams to access (if any).
	Region specific Social Development interventions.
1	1 List of Region specific SD topics identified and implemented at Project level once every 6 months.
	2 Co-ordination and record of referrals on substance abuse.
2	3 Co-ordination and record of referrals on social grant claimants.
	4 Co-ordination and record of sessions by local government NGOs on SD topics.
	5 Co-ordination and record of interactions and partnerships with other institutions - e.g. NICRO.
3	Monthly SD report submitted and copy on file.
4	Gantt chart updated monthly and attached to the SD report.
<b>14.5</b>	<b>Primary health care.</b>
1	Record of primary health care training done with the teams - e.g. hygiene, nutrition.
2	Record of Tool-BoxTalk topics on Primary Health Care shared with the teams - e.g. personal hygiene, camping hygiene, drinking water, nutrition, food gardens, malaria, TB, other infectious or contagious diseases or conditions.
3	Record of training on Sexual Reproductive Health training done with the teams - e.g. contraception, STDs, child spacing etc.
4	A co-ordinated Primary health session must occur within each contractors team in conjunction with approved institutions at least once every six working months.
5	Workers must have access to local Dept Health clinics when they are available.
6	Basic health principles must be encouraged by project manager and contractor e.g. Washing of hands before meals.

14.6	HIV/AIDS program in place for each project.
1	WfW workplace policy on HIV/AIDS and Universal Precautions available and record of implementation.
2	Peer educators trained - 1 male, 1 female per team.
3	Record of 3 monthly peer educators intervention sessions per team.
4	HIV/AIDS sessions recorded on WIMS - treatment area ID, Tool-Box talk topic, date, time, number of females/males attended, item distributions and quantity, PM name and surname.
5	A co-ordinated HIV/AIDS session must occur within each contractor's team in conjunction with an approved institution. This must occur at least once every six working months.
6	HIV/AIDS Information, posters brochures etc, must be in evidence at each project.
7	Condoms available at work sites.

15. EMPLOYMENT		REFERENCE								
15.1	<p><b>Target groups according to the national employment standards</b> WfW employment must target poor, unemployed persons of previously disadvantaged communities in the prescribed ratios.</p>	Sample Transformation plan								
1	<p>Gender, youth and disability employment must conform to national standard across all job categories:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20px; text-align: center;">1</td> <td>60% Women</td> </tr> <tr> <td style="text-align: center;">2</td> <td>20% Youth (18 to 35)</td> </tr> <tr> <td style="text-align: center;">3</td> <td>2% Disabled</td> </tr> <tr> <td style="text-align: center;">4</td> <td>Only one person per household employed</td> </tr> </table>		1	60% Women	2	20% Youth (18 to 35)	3	2% Disabled	4	Only one person per household employed
1	60% Women									
2	20% Youth (18 to 35)									
3	2% Disabled									
4	Only one person per household employed									
2	Where equitable empowerment according to these standards is not yet realised, there must be a transformation plan to achieve them.									
3	The plan must have set targets within a reasonable time-frame and progress must be evaluated annually.									
4	Record available of number of: persons employed, employment record of each person									
15.2	<p><b>Minimum Regional wage enforced.</b></p>									
1	Contractors must pay the workers the wage agreed for the task. (Wage register)									
2	Value of the task must be based on the minimum regional wage.									
3	A wage agreement must be in place for each worker per contract detailing the rate, days and total wage to be paid.									
15.3	<p><b>Employment contract exist.</b> Employment contract must conform to the Special Public Works Contract standard.</p>	SPWP Act								
1	Contractors must have an employment contract with their workers.	Sample contract								
2	Workers must understand the contents of the contract.									
3	The grievance procedure and disciplinary code must be available and understood by the workers.									
15.4	<p><b>Contractors may only have one contracting team</b></p>									
1	Contractors can only have one contracting entity within the WfW Programme									
15.5	<p><b>Managers cannot have any financial involvement with the contractors</b></p>									

1	No financial involvement by any WfW staff member with any contractor	
2	Contractors cannot have any financial involvement with the workers, landowners or stakeholders	

16. COSTS		REFERENCE
<b>16.1</b>	<b>Costs Known</b>	KPI tables
1	Budgeted costs per hectare known (initial and follow-up)	
2	Actual costs per hectare known (initial and follow-up)	
3	Budgeted person days per hectare known (initial and follow-up)	
4	Actual person days per hectare known (initial and follow-up)	
5	The Project Manager and Contractor must have an acceptable method of calculating the budgeted and actual costs per hectare (person days/ha and Rands/ha).	
6	The operational costs must include the labour, herbicide, transport, equipment and running costs.	
7	Management costs must be known and indicated separately.	
<b>16.2</b>	<b>Costs &amp; person days per hectare within norms</b>	
1	Costs & person days must be within norms for the type of operation.	
2	Costs & person days must be in line with the APO / budget.	
3	The actual person days achieved must be evaluated regularly against the norm.	

17. TRAINING		REFERENCE
<b>17.1</b>	<b>Induction</b>	
1	All workers must receive orientation within 24 hours, and induction training within 1 month of starting work.	
<b>17.2</b>	<b>Compulsory job training</b>	
1	All training on the training matrix, including refresher courses, is compulsory.	Training Policy & matrix
2	All training on the training matrix must be provided to workers and contractors within the stated timeframe.	
3	Training will comply with the WFW Training Policy and matrix.	
<b>17.3</b>	<b>Training Plan &amp; Profiles</b>	
1	The Training Annual Plan of Operations must be displayed.	Training Plan & profile sample
2	The plan must be based on the National Standard.	
3	Each learner's profile must be plotted on the plan.	
4	All learner profiles must be captured on WIMS.	
<b>17.4</b>	<b>Training Records</b>	
1	All training capture sheets, attendance registers, evaluation forms, and certificates must be filed in the Regional Training Manager's office or Area office.	
2	All Department of Labour monitoring sheets, correspondence, financial records and training schedules must be filed in the Regional Training Manager's office or Area office.	
3	All training financial records (e.g. venue hire, lunch, transport, etc) must be filed in the Regional Training Manager's Office or Area office.	
4	All training provider reports must be filed in the Regional Training Manager's office or Area office.	
5	All training must be captured on WaterWorks within the stipulated time frame.	
<b>17.5</b>	<b>Training Reports</b>	
1	Training Monthly reports must be completed by the Regional Training Manager and submitted to both the Regional Programme Leader and National Training Unit by the tenth of each month.	
2	Ensure completed training is captured into WIMS monthly.	



3	Quarterly Training Reports must be submitted to the Department of Labour.	
4	National Training Evaluation Reports must be submitted to the National Training Unit for inclusion in the WfW Annual Report to the Department of Labour and other stakeholders.	
<b>17.6</b>	<b>Training Monitoring and Evaluation</b>	
1	All training courses to be monitored by a WfW staff member.	
2	All Monitoring reports must be filed with the Regional Training Manager.	
<b>17.7</b>	<b>Accreditation</b>	
1	All training must be aligned to unit standards, where possible.	
2	All training must be provided by accredited training providers, where possible.	

18. OVERALL IMPRESSIONS, PUBLIC AND WORKER PARTICIPATION		REFERENCE
<b>18.1</b>	<b>Active employee/contractor participation in project management</b>	
1	Workers must have a formalised forum through which they can make inputs into the overall management of the project (e.g. workplace committee).	
2	Work Place Committee meeting minutes must be available in the Project Managers Office.	
<b>18.2</b>	<b>Active forum for public participation in project: Advisory Committee</b>	
1	Advisory Committee meeting minutes must be available in the Project Managers Office.	
2	Advisory committee assist in the identification of a pool of contractors to be used by project.	
3	Advisory committee assist in identification of target groups for employment	
4	Community based forums should participate in the advisory committees as advisors as regards the prioritisation and implementation of social development issues.	
<b>18.3</b>	<b>Active forum for public participation in project: Working Groups</b>	
1	Working Groups meeting minutes must be available in the Project Managers Office.	
2	Meetings must be held at least every six working months	
3	Advisory committee / working groups assist in the identification of new infestations	
4	Advisory committee working group assist in advising aquatic weed project manager on suitable treatment methods, prioritization and implementation	
5	Advisory committee / working group assist in public awareness	
6	Reports must be given by aquatic and bio-control project managers at each meeting	
<b>18.4</b>	<b>Representing the WfW programme and image.</b> All persons, activities and facilities allied to WfW represent the public image of the programme and there must a conscious effort to improve this image.	
1	WfW offices, work sites and vehicles must be identified with the standard WfW signboards or stickers.	

2	Offices and work sites must be neat and well presented.	
3	Regional, Area and Project offices and stores complexes and their immediate surroundings must comply with the CARA regulations, i.r.o. alien invasive plants.	
4	WfW personnel and contractors must be identified by standard WfW attire; or business / I.D. cards.	

**C. Policies, Documents, Circulars and Notices for consideration**

**Treatment Methods Document**

**Herbicide policy**

- The non-use of diesel

Herbicide / Treatments Summary sheets

Frilling vs Felling – tall and / or dangerously sited trees

Tool use / method selection

Tool sharpening

Dangerous animal awareness

**OHS Policy and Act**

**Safety News Flashes**

- No. 07a/2005: Tree felling & Stump reading
- No. 01/2006: Safe working distances
- No. 09/2006: Lightning awareness

## D. Field Audit Sheet

<b>FIELD AUDIT SHEET – CLEARING OF ALIEN VEGETATION</b>
---

Treatment Area ID: \_\_\_\_\_ Contractor: \_\_\_\_\_ Date: \_\_\_\_\_

<b>PLANNING, REPORTING AND RECORD KEEPING</b>	<b>YES</b>	<b>NO</b>
1. Is the Contract document on site?		
2. Is a clear map of the Treatment Area available?		
3. Can the contractor identify the Treatment Area boundary on the ground?		
4. Has a Landowner's Agreement been completed for all properties within the Treatment Area?		
5. Is the original Timesheet up to date with details of new employees and those that have left?		
6. Is the daily production and herbicide usage recorded correctly on the prescribed form?		
7. Does the contractor have a copy of the corrective measures of the previous audit, and has he taken the required corrective actions?		
8. Are monthly Pay sheets available and correct?		
9. Is there a workers' committee in place?		
10. Are there valid contracts between the contractor and his/her workers in place for the duration of the tender period reflecting the amount of tender days and paid workdays?		
<b>Sub total:</b>		

<b>TRANSPORT</b>	<b>YES</b>	<b>NO</b>
1. Vehicles must display a valid license.		
2. All vehicles transporting people must display a C.O.F certificate.		
3. The driver must have a valid driver's licence verified by the local traffic authority.		
4. The driver must have a valid PDP certificate.		
5. Has the driver undergone an annual medical check up?		
6. Is there an up-to-date Daily Pre-trip Checklist available where faults are recorded?		
7. Are faults affecting the roadworthiness of the vehicle repaired immediately?		
8. Is there an up-to-date logbook available?		
9. Does the driver adhere to prescribed maximum loads? (SWB = 15 people standing or 11 people seated, including the driver; LWB = 17 people standing or 13 people seated, including the driver)		
10. Are benches secured if supplied?		
11. Are sufficiently strong railings provided? (350mm above seat level or 100mm above standing surface)		
12. Tools, equipment, herbicides and containers must be secured and isolated from the passengers.		
<b>Sub total:</b>		

<b>TOOLS AND EQUIPMENT</b>	<b>YES</b>	<b>NO</b>
1. Is the equipment suitable for the type of operation?		
2. Tools must have correct and secured handles and it must be in a safe working order.		
3. Tools must be properly maintained and sharpened regularly. A sharpening stone or file should be on site.		
<b>Sub total:</b>		

<b>HERBICIDES</b>	<b>YES</b>	<b>NO</b>
1. Is the correct method used for treatment?		
2. Are the herbicides registered for the species being treated?		
3. Are herbicides applied correctly, e.g. knapsacks or polycans?		
4. Are herbicides mixed according to the respective labels?		
5. Are the correct additives and dyes used according the respective labels?		
6. Are clean water being used for the mixing of the herbicide?		
7. Are weather conditions being taken into consideration, e.g. spray drift in windy conditions?		
8. Calibrations to be done where applicable to monitor application rates per hectare.		
9. No leaking equipment?		
10. Filters cleaned daily?		
11. Knapsack sprayers fitted with a 1 bar Pressure Regulator?		
12. Correct nozzles fitted?		
13. Proper padded harnesses used on knapsack sprayers?		
14. Lances to be secured to prevent damage during transport.		
15. Storage of herbicides in a designated, demarcated area? (Away from eating area; at least 20m away from water bodies; away from indigenous vegetation, crops and gardens.)		
16. No leaking containers?		
17. Containers used UV resistant and stored in the shade?		
18. Containers used clearly marked, showing type of herbicide and the mixture percentage?		
19. Containers standing on a type of absorbent material in field?		
20. Refilling done by using a funnel or spout on the absorbent material?		
21. Water from rinsing the equipment recycled for fresh mixtures?		
22. No washing or rinsing of equipment and containers done in natural water bodies?		
23. Empty containers returned to stores?		
24. Sufficient clean water for washing purposes?		
25. Bucket or bowl available on site?		
26. Soap and clean towel available on site?		
27. Have the herbicide applicators received the WfW Herbicide Applicators course?		
28. Have the other workers received Herbicide Awareness training?		
<b>Sub total:</b>		

<b>METHOD OF WORK</b>	<b>YES</b>	<b>NO</b>
1. Appropriate clearing methods and specifications applied (most cost effective)?		
2. Team structure and ration correct for optimum productivity?		
3. Individuals spaced to facilitate effective control by the supervisor?		
4. Stump height below 10cm?		
5. Seedlings targeted for foliar application at knee height or lower?		
6. Coppice targeted for foliar less that head height?		
7. At least 90% of plants targeted are treated with herbicide?		
8. Debris along stream banks removed to above the flood line?		
9. Work methods conforming to the Contract requirements?		
10. Have all workers undergone plant identification training?		
<b>Sub total:</b>		

ENVIRONMENTAL AWARENESS	YES	NO
1. Site clean and free of litter?		
2. Spade and toilet paper available on site?		
3. Human waste and paper buried at least 20m away from all water bodies?		
4. Clean water and soap available for washing hands?		
5. Existing access routes used, unless permission obtained from respective landowner?		
6. No indigenous plants or animals disturbed or killed?		
7. Alien trees with bird nests killed standing?		
<b>Sub total:</b>		

HEALTH AND SAFETY	YES	NO
1. Trained First Aid officer on site with a valid certificate?		
2. Is there an alternative First Aid officer on site with a valid certificate?		
3. Complete First Aid Kit available, fully stocked according to the standard stock list?		
4. Is there an up-to-date Dressing Book available?		
5. Emergency numbers pasted in the lid of the First Aid Kit?		
6. Effective IOD system in place (forms available)?		
7. Is there a trained Safety officer with a valid certificate on site?		
8. Did the Contractor receive Phase 1 Health and Safety training?		
9. Correct PPE worn?		
10. WfW Safe Working Procedures on site (used in Toolbox Talks)?		
11. Documented proof of Safety Talks with an attendance register?		
12. Workplace Inspection Reports up to date and available?		
13. Incident Reports up to date and available?		
14. No narcotic substances on site or used during working areas?		
<b>Sub total:</b>		

FIRE PROTECTION	YES	NO
1. No open fires allowed at any worksite?		
2. Smoking only allowed in areas designated by the contractor/landowner/project manager?		
3. 5 Fire beaters and 1 filled Venfire pump available on site?		
4. 5 Rakehoes available when working in a plantation area (in addition the the above)?		
5. Prescribed Fire Extinguishers available where fuels and machines are used?		
<b>Sub total:</b>		
<b>GRAND TOTAL:</b>		/89
<b>Percentage:</b>		

\_\_\_\_\_  
Project Manager

\_\_\_\_\_  
Contractor

\_\_\_\_\_  
Area Manager

**CORRECTIVE MEASURES**

DESCRIPTION	ACTION BY	DEADLINE	CLOSED OUT

\* Duplicate to be handed to the Contractor

\_\_\_\_\_   
Project Manager

\_\_\_\_\_   
Contractor

\_\_\_\_\_   
Date

\_\_\_\_\_   
Area Manager



APPENDIX 5. DEA 2015 Alien Invasive Control Guidelines

# MONITORING, CONTROL & ERADICATION PLANS

GUIDELINES FOR SPECIES LISTED AS INVASIVE IN TERMS OF SECTION 70 OF NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, 2004 (ACT NO. 10 OF 2004) (NEMBA) AND AS REQUIRED BY SECTION 76 OF THIS ACT

30 September 2015

Biosecurity  
Department of Environment Affairs  
Private Bag X4390, CAPE TOWN, 8000



environmental affairs

Department:  
Environmental Affairs  
REPUBLIC OF SOUTH AFRICA

**GUIDELINES FOR  
MONITORING, CONTROL AND ERADICATION PLANS  
AS REQUIRED BY SECTION 76 OF THE  
NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, 2004  
(ACT NO. 10 OF 2004) (NEMBA)  
FOR SPECIES LISTED AS INVASIVE IN TERMS OF SECTION 70 OF THIS ACT**

30 September 2015

Biosecurity  
Department of Environment Affairs  
Private Bag X4390, CAPE TOWN, 8000

## CONTENTS

1. Executive Summary
2. The Legislative Background to these Guidelines
3. The Framework Guidelines
  - 3.1 Compiling the List of Invasive Species for the Area
  - 3.2 Describing the parts of the relevant land that are infested with Listed Invasive Species
  - 3.3 Assessing the extent of infestations
  - 3.4 Reporting on the efficacy of previous control or eradication measures
  - 3.5 The current measures to monitor, control or eradicate Listed Invasive Species
  - 3.6 The measurable indicators of progress and success, and indications of when the Control Plan is to be completed

**Addendum A:** A Generalised Table of Contents for a Monitoring, Control and Eradication Plan

### Annexes to these Guidelines

- a. **Annex 1.** [Government Notice, Regulation No. 598 National Environmental Management: Biodiversity Act \(10/2004\): Alien and Invasive Species Regulations, 2014](#) (Government Gazette No. 37885).
- b. **Annex 2.** [Government Notice, No. 599 National Environmental Management: Biodiversity Act \(10/2004\): Alien and Invasive Species List, 2014](#) (Government Gazette No. 37886)

These Guidelines are relevant regardless of the type of statutory body (including municipal authorities) that is responsible for the land parcel, the size of the land parcel, the ecosystems it includes, and the type of Listed Invasive Species) that are to be managed in the land parcel.

## 1. Executive Summary

Management Authorities of all Protected Areas and of Organs of State (e.g. municipalities) are obliged in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) and its Regulations (Alien and Invasive Species Regulations, 2014). Section 76 of the Act requires that all Protected Area Management Authorities and all other “Organs of State in all spheres of government”, including all municipalities, draw up an “Invasive Species Monitoring, Control and Eradication Plan for land under their control,” [Hereafter termed a Control Plan]. These plans have to cover all Listed Invasive Species in terms of Section 70(1) of this Act.

The Guidelines have been drawn up to follow the legal requirements of the Act. They have been kept as simple and straight-forward as possible with minimal use of specialized terminology and acronyms. Hypothetical examples have been inserted wherever this has been thought to be useful. The Guidelines are intended to be usable by any land manager: However, the identification of Listed Invasive Species and some of the more technical aspects, such as measuring the extent of invasive species infestations and formulating optimal control strategies, or choosing optimal control techniques, should preferably be done either by an expert trained in the management of invasive species or with the assistance and guidance of such an expert.

The Guidelines include a generalised Table of Contents of a Control Plan, as a template which Management Authorities may wish to follow. There might have to be deviations from this template to meet the particular requirements of the area for which the plan is being drawn up. The Department of Environmental Affairs will, in time, be loading up examples of Control Plans on its website, to give practical expression to these Guidelines.

## 2. The Legislative and Policy Background to these Guidelines

The Regulations on the management of Listed Alien and Invasive Species under the National Environmental Management: Biodiversity Act [hereafter termed "NEMBA"] were promulgated on 1 August 2014 as Regulation Gazette No. 10244 in Volume 590 of the South African Government Gazette (Publication No. 37885). These regulations came into effect on 1 October 2014. (They are annexed to this report as Annex 1.)

In Chapter 4, "National Framework Documents", Section 8, entitled "Invasive Species Monitoring, Control and Eradication Plans", states *inter alia* that "The Minister must - (a) within one year of the date on which these regulations come into effect, develop guidelines for the development of Invasive Species Monitoring, Control and Eradication Plans for Listed Invasive Species as contemplated in section 76 of the Act".

The Listed Invasive Species were also published on 1 August 2014 as Government Notice No. 599 National Environmental Management: Biodiversity Act (10/2004): "Alien and Invasive Species List, 2014" also in Volume 590 of the South African Government Gazette (Publication No. 37886). In terms of the Act's Section 70 (1), 559 species /groups of species were listed (they are annexed to this report as Annex 2). It is the management of these species [hereafter termed "Listed Invasive Species"] that is covered by this Framework Guidelines Document. These Lists also came into effect on 1 October 2014. However, the Lists will be regularly updated, in order to correct nomenclature, and addressing other changes to the Listed Invasive Species. The first amended Lists are about to be published in the Government Gazette. Further updates will occur, and will be able to be found on the website after publication.

NEMBA Sections 75 and 76 are very specific in terms of who must develop these Invasive Species Monitoring, Control and Eradication Plans, what the plans must include and how they should be implemented, *i.e.*:

### ***"Control and eradication of listed invasive species"***

**75.** (1) *Control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs.*

(2) *Any action taken to control and eradicate a listed invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment.*

(3) *The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating or re-establishing itself in any manner.*

(4) *The Minister must ensure the coordination and implementation of programmes for the prevention, control or eradication of invasive species.*

(5) *The Minister may establish an entity consisting of public servants to coordinate and implement programmes for the prevention, control or eradication of invasive species.*

### ***Invasive species control plans of organs of state***

**76.** (1) *The management authority of a protected area preparing a management plan for the area in terms of the Protected Areas Act must incorporate into the management plan an invasive species control and eradication strategy.*

(2) (a) *All organs of state in all spheres of government must prepare an invasive species monitoring, control and eradication plan for land under their control, as part of their environmental plans in accordance with section 11 of the National Environmental Management Act. "*

*(b) The invasive species monitoring, control and eradication plans of municipalities must be part of their integrated development plans.*

(3) *The Minister may request the Institute<sup>1</sup> to assist municipalities in performing their duties in terms of subsection (2).*

(4) *An invasive species monitoring, control and eradication plan must include -*

*(a) a detailed list and description of any listed invasive species occurring on the relevant land;*

*(b) a description of the parts of that land that are infested with such listed invasive species;*

*(c) an assessment of the extent of such infestation;*

*(d) a status report on the efficacy of previous control and eradication measures*

*(e) the current measures to monitor, control and eradicate such invasive species; and*

*(f) measurable indicators of progress and success, and indications of when the Control Plan is to be completed."*

In preparing its guidelines for Control Plans by Protected Area Management Authorities and Organs of State, the Department of Environmental Affairs has taken into cognizance all other pertinent international and national legal requirements. These include international treaties, national laws, provincial ordinances and municipal bylaws and other relevant legislation. These are summarized in **Addendum B**

The Control Plans for every Protected Area and every other relevant land area managed by an Organ of State (including municipalities) have to be compiled and a copy of the plan submitted to SANBI within a year of these Framework Guidelines having been posted on the Department of Environmental Affairs' website on 30 September 2015.

<sup>1</sup> "The Institute" in terms of NEMBA is the South African National Biodiversity Institute (hereafter referred to as SANBI).

### **3. The Framework Guidelines**

#### **3.1 *Map the parcels of land under the control of the Organ of State or Protected Area Management Authority, in management unit compartments***

A Protected Area Management Authority must map the Protected Area, and break it into logical management unit compartments. These compartments should be of a size and structure that allows for coherent management interventions. An example might be a quinary catchment area, or a riparian area, or a geographically coherent part of the Protected Area. All parts of the Protected Area should be mapped, and the Listed Invasive Species known to be in the compartment will be indicated in the accompanying table (see 3.2).

An Organ of State Management Authority should similarly map the land parcels under their control (i.e. those for whose management they are responsible), and break these into logical management unit compartments. They too should be of a size and structure that allows for coherent management interventions. Here an example might be a suburb in a municipality, or a riparian area.

#### **3.2 *Compiling the List of Invasive Species for each management unit compartment***

The Managing Authorities must compile a comprehensive list of the Listed Invasive Species under Section 70(1) of NEMBA that occur on the relevant land area (see Annex 2 for the full list). These should follow the sequence of the Lists, and the authorities should indicate the (a) scientific name, (b) common name(s), (c) Category (i.e. 1a, 1b, 2, 3), (d) average density, (e) prioritization of each species, and (f) risk of potential invasion, in that management unit compartment. The Department of Environmental Affairs will provide a general description of each Listed Invasive Species on its website.

In terms of the average densities, the Department of Environmental Affairs recommends that the Management Authorities ascertain the extent of cover by each of the Listed Invasive Plant Species in a management unit, in terms of the percentage of land that is invaded by the species. For larger tree species, it is recommended that an estimate be given for the percentage canopy cover by each species on the land under their control in the management unit compartments. For herbaceous species, an estimate should merely be made of the percentage of land invaded by each species on the land under their control in the management unit compartments.

In terms of Listed Invasive Animal and Microbial Species, it is recommended that the Management Authorities indicate presence or absence in the management unit compartments, and (where possible) the estimated numbers..

In terms of the risk of invasion, it is recommended that Management Authorities indicate those Listed Invasive Species that are not currently known to be invading in a management unit compartment, but which have the potential to invade in the area (to aid early detection and rapid response).



For the major category of Listed Invasive Species, namely Terrestrial and Freshwater Plants (currently 379 species or groups of species out of the total of 559 listed over all groups of organisms), the Managing Authority should utilise the readily available distributional data included in the Southern African Plant Invaders Atlas<sup>2</sup> to create a list of known or likely Invasive Species for their particular area. For some of the more important woody plant invaders, a national mapping exercise has been done using remote sensing<sup>3</sup>.

### **3.3 Describing the prioritization of the land parcels in the management unit compartments**

The Managing Authority should describe the parts of the relevant land area that are infested with the various Listed Invasive Species in a manner which aids the prioritization of their monitoring and control. This may relate to areas of high biodiversity importance, water security, risk of wild fires, erosion, siltation and flooding, and other similar indicators for prioritization. Management Authorities are referred to the indications of biodiversity and environmental assets within municipalities and protected areas, on the SANBI website.

### **3.4 Assessing the extent of infestations**

The Managing Authority should estimate the extents of the infestations of each of the Listed Invasive Species that are known to be present in the relevant area. The estimates of extent are best expressed in quantitative terms such as “Square-kilometres infested” or “Hectares infested” or “Number of individuals” or “Square metres of plant cover”. It is normally impossible to measure the extent of an infestation perfectly so that even the best measure will still be an approximation. It is always important to quantify the extent in such a way that different people will be able to repeat the quantification in the future and generate comparable measures such that they can see whether the infestation is expanding or contracting. The measurement of extent is also crucial to the calculation of (a) the severity of the impacts of the invasive species on the invaded area, and of (b) how much effort will be required to control the infestation.

In particular, the Managing Authority must indicate where clearing has taken place, and track the necessary follow-up clearing work that must be detailed and planned for.

### **3.5 Reporting on the efficacy of previous control or eradication measures**

The Managing Authority must compile a section of the Control Plan in which a brief history of past efforts at controlling the Listed Invasive Species within the relevant land area for the management unit compartments is presented. This historical account should be based on the best available information (if there is no such information available the Management Authority must simply state this to be the case). The purpose of this section of the Control Plan is to ensure that lessons that have been learned in past control efforts are not simply lost, but instead are built upon to provide the best possible prospects of the success in the implementation of the current plan. The Department of Environmental Affairs will make available information on clearing work through its Working for Water programme, where appropriate.

<sup>2</sup> See [http://www.arc.agric.za/arc-ppri/Pages/Weeds%20Research/Geographical-distribution-of-IAPs-in-southern-Africa-\(SAPIA\)-.aspx](http://www.arc.agric.za/arc-ppri/Pages/Weeds%20Research/Geographical-distribution-of-IAPs-in-southern-Africa-(SAPIA)-.aspx) - To learn more about SAPIA see its newsletters at <http://www.invasives.org.za/resources/sapia-news.html#2006>

<sup>3</sup> Kotzé, J.D.F., *et al.* (2010). National Invasive Alien Plant Survey. Report Number: GW/A/2010/21. Agricultural Research Council: Institute for Soil, Climate and Water, Pretoria.

### **3.6 *The current measures to monitor, control or eradicate Listed Invasive Species***

The most important section of the Control Plan is this section which details what is actually being done to limit the undesirable impacts of the Listed Invasive Species and what is being planned to be done in the near future in the relevant area. The Control Plan should be both as an annual plan of operation and for a minimum of five years.

Based on the size of the relevant area, the number of species of Listed Invasive Species present in the area, the characteristics of these species (including the severity of their known or predicted impacts and the ease with which they can be controlled) as well as the extent of their infestations, the first decisions that need to be made are (a) which of the Listed Invasive Species to prioritise for management and (b) what the objective of this management should be. In particular, one has to decide whether the Listed Invasive Species is still capable of being totally eradicated from the relevant area (this local eradication is termed “extirpation”) and will be used in these Guidelines from here on) or whether the species is so well-established or so numerous in the relevant area (or in the relevant area’s immediate vicinity such that reinvasion of the relevant area is extremely likely) that such extirpation is not feasible. In this latter case, which is generally the case for the majority of Listed Invasive Species (except for Category 1a species) in the majority of areas in which they are found, very important decisions have to be made as to (c) what quantifiable level of infestation of the relevant area by the Listed Invasive Species will be the target level for the control actions that are to be undertaken and (d) over how many years will it be planned to reach this target level.

Regardless of whether it is extirpation or control to below a specified level of infestation that is the agreed objective of the Control Plan, it is extremely important that a monitoring system be put in place. This monitoring should allow the Managing Authority to know (a) how the extent of the targeted Listed Invasive Species infestation is changing over time and (b) how well the management techniques being employed are working to kill or reduce the vigour of the targeted species. Ideally the monitoring system should also enable the Managing Authority to say how the desirable benefits (e.g. to the relevant area’s biodiversity assets or to its ecosystem services, such as streamflow) are increasing in response to the control of the Listed Invasive Species.

Two crucial components of any effective Monitoring Programme are (a) the data storage system to ensure that the data generated by the monitoring activities are not lost and are readily accessible, and (b) the evaluation system that ensures that these monitoring data are analysed and then used to adapt the Control Plan in the light of the insights gained through this analysis if any such adaptation is necessary.

### **3.7 *The measurable indicators of progress and success, and indications of when the Control Plan is to be completed***

This section of the Control Plan must tabulate for each of the Listed Invasive Species or groups of species that is to be managed in the relevant area the indicators that are to be used to evaluate the success of the control programme.

In order for the progress of the plan to be accurately assessed, it is important that a timeline be created for the achievement of predetermined levels of each of these measurable indicators. For example, one might decide that by the end of Year 1 of the Listed Invasive Species Control Plan the canopy cover of Listed Invasive Plant Species in the relevant area will be reduced by 25% of its initial value, by 50% of this initial value by the end of Year 2, by 70% by the end of Year 3, and by 90% by the end of Year 4. One could also say that the

final target level for this canopy cover reduction would be 95% and that this would be achieved by the end of Year 5. The achievement of this level would be considered to be indicative of a successful 5-year control programme, following which the relevant area would be considered “Cleared” and would be subjected only to low-level maintenance clearing for the indefinite future.

It is essential to include an indication of budget allocated and budget spent on Listed Invasive Species in each financial year, and an indication of the source(s) of the funding.

## Addendum A

### A Generalised Table of Contents for a Monitoring, Control and Eradication Plan

The Control Plan should have a Table of Contents that will in general look something like the following (there will have to be local adaptations to cater for particular unique aspects of the land parcel and/or the type of Listed Invasive Species being managed):

**1. Executive Summary**

An overview of the key points in the Control Plan of the Protected Area or Organ of State;

**2. Introduction**

The land parcel under the control of the Protected Area or Organ of State; key vulnerabilities to invasion (e.g. water, fire, biodiversity); risks of invasions; regulation of invasives on adjacent private land; management history; and, current management objectives<sup>4</sup>.

**3. Maps of the Management Unit Compartments in land under the control of the Protected Area or Organ of State**

Each management unit compartment that makes up the land under the control of a Protected Area or Organ of State, must be depicted in a map, A legend must indicate the scale of the map, and other information that makes specific management options possible (e.g. erf numbers; the size of the land in hectares).

**3. A Table of Listed Invasive Species in each Management Unit Compartment**

The table of Listed Invasive Species for each management unit compartment should indicate the (a) scientific name, (b) common name(s), (c) Category (i.e. 1a, 1b, 2, 3), (d) level of invasion (i.e. estimated percentage cover) for plants, or estimated numbers of animals, or presence of microbes), (e) prioritization of each species, and (f) risk of potential invasion, in that management unit compartment. An example is given in the table below.

<sup>4</sup> The appropriate IAS Management Strategy and hence IAS Management Plan will depend to a large extent on the land parcel's overall management objectives, e.g. a National Park will have a very different IAS strategy and IAS management plan to those of a road reserve or of a military training ground.

Table 3.1: The Listed Invasive Species in Management Unit Compartment X:

Group	Species name	Common name	NEMBA Category	Estimated % cover	Prioritization (/10)	Risk of Invasion
Plants	<i>Acacia mearnsii</i>	Black wattle	2 but 1(b) here	30%	High (8)	n/a
	<i>Chromolaena odorata</i>	Triffid Weed	1(b)	0%	Low (0)	High
Birds	<i>Anas platyrhynchos</i>	Mallard Duck	2 but 1(b) here	Up to 40 specimens <sup>5</sup>	Medium (4)	n/a
etc.						

The Managing Authority must indicate where clearing has taken place, and track the necessary follow-up clearing work that must be detailed and planned for.

It is also important to bear in mind that some of the listed species are not regulated in specific circumstances. For example, large specimens of listed gums trees do not need to be cleared in certain urban circumstances. This should be clear from the Lists in **Addendum B**.

**4. Describing the prioritization of the land parcels in the Management Unit Compartments**

The Managing Authority must describe the parts of the relevant land area that are infested with the various Listed Invasive Species in a manner which aids the prioritization of their monitoring and control. This may relate to areas of high biodiversity importance, water security, risk of wild fires, erosion, siltation and flooding, and other similar indicators for prioritization. Management Authorities are referred to the indications of biodiversity and environmental assets within municipalities and protected areas, on the SANBI website.

**5. Reporting on the efficacy of previous control or eradication measures**

The Managing Authority must compile a section in the Control Plan in which a brief history of past efforts at controlling the Listed Invasive Species within the management unit compartments of the relevant land area is presented. This historical account should be based on the best available information (if there is no such information available the Management Authority must simply state this to be the case). The purpose of this section of the Control Plan is to ensure that lessons that have been learned in past control efforts are not simply lost, but instead are built upon to provide the best possible prospects of the success in the implementation of the current plan. The Department of Environmental Affairs will make available information on clearing work through its Working for Water programme, where appropriate.

Table 5.1: History of past control of Listed Invasive Species in the Land Parcel

Group	Species name	Common name	Past Control Efforts	Nature of records
Plants	<i>Acacia mearnsii</i>	Black wattle	Controlled since 2002 – infestation halved since then now mostly regeneration from seedbank	Data from files of Working for Water Project carried out in the Land Parcel
	<i>Chromolaena odorata</i>	Triffid Weed	Unknown	Not yet definitely recorded – only suspected ex SAPIA
Birds	<i>Anas platyrhynchos</i>	Mallard Duck	Not controlled yet in the Land Parcel	Personal Communication from Municipal Manager
etc.				

<sup>5</sup> The Biennial Coordinated Waterbird Counts administered by the Animal Demography Unit of the University of Cape Town (see <http://cwac.adu.org.za/>).

7. Targets and timelines for the Control Plan

It is vital that clear objectives are set for Control Plans, and that this is done from the outset. These will need to be modified on an ongoing basis, owing to the propensity of invasive species to spread and grow, as well as the biosecurity risk of new invasive species coming into the area. It is also likely that climate change will alter the invasiveness of species already in the area. Moreover, certain invasive species have a “lag time” (sometimes called, “long fuse, big bang”), staying non-invasive for a long period before exploding as new invasives in an area.

A Control Plan should ideally begin with a goal or goals. Moreover, the goals should be “SMART”, management will be guided by goals that are SMART – i.e.

**Specific** (the nature and level of the performance required must be clearly identified);

**Measureable** (the indicators chosen must be meaningful, easily understood and measurable);

**Assignable** (who will carry out the actions?);

**Realistic** (what can realistically be achieved, given the available resources?); and,

**Time-bound** (the timeframe for the achievement of goals must be clear).”

Table 7.1 SMART goals for the control of Listed Invasive Species in the Management Unit Compartment:

Group	Species name	Common name	Specific Goal	Measurable Goal	Assignable Goal	Realistic Goal	Time-bound Goal
Plants	<i>Acacia meamsii</i>	Black wattle	Reduce total area infested to less than 100 ha,	Area systematically cleared to less than 100 ha.	Work to be done through EPWP Wage Incentive, managed by the Parks & Gardens Branch.	Budget secured to ensure that approximately 100 ha of invading black wattles can be cleared per year by the EPWP team.	Infestation down to 400 ha by end of Year 1; 300ha by end of Year 2; 200 ha by end of Year 3; to less than 100 ha by end of Year 4.
	<i>Chromolaena odorata</i>	Triffid Weed	Local extirpation within first season of its arrival	Early detection surveys of the entire land parcel at least once a year and the immediate removal of all establishing plants before the species can flower	Managed by Early Detection capacity through EPWP.	Major communication drive to ensure land-owners help with the early detection of the species in the area.	Annual assessments and reports on findings. Immediate treatment of any incursions of triffid weed,
Birds	<i>Anas platyrhynchos</i>	Mallard Duck	Local extirpation of existing population	Entire population to be captured within first six months of the programme and removed. Annual surveillance and immediate removal of any new arrivals thereafter.	Work to be undertaken by Parks & Gardens staff.	Careful engagement with public to gain understanding of need for this action. Staff capacity and training to do the work.	Removal in first six months. Annual surveys thereafter.
etc.							

It is important to set time-bound goals over the medium-term. A Control Plan should firstly be an annual plan of operation. This is because of the strong likelihood of the spread and growth of invasives in parts of the area that cannot be cleared; the possible introduction of new invasive species; the modification of the problems posed by invasive species through a wild fire, or through flooding that impacts on riparian areas; climate change influences, and other uncontrolled variables.

As practical as it is to work within the challenges of an annual plan of operation, there must be medium- and long-term planning, capacity building, advocacy, research, budgeting and other planned interventions.

**8. Responsibilities and reporting requirements of the Control Plan**

Linked to the SMART goals should be an outline of the staff capacity for the Control Plan; the reporting lines and the reporting frequency (e.g. what is required in terms of monthly reports, annual reports, five-yearly assessments, etc.). Without this being well (and clearly) established at the outset of the control programme, there can be no accountability for the success (or failure) of the programme.

**9. The Methods to be employed in the Control Plan**

In section 7.4 of the template, control methods are to be described. A range of different management practices should be strategically combined to achieve the goals of management. The strategic combination of all available and appropriate methods may optimise the prospect of achieving stated goals. Guidance with respect to best control methods will be provided through the Working for Water Programme, on the Department of Environmental Affairs’ website<sup>6</sup>.

Table 9.1: Methods to be employed for the control of Listed Invasive Species in the Land Parcel

Group	Species name	Common name	Control Methods	Source for Control methodology
Plants	<i>Acacia mearnsii</i>	Black wattle	Chainsaw removal of large trees with immediate arboricide treatment of cut stumps. Knapsack spraying of coppice and seedling regeneration.	Working for Water Programme’s approved methods for the control of <i>Acacia mearnsii</i> .
	<i>Chromolaena odorata</i>	Triffid Weed	Manual removal of all young plants found, ensuring all roots are removed.	Working for Water Programme’s approved methods for the control of <i>Chromolaena odorata</i> .
Birds	<i>Anas platyrhynchos</i>	Mallard Duck	Walk-in/Swim-in duck traps followed by euthanasia of all captured birds.	Provincial Conservation Agency to provide traps and expertise. Removal to be in accordance with humane standards.
etc.				

Note that the control methods may include biological control, fire, suppression by indigenous or other vegetation, predation, chemical control, mechanical control, labour-intensive clearing, and the use of heavy machinery.

<sup>6</sup> See also Wittenberg, R & Cock, MJW (2001). Invasive alien species: A toolkit of best prevention and management practices. CAB International, Wallingford, UK.

**10. Monitoring and Evaluation of the Control Plan**

This section should detail what is to be recorded about the Listed Invasive Species and about the implementation of the Control Plan in the land parcel; how and how frequently these data are to be collected; how the data are to be stored, and how they are to be analysed. The frequency of the analyses and their evaluation and feedback to the Managing Authority should also be recorded.

**11. References**

To be compiled, as relevant.

**12. List of Annexes**

To be compiled, as relevant.



APPENDIX 6. NEMBA AIP LISTS 2020.



## forestry, fisheries & the environment

Department:  
Forestry, Fisheries and the Environment  
**REPUBLIC OF SOUTH AFRICA**

### ***ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY FOR THE CONTROL OF ALIEN INVASIVE SPECIES***

Originated By:		Reviewed By:	Recommended By:	Approved By:
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<b>Signature:</b>				
<b>Date:</b>				

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DOCUMENT CONTROL PAGE

Document Control Page	
Document Title	Environmental Programmes Pesticide Policy
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**APPROVAL**

\_\_\_\_\_

**Name:**

**Designation: Director-General**

**Date:** \_\_\_\_\_

## TERMINOLOGY

## Abbreviations

Acronym	Meaning
AIS	Alien Invasive Species
CD: NRM	Chief Directorate: Natural Resource Management
COIDA	Compensation for Occupational Injuries and Diseases Act (COIDA) (Act 130 of 1993)
DDG	Deputy Director General
DFFE	Department of Forestry, Fisheries and the Environment
DG	Director General
D: N, S & WP	Director: National, Southern & Western Programmes
EDC	Endocrine disrupting chemical
EP	Environmental Programmes
EPWP	Expanded Public Works Programmes
ESRA	Environmental Social Risk Assessment
FAO	Food and Agriculture Organization
GHS	UN Global Harmonization System of Classification and Labelling of Chemicals, known as the Purple book
HA	Hectare
HHP	Highly hazardous pesticide
IPM	Integrated Pest Management
MANCO	Management Committee
NEM:BA	National Environmental Management: Biodiversity Act
NRM	Natural Resource Management
OHS	Occupational Health and Safety
PIC	Prior informed consent
POE-T	Polyethoxylated tallow amine
PPE	Personal Protective Equipment
SCM	Supply Chain Management
SDS	Safety Data Sheet
SP	Service Provider
SPCA	Society for the Prevention of Cruelty to Animals
WFW	Working for Water
WHO	World Health Organization

## Terminology

Terminology	Definition
Absorption route	Includes ingestion, inhalation or absorption through the skin or mucous membranes of the pesticide
Acute toxicity	Acute toxicity refers to those adverse effects occurring following oral or dermal administration of a single dose of a substance, or multiple doses given within 24 hours, or an inhalation exposure of 4 hours.
Bioaccumulation	Bioaccumulation is the process by which toxins enter the food web by building up in individual organisms
Biological exposure index	Value for assessing biomonitoring results, intended as a reference guideline for use in the likelihood of adverse health effects. It generally represents the level of metabolites that are most likely to be observed in the specimens collected from employees exposed to pesticides with

	inhalation exposure at the occupational exposure limit or body burden threshold
Biomagnification	Biomagnification is the process by which toxins are passed from one trophic level to the next (and thereby increase in concentration) within a food web.
Biomonitoring	Biomonitoring is a tool of health-related environmental monitoring with which populations are examined for their exposure to pollutants from the environment using bioassays. A component of medical surveillance.
Biopesticide	Biopesticides are certain types of pesticides derived from such natural materials as animals, plants, bacteria, and certain minerals.
Carcinogenicity	Is any pesticide or mixtures of pesticides that induces cancer or increase the incidence of cancer as classified by GHS as either category 1 (known carcinogen) or category 2 (suspected carcinogen) and falls in hazard group 2
CAS number	Chemical identity number or name given to each pesticide which is its unique identifying number in accordance with the nomenclature systems of the International Union of Pure and Applied Chemistry
Container Management Programme	The Container Management Programme should provide for the safe, effective and responsible management of all of the empty pesticide containers from the collection to the disposal.
Developmental and reproductive toxicity	<b>Developmental toxicity</b> pertains to adverse toxic effects to the developing embryo or foetus. Chemicals cause developmental toxicity by two ways. They can act directly on cells of the embryo or foetus causing cell death or cell damage, leading to abnormal organ development. A chemical might also induce a mutation in a parent's germ cell which is transmitted to the fertilized ovum. Some mutated fertilized ova develop into abnormal embryos. <b>Reproductive toxicity</b> is defined as adverse effects of a chemical substance on sexual function and fertility in adult males and females, as well as developmental toxicity in the offspring
Ecotoxicity	Ecotoxicology is the study of toxic effects caused by natural or man-made substances on biota.
Engineering control measures	Control measures that remove or reduce exposure of persons to pesticides by means of engineering methods, a step in the Hierarchy of Control
Environmental fate	The environmental fate of pesticides depends on the physical and chemical properties of the pesticide as well as the environmental conditions. ... Once a pesticide has been released into the environment, it can be broken down by exposure to sunlight (photolysis) exposure to water (hydrolysis)
Exposed	Exposed to a highly hazardous pesticide or Hazardous chemical agent
GHS concentration limit	Minimum concentration of a pesticide, expressed as a percentage to trigger the classification that a pesticide can be classified as highly hazardous
Hazard class	The nature of a physical, health or environmental hazard under the GHS
Hazard classification	GHS hazard classes and hazard categories assigned to various pesticides
Hazard category	A division of the hazard criteria within the hazard class in the GHS where these hazard categories compare hazard severity within the hazard class, this is not a comparison of hazard categories
Hazard pictogram	Graphical composition, including a symbol plus graphical elements such as border, background pattern or colour that is intended to convey specific



	information, that is assigned in the GHS to a hazard class or hazard category
Hazard statement	A statement assigned in GHS to a hazard class or hazard category describing the nature of the hazards of the pesticides, including degree of hazard if appropriate
Hazardous chemical waste	Hazardous chemical waste is defined as a chemicals/pesticides that pose a hazard to human health or the environment when improperly managed.
Hierarchy of Control	The hierarchy of control is a system for controlling risks that pesticides pose. The hierarchy of control is a step-by-step approach to eliminating or reducing risks and it ranks risk controls from the highest level of protection and reliability through to the lowest and least reliable protection.
Highly hazardous Pesticide	HHP's are pesticides that are acknowledged to present particularly high levels of acute or chronic hazards to health or environment according to internationally accepted classification systems such as WHO or Global Harmonized System (GHS)
Integrated Pest Management	IPM is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and nontarget organisms, and the environment
Medical surveillance	A planned programme or periodic examination, which may include clinical examinations, biological monitoring or medical tests of employees by an occupational health practitioner or in prescribed cases, by an occupational medicine practitioner.
monitoring	Planning, carrying out and recording results of a measurement programme
OEL	Occupational exposure limit is the limit value set by the Minister, which represents the airborne concentration of a pesticide, where the exposure standard can be, a) an eight-hour time-weighted average, b) a ceiling limit, c) a short-term exposure limit
Obsolete pesticide	Obsolete pesticides are defined by the FAO as stockpiled pesticides that can no longer be used for their original purpose or any other purpose and therefore require proper disposal.
Persistent Organic Pollutants	Persistent organic pollutants (POPs) are toxic chemicals that adversely affect human health and the environment around the world.
Pesticide Lifecycle Management	Pesticide lifecycle management encompasses a range of elements from legislation, regulation, manufacturing, application, risk reduction, monitoring, and enforcement to disposal of pesticide waste.
Precautionary principle	Essentially the precautionary principle directs that action be taken to reduce risk from pesticides in the face of uncertain but suggestive evidence of harm
Precautionary statement	A phrase prescribed by GHS that describes recommended measures that should be taken to minimise or prevent adverse effects resulting from exposure to pesticides or improper handling or storage of pesticides
Prior informed consent procedure	The Prior Informed Consent (PIC) procedure is a means of sharing information globally regarding certain chemicals and pesticides that have

	been considered hazardous to human health and/or the environment by the Conference of the Parties.
Risk assessment	A programme to determine any risk from exposure to a pesticide and the steps taken to remove, reduce control or mitigate such risks posed by said pesticide
Safety data sheet	SDS, a document that is aligned to the GHS providing information on hazard classification, properties of pesticides, procedures for handling and working with pesticides in a safe manner and the ecotoxicity information on pesticides and emergency information and numbers for accidental spillages
sensitizer	A pesticide that causes people to develop allergic skin reactions in normal tissue after repeated exposure, includes dermal and respiratory sensitizers
signal word	The word 'danger' or 'warning' used on GHS labels to indicate to the reader the potential hazard as well as the potential severity
Toxicity rating	The quality of being poisonous, especially the degree of virulence of a toxic microbe or of a poison.
Waste management Programme (WMP)	A WMP prescribes measures for the collection, temporary storage and safe disposal of the waste streams associated with the project and includes provisions for the recovery, re-use and recycling of waste

#### LIST OF RELEVANT LEGISLATION

National Water Act, 1998 (Act 36 of 1998)

National Forest Act, 1998 (Act 84 of 1998)

National Environmental Management Act, 1998 (Act 107 of 1998)

National Environmental Management Act, 1998 (Act 107 of 1998): *Regulations to domesticate the requirements of the Rotterdam Convention on the prior informed consent procedure to certain hazardous chemicals and pesticides in International Trade, 2021, published as Government Notice No. 413 of 12 May 2021*

National Environmental: Waste Act, 2014 (Act 26 of 2014)

Occupational Health and Safety Act, 1993 (Act 85 of 1993)

Occupational Health and Safety Act, 1993 (Act 85 of 1993): *Hazardous Chemical Agent Regulations, 2021, published as Government Notice No. R280 of 29 March 2021*

Farm Feeds, Fertilizers, Agricultural Remedies and Stock remedies Act, 1947 (Act 36 of 1947)

National Aviation Act. 1962 (Act 74 of 1962)

SABS 072: (The Code of Practice for the Safe Handling of Pesticides)

SANS 10228:2010 (The Code of Practice for the Identification and Classification of Dangerous Goods for transport)

SANS 10118:2011 Edition 3.01: The Aerial Application of Pesticides.

SANS 10206:2010 The handling, storage and disposal of Pesticides.

OHSAS 45001:2016: Health and Safety Management Component (Clause 8.1)

#### **PURPOSE:**

To provide guidelines and practical advice to departmental staff and service providers on current pesticides available, international obligations and biomonitoring requirements with regards to using some pesticides that have health impacts and mitigation measures for these.

#### **APPLICATION:**

The EP Pesticide Policy will apply to all persons who use pesticides to carry out work for the Department as part of their work as an employee or Service Provider either directly or as a contractor or subcontractor.

#### **INTRODUCTION:**

The EP Pesticide Policy complies with all international conventions on pesticide management such as the Stockholm convention<sup>1</sup>, Rotterdam convention<sup>2</sup>, Basel convention<sup>3</sup> and Bamako<sup>4</sup> convention.

The Stockholm convention deals with persistent organic pollutants such as the dirty dozen that have been banned internationally due to their impacts on human health and these have all been removed from the EP pesticide policy as the EP pesticide policy follows the precautionary principle of the Hierarchy of Control in the Code of Conduct of Pesticide Management<sup>5</sup> which eliminates and substitutes all highly hazardous pesticides (HHP's) as the first stage of mitigation for protection of human health and the environment.

The Rotterdam convention deals with Prior Informed Consent (PIC) pesticides through Annexure III where all pesticides listed under Annexure III have been banned thus their import into the receiving country has to be approved by the receiving country and be reported to the Rotterdam secretariat and all conditions regarding their import needs to be met. Paraquat has currently been listed under Annexure III and thus removed from the EP policy due to the Precautionary Principle adopted.

The Basel Convention deals with trans boundary movement of hazardous chemical wastes, disposal of empty pesticide containers, obsolete pesticide disposal and pesticide container management.

The Bamako Convention is specific to Africa and is related to the Basel Convention regarding all the categories listed above and includes the banning of pesticides being imported into Africa that are close to their expiry date making Africa a dumping ground for near expired pesticides. Both of these conventions are critical for implementation in the EP Pesticides Policy for implementation of the container management programme for empty pesticide containers.

The EP Pesticide Policy aims to implement pesticide lifecycle management by implementing all the stages the pesticide might pass through from when the pesticide is procured to its degradation in the environment after use, or its destruction as an unused or obsolete product. For the purposes of this

policy, the life cycle includes procurement, distribution, storage, transport, use and final disposal of the pesticide product and/or its container<sup>5</sup>.

**The Service Provider is responsible for the procuring pesticides and may make use of the RT12 (Transversal Contract by national Treasury) to procure pesticides at the same price as government, providing that National Treasury approval is in place and that the pesticides are only used for this Project. The Service Provider is required to Comply to the Departments EP Pesticide Policy. The Department shall, whenever requested by the Service Provider, facilitate the process of obtaining approval from National Treasury for the Service Provider to use RT12 (Transversal Contract by National Treasury) to procure pesticides at the same price as government. The Service Provider will not only be responsible for procuring pesticides but also to implement, manage, store, handle, transport and dispose of the empty pesticide containers and obsolete pesticides in line with the EP Pesticide Policy implementing responsible container management programmes and adopting responsible pesticide lifecycle management.**

#### OBJECTIVES FOR THE USE OF PESTICIDES FOR INVASIVE ALIEN SPECIES CONTROL

1. To implement a long-term strategy for the initial and long-term control of invasive alien species.
2. To ensure the safety of operators involved in the control operations and public in the operational area in compliance with the EP biomonitoring protocols<sup>6</sup> for pesticides in hazard groups 1-6 and 9 & 10 (Annexure 1), Regulations for Hazardous Chemicals Agents<sup>7</sup> and Guidelines for Personal Protection when handling and Applying Pesticides<sup>8</sup>.
3. To ensure that there is minimal environmental impact in the short-term and that there are no long-term adverse effects on the environment resulting from the application of pesticides, to humans and the environment, environmental risk assessments are required for pesticides in hazard groups 7 and 8<sup>6</sup> (Annexure 1).
4. To ensure that the application takes place in the most cost effective way within objectives 2 and 3, taking the recommendations into account as listed in the **WFW Species and Pesticide list** spreadsheet that accompanies this policy.
5. To attain these objectives DFFE EP management shall be responsible for:
  - 5.1 Determining areas and species to be controlled and setting priorities.
  - 5.2 Deciding upon appropriate methods of pesticide and biopesticide control.
  - 5.3 Drawing up short and long-term control programmes.
  - 5.4 Selection of suitable pesticides and biopesticides.
6. Establishing training requirements for EP personnel and contractors and ensuring that the training takes place
7. Costing control programmes.
8. Sourcing suitable pesticide and biopesticide equipment suppliers and obtaining product and equipment at the best prices. Ensuring compliance to government transversal contracts, such as RT 12.
9. Ensuring that pesticide applications take place within all relevant legislation, including international legislation and conventions.
10. Ensuring proper medicals, biomonitoring and medical surveillance is done on all pesticide operators and staff exposed to pesticides in compliance to legislative requirements<sup>6,7,9</sup>.

## METHODS OF CONTROL

### A. Invasive Alien Plants

1. Selection of appropriate methods of control shall be based on the following criteria:

- Species to be controlled
- Size of target plants
- Density of stand
- Accessibility of terrain
- Environmental safety
- Disposal of dead vegetation

1.1 Species to be controlled.

1.1.1 Pesticides selected for control shall be registered for use on that species under the conditions specified under Act 36, the label and minor use registrations.

1.1.2 Selection should be based on the WfW species and pesticide spreadsheet, Croplife suggestions, minor use registrations, labels and information brochures issued by suppliers.

1.2 Size of plants.

The following methods of control are appropriate for age or size target plants:

1.2.1 Seedlings.

1.2.1.1 *Hand pulling or hoeing.* Hand pulling should be carried out in sparse stands under conditions where seedlings are easily removed from the soil. Operators should be supplied with suitable gloves or other hand protection<sup>6</sup>. Hoeing is also most suited to sparse stands. Seedlings should be severed below the soil surface or removed from the soil. Soil disturbance should be minimized to reduce re-germination.

1.2.1.2 *Foliar applications of pesticides/ biopesticides* can be carried out in dense stands or open stands. For dense stands suitable fan nozzles for overall application should be fitted. Sprayers should be fitted with pressure or flow regulators. In stands where individual plants are treated solid cone nozzles should be fitted. This is the same for biopesticide applications, except the carrier is a medium grade mineral oil such as canola oil.

1.2.2 Saplings.

1.2.2.1 *Hand pulling, hoeing or brashing.* Where appropriate hand pulling or hoeing should be carried out as recommended for seedlings. Brashing is recommended for Eucalyptus species seedlings. Brashing is done using a hand saw or hatchet. The programme does not currently use this method.

- 1.2.2.2 *Foliar sprays.* Overall application or individual plant spraying 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. Pressure or flow regulators should be fitted to sprayers for overall application. Spraying should be restricted to plants waist height or lower, but ensure there is sufficient foliage to carry the applied pesticide to the root system. Foliar applications should not be done with volatilizing pesticides due to human health inhalation risk being too high to mitigate<sup>9</sup>, alternative methods should be implemented here.
- 1.2.2.3 *Basal stem treatments.* Applications using pesticides registered for this method that DO NOT use diesel as a carrier are allowed (such as Turbador). No diesel applications allowed due to environmental risks. Stems with a diameter up to 50 mm should be treated to a height of 250 mm and stems above 50mm diameters to a height of 500 mm. This method is only suitable for stems up to 100 mm in diameter with smooth live bark. Application is by means of a low pressure coarse droplet spray from a narrow angle, solid cone nozzle.
- 1.2.2.4 *Cut stump treatments.* Stems should be cut as low as practical as stipulated on the label and in the EP best practices guidelines. Pesticides are applied in water as recommended for the pesticide. No diesel applications are allowed. The gel applications need to be painted on the whole cut surface and should be 10mm in thickness. Biopesticides can be applied using the same method as for pesticides, but in canola oil as the carrier.
- 1.2.2.5 *Mature trees.* These should be regarded as trees above shoulder height or robust bushes 12-18 months or older.
- 1.2.2.6.1 *Strip barking.* Bark must be removed from approximately waist height to the bottom of the stem. 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 treatments should be carried out. Handsaws (such as silky zubats) or hatchets (silky nata hatchets) should be used for de-barking.
- 1.2.2.6.2 *Ring barking.* A band of bark is removed around the stem, 10cm wide and situated as close to the ground as possible. Ensure all bark, phloem and cambium tissue is removed within the band.
- 1.2.2.6.3 *Frilling or partial frilling.* Cuts should be made through the bark into the sapwood by means of a bush knife or light axe and a suitable pesticide applied into the cuts. In a full frill the cuts join or overlap along the circumference of the stem. This is the standard method for most species to be frilled. A partial frill has cuts spaced along the stem circumference and is only used where a pesticide is very effective on a particular species.
- 1.2.2.6.4 *Stem injection.* Pesticide solutions are applied directly into pre-mad

holes in the stem and cladodes of certain cactus species using a sheep dose applicator. This application method is only used on rare occasions when biocontrol is not available for the species as biocontrol is the preferred method.

- 1.2.2.11 *Soil application.* Pesticide granules are applied directly to the soil under the trees in the dosage rates stipulated on the label. This method is mostly used for bush encroachers. Care must be taken when applying and the application must be timed with the rainfall. Risk assessments must be done for all soil applications as all the soil application pesticides fall within hazard criterion 7 and 8 (Annexure 1).

### 1.3 Density of stands.

- 1.3.1 Overall applications can be made to dense stands of seedlings or saplings. Where other desirable vegetation is present (e.g. grass cover), selective pesticides that will not damage the grass or other desirable vegetation cover should be applied. Fan nozzles and pressure regulators should be fitted to sprayers. The non-target species kill rate and acceptable non target criteria must be agreed to prior to application. Aerial applications with biopesticides can also be used. Risk assessments must be done to determine the acceptable non target criteria.

- 1.3.2 Where dense stands of big trees, resulting in a large bio-mass, treatment of standing trees may be appropriate to obviate the problem of disposing of felled trees. Where there is a danger of dead trees falling into water courses they should be cut down and removed and the stumps treated with a suitable pesticide. Risk assessments must be done if there is a risk to riparian areas and a rehabilitation plan be put into place to mitigate these risks.

### 1.4 Accessibility of terrain.

- 1.4.1 In inaccessible areas such as mountainous areas or where no access roads exist, methods of control where a minimum amount of transportation of equipment and pesticide is involved should be given preference. Appropriate gel applied pesticides should be considered or nomix products.

### 1.5 Environmental considerations.

- 1.5.1 Protection of the environment is of prime importance. Riparian areas, where most alien vegetation infestations occur, require a particularly careful approach. Only pesticides that are approved for use in riparian areas should be used. Only aquatic safe products that are polyethoxylated tallow amine free can be used in riparian and aquatic systems. Consult the technical manager for these products. Washing of equipment or disposal of waste spray mixture or washings is prohibited in or near water courses where contamination of water can occur, including aquifer or ground water contamination<sup>5-9</sup>.

- 1.6 Desirable vegetation.
- 1.6.1 Where desirable vegetation is present, e.g. grass cover in pastures or the margins of forests, methods of control must be selected that will cause minimum damage to the desirable vegetation. Alternative methods to foliar spraying should be adopted where there is a danger of damage to adjacent desirable plants occurring. The non-target species kill rate must also be determined prior to the control after a risk assessment (ESRA) is done.
- 1.7 Disposal of vegetation.
- 1.7.1 Where possible utilizable wood should be removed after felling from properly stacked and piled wood sources. Brush piles in certain environmental conditions is not ideal, and in these situations, the brush/cut biomass should be removed or spread out over the entire area to minimise the risks.
- 1.7.2 Brushwood is often burned on purpose or accidentally. If burning is planned, brushwood should be spread out rather than stacked to limit soil damage as intense fires result in stacked brushwood destroying soil structure and preventing grass establishment for many years.
- 1.7.3 If there is a danger of damaging fires, unusable trees should be left standing as this will result in a less intense fire. This can only be done for wood in landscape areas.
- 1.7.4 Felled trees or trees in danger of falling in water courses should be removed so that they do not cause blockages with resulting problems of flooding and damage to infrastructure such as roads and fences. The felled trees should not be stacked within 20m of the riverbank/shore to comply with the National Water Act.

## B. Non Plant Invasives

1. Selection of appropriate methods of control shall be based on the following criteria:
- Priority species
  - Availability of best practise
  - Availability of registered pesticides
  - Integrated Pest Management Practices
- 1.1 Priority species
- 1.1.1 Priority species will be guided by the National Environmental Management: Biodiversity Act, 10 of 2004, Alien and Invasive Species Lists, 2016.
- 1.1.2 Priority species will be divided into categories as listed in the AIS lists as follows;
- 1.1.2.1 List 1: National list of Invasive Terrestrial and Freshwater Plant Species
- 1.1.2.2 List 2: National list of Invasive Marine Plant Species



- 1.1.2.3 List 3: National list of Invasive Mammal Species
- 1.1.2.4 List 4: National list of Invasive Bird Species
- 1.1.2.5 List 5: national list of Invasive Reptile Species
- 1.1.2.6 List 6: National list of Invasive Amphibian Species
- 1.1.2.7 List 7: National list of Invasive Freshwater Fish species
- 1.1.2.8 List 8: National list of Invasive Terrestrial Invertebrate Species
- 1.1.2.9 List 9: National list of Invasive Freshwater Invertebrate Species
- 1.1.2.10 List 10: National list of Invasive Marine Invertebrate Species
- 1.1.2.11 List 11: National list of Invasive Microbial Species
- 1.1.3 At least one species should be selected for control from each list based on their priority within their list and their risk to human health and the environment
- 1.1.4 Pesticides selected for control of priority species must be registered for use on the selected species under Act 36 of 1947.
- 1.1.5 Selection should be based on the WfW species and pesticide spreadsheet, Croplife suggestions, minor use registrations, labels and information brochures issued by suppliers.
- 1.2 Availability of best practise
  - 1.2.1 Best practice methods contains integrated methods with a portion of pesticides in some form, whether by spraying, baiting or treatment of waterbodies with piscicides. Strict guidelines need to be adhered to when implementing these.
- 1.3 Availability of registered pesticides
  - 1.3.1 Registered pesticides for non-plant programmes are not readily available in South Africa.
  - 1.3.2 There are a variety of rodenticides registered for mice control with varying effectiveness but huge impacts on non-target organisms such as birds as brodifacoum, coumatetralyl and difenacoum are secondary poisoners and anti-coagulants but cholecalciferol is not and should be the preferable product (see WFW species and pesticide spreadsheet).
  - 1.3.3 Avicides are generally used in the form of baiting and there is currently only one avicide registered as a restricted use pesticides for the use on house crows and is held by the City of Cape Town. The health impacts of this avicide is concerning and relates to the operators and the utmost care needs to be taken when applying the bait, thus the EP biomonitoring protocols need to be strictly adhered to<sup>6</sup>, as well and the PPE guidelines<sup>14</sup>.
  - 1.3.4 Piscicides are generally applied as solutions to waterbodies to control invasive alien fish and once the invasive alien fish have been removed from the system, a solution of potassium permanganate is released into the system to render the piscicide inert. There is currently only one piscicide registered under an emergency registration in South Africa as a restricted use pesticide for the control of invasive alien fish.
- 1.4 Integrated Pest Management (IPM) Practises
  - 1.4.1 (IPM) in relation to non-plant invasives relates to a combination of control methods utilised to combat these species to reduce the amount of pesticides needed for their management and/or control

- 1.4.2 Mammals are generally controlled using a combination of trapping and shooting as pesticides are considered inhumane by organizations such as the SPCA
- 1.4.3 Birds are generally controlled with a combination of trapping using a Judas bird, baiting with pesticide laced bait, and nest destruction and egg removal from nests.
- 1.4.4 Invertebrates such as invasive wasps are controlled by fumigating their nests
- 1.4.5 Amphibians are caught and humanely exterminated.

## LONG TERM CONTROL PROGRAMMES

- 2.1 In areas where after initial control of alien vegetation has taken place and regrowth of the species and/or other undesirable vegetation will occur, the programme should be so structured that a minimum of regrowth will occur and a follow-up programme will be actioned. The following must be taken into consideration:
  - 2.1.1 *Species coppicing.* Many species coppice from cut stumps and/or roots. Cut stumps must be thoroughly treated within 15 minutes of cutting according to label recommendations to minimise regrowth. Root coppice from species such as grey poplar (*Populus canescens*) and silver wattle (*Acacia dealbata*) occurs rapidly and control measures must be undertaken before plants become too large to be controlled with foliar sprays. Coppicing stumps should be treated before coppice reaches head height. Biopesticides should also be considered where practical and available.
  - 2.1.2 *Seedling control.* Germination of Acacia species takes place rapidly after a fire and control measures must be put in place as soon as possible to minimise the quantity of pesticide used and the cost of application. Selective pesticides should be used where there is a danger of damage to grass present. Biopesticides should also be considered.
  - 2.1.3 *Burning.* Burning should be considered part of the control programme to get rid of unwanted brushwood or to stimulate even growth of seedlings so that follow-up control measures are easier.
  - 2.1.4 *Rehabilitation.* Where the danger of erosion exists or where the re-establishment of pastures is desired after clearing, rehabilitation of the area with grasses or other suitable plants should be carried out. The advice of pasture / rehabilitation / ecology experts should be sought in planning this operation. Other erosion control measures such as the building of weirs should be undertaken where necessary.
  - 2.1.5 *Monitoring.* Monitoring of control and/or eradication programmes should be done to ensure extirpation of the invasive alien species from the area/catchment

and reported to DFFE Biosecurity unit for compliance with the NEM:BA AIS regulations promulgated in 2014.

- 2.1.6 *Data reporting.* All data should be reported to DFFE National Office and kept on file to comply with reporting requirements.

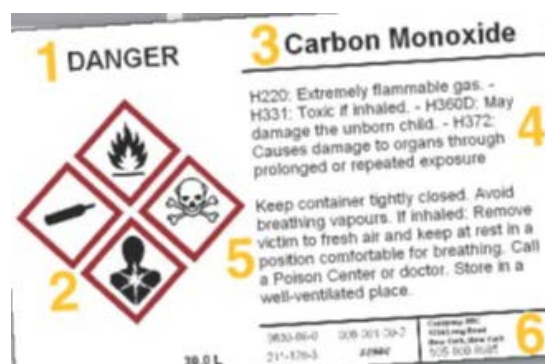
## SELECTION OF PESTICIDES

- 3.1 Pesticides are selected in accordance with the “WfW species and pesticide spreadsheet” by the Technical unit. The selection of pesticides should be based on the following criteria and any deviation from this point must be approved by the management committee (MANCO). Consult the NRM Technical Advisor.
- 3.1.1 *State Tender.* Most of the pesticides are found on The State Tender Contract – RT 12. These pesticides must be purchased in accordance with the correct procurement procedures as laid down by the department and National Treasury. The status of the State Tender Contract changes from time to time and it is therefore imperative that the latest version is used. For the latest version please contact your Regional DFFE:NRM Office.
- 3.1.2 *Efficacy.* Where alternative products are available for the same purpose, advice should be sought on the efficacy of these products under the prevailing application conditions. Biopesticides should be the priority as the environmental impacts are limited after biocontrol.
- 3.1.3 *Cost.* Where different methods of application exist the cost of application and retreatment, in addition to the cost of the product shall be taken into consideration in deciding on which pesticide to apply. The non-target effects and toxicity to human health and the environment should also be taken into account when deciding on a product. The ecotoxicity and environmental fate for all the pesticides is available in the species and pesticide spreadsheet. Biopesticides should be considered, but biocontrol is the priority if available for the species under investigation.
- 3.2 Operator safety.
- 3.2.1 All measures must be taken to ensure the safety of the operators<sup>6,8</sup> and where choices exist preference should be given to the safest product. Check the label colour band.
- 3.2.2 The following table gives the toxicity rating according to the label colour band according to the WHO Recommended Classification of Pesticides by Hazard<sup>10</sup>:

<b>BLUE</b>	<b>SLIGHTLY HAZARDOUS - CAUTION</b>
<b>YELLOW</b>	<b>MODERATELY HAZARDOUS - HARMFUL</b>
<b>RED</b>	<b>TOXIC TO VERY TOXIC</b>

The new GHS labelling guidelines indicate that the labels will not have colour bands anymore but will have 6 compulsory label elements as follows<sup>9</sup>:

1. *Signal word*  
Indicates relative level of hazard. "Danger" is used for most severe instances while "Warning" is less severe.
2. *Symbols* (hazard pictograms)  
Convey health, physical and environmental hazard information with red diamond pictograms. May use a combination of one to five symbols.
3. *Product name or identifiers*  
Identifies the chemical or substance. Should match the product name or identifier used on the SDS.
4. *Hazard statements*  
Phrases that describe the nature of the hazardous products and often the degree of the hazard.
5. *Precautionary statements*  
Phrases associated with each hazard statement that describe general preventative, response, storage or disposal precautions.
6. *Manufacturer Information*  
Company name, address & telephone number



An example of a new GHS pesticide label with the 6 compulsory label elements.

3.2.3 Label recommendations regarding safety must be strictly observed in line with legislation<sup>6-10</sup>.

### 3.3 Environmental safety.

3.3.1 Pesticides that have the least impact on the environment shall be used where no effective biopesticides or biocontrol is available.

3.3.2 Every precaution shall be taken to ensure that these products are safely stored, handled and applied.

### 3.4 Availability.

- 3.4.1 Products should be readily available from suppliers in the areas of use to limit quantities stored in line with legislative requirements<sup>3,4</sup>.

## TRAINING

All contractors (or one of their employees) who apply pesticide for gain in the EP Programme must attend and pass the approved WfW Limited Pest Control Certified Pesticide Course or its equivalent. All Project Managers, in order to effectively manage the pesticide operations in their projects, must attend and pass the approved Pest Control Operators Course or its equivalent.

Operating teams shall be trained in the following aspects of pesticide use. Teams must receive training before commencing operations. Training shall be appropriate for the situations where teams will operate and specialized training or teams operating under specialized conditions, e.g. indigenous forests or soil applied pesticides, may be necessary.

### 4.1 Supervisors. Team supervisors shall receive training in the following:

- 4.1.1 Pesticide awareness. Basic training on the mode of action of pesticides, safety and human health impacts.
- 4.1.2 Operator safety. Handling of concentrates and spray mixtures, personal hygiene and protective clothing.
- 4.1.3 Safe storage of product at depots and operational sites and spray mixtures at operational sites in line with the international conventions and Waste Management Programme<sup>11</sup>.
- 4.1.4 Mixing. Handling of concentrates and mixing techniques and safety procedures.
- 4.1.5 Safety procedures to be observed during transportation of product, spray mixtures, equipment and personnel in line with legislative requirements<sup>3,4</sup>.
- 4.1.6 Care and maintenance of application equipment, saws etc.
- 4.1.7 Record keeping in respect of quantities of product/spray mixtures used, area treated, person hours per area/operation, stock control.
- 4.1.8 Planning. Advanced planning for follow-up operations, transportation, equipment and spares requirements, product procurement and availability. Team management.
- 4.1.9 First aid. Actions to be taken in case of accidental contamination, suspected and actual poisoning, chronic poisoning, eye contamination and other physical injuries.
- 4.1.10 Health of operators. Persons unsuitable for use as application operators, e.g. chronically ill, persons with disabilities, pregnant women. Allergic reactions. Wearing of protective apparel. Hygiene<sup>5-9</sup>.
- 4.1.11 Disposal of general waste.
- 4.1.12 Disposal of pesticide waste, triple rinsing procedures and management of pesticide spillage according to best management practise and Waste Management Programme<sup>3,4,11</sup>.
- 4.1.12 Managing major and minor spills, accident sites.
- 4.1.13 Calibrating application equipment.

- 4.1.14 Environmental safety.
  - 4.1.15 Application techniques. Correct application to obtain most cost effective results.
  - 4.1.16 Suitable and unsuitable application conditions.
- 4.2 Operators. Operators should receive training in the following:
- 4.2.1 Pesticide awareness - the purpose and functioning of pesticides and the need for correct application.
  - 4.2.2 Pesticide applicator – ensure knowledge of pesticides and human health impacts and environmental impacts.
  - 4.2.3 Safe handling of concentrates and spray mixtures, toxicity of pesticides, protective clothing, safe application, personal hygiene and disposal of waste in line with legislative requirements<sup>6-10</sup>.
  - 4.2.4 Application techniques. Correct, thorough application. Preventing waste.
  - 4.2.5 Care of equipment. Cleaning and disposal of washings.
  - 4.4.6 Cleaning of empty containers. Triple rinse procedure and proper disposal of empty containers<sup>3,4,11</sup>.

#### COSTING OPERATIONS OR PROGRAMMES

- 5.1 Prior to the commencement of any control operations or programmes an assessment shall be made on the cost, based on the following:
- 5.1.1 Cost of pesticides and co-formulants.
  - 5.1.2 Quantity, to be based on:
    - 5.1.1.1 Method of application
    - 5.1.1.2 Size and density of target plants.
    - 5.1.1.3 Size and density of the non-plant infestation
    - 5.1.1.3 Dilution rates
  - 5.1.3 Adjuvant/surfactants required.
  - 5.1.4 Personnel costs. Number of person hours per area/operation.
  - 5.1.5 Cost of equipment, spares and maintenance.
  - 5.1.6 Cost of transportation, storage and other incidental costs.
- 5.2 Follow-up treatments such as seedling and/or coppice control must be similarly costed and built into the total cost of the control operation.
- 5.3 The cost of the biomonitoring and medical surveillance of spray operators and workers should be built into the overall cost of the control operation.

## PROVISION OF EQUIPMENT

- 6.1 Application equipment shall be standardised and obtained from approved suppliers.
- 6.2 Use of the following brand of knapsacks has been approved. CP 3, CP 15, Matabi, Solo, AgrimexA18, Osatu. (On placing an order for knapsacks, ensure the quote includes the approved nozzles and pressure regulator or constant flow valves, and a replacement set.)
  - 6.2.1 Where appropriate sprayers must be fitted with pressure regulators or flow regulators.
  - 6.2.2 Spares must be readily available and spares such as nozzles, plumbers tape, nuts, screws, hose and washers must be carried with teams. Suppliers must be consulted on spares requirements.
  - 6.2.3 The following nozzles or their equivalents shall be used as standard: TG-1, FL-5VS and TF-VS2 or their equivalents.
- 6.3 The teams should have the necessary tools, e.g. spanners, screwdrivers, pliers, to carry out necessary maintenance and repairs in the field.
- 6.4 Malfunctioning nozzles should be replaced in the field and no attempt should be made to clean them. Cleaning should be done at the workshop/store using preferably compressed air and water.
- 6.5 Small hand held sprayers should be standardised on to Polispray or equivalent and Hack-pack applicators.
- 6.6 Suitable plastic measuring cylinders, beakers and mixing containers must be available and only used for pesticide mixing.
- 6.7 Containers must always be provided for clean water for personal use.

## STORAGE, HANDLING AND TRANSPORTATION

- 7.1 Storage.

All storage facilities shall comply with the requirements of Croplife South Africa<sup>11</sup>, Regulations for Hazardous Chemical Agents 2021<sup>7</sup>, Occupational Health and Safety Act 85 of 1993, FAO Pesticide Storage and Stock Control Manual<sup>12</sup> and the FAO Guidelines for retail distribution of Pesticides with particular Reference to Storage and Handling at the Point of Supply to Users in Developing Countries<sup>13</sup>. These can be summarised as follows:
- 7.2 Isolation.

Where possible, a store should preferably be a separate building and should not be sited near a dwelling house, hospitals, schools, shops, food markets, livestock buildings or where fodder, fuel or other flammable materials are stored<sup>12</sup>. A minimum of five meters between the store and the other buildings is recommended. If part of a complex, the store must be totally sealed off from the rest of the complex, i.e. no free movement of air between the storage area and the rest of the complex. **The store should be far away from watercourses, wells and other supplies of water for domestic and stock animal use that could be contaminated by spillages or leaks from the store<sup>12,13</sup>. The site should not be in an area with high groundwater levels which may be subject to seasonal flooding nor adjacent to areas subject to seasonal flooding.**

### 7.3 Accessibility.

When planning a store bear in mind the ease of access for delivery or dispatch. Also consider the possibility of a fire and the need to be able to approach the building from all sides. There should be easy access for pesticide delivery vehicles. There should be access on at least three sides of the building for fire-fighting vehicles and equipment in an event of an emergency.

### 7.4 Construction.

#### 7.4.1 Floor.

Earth, timber, bitumen, PVC or linoleum, coarse unscreened or disintegrating concrete is not acceptable. The floor should be made of impervious material or of slats over a concrete-lined sump into which chemical spills can drain to be neutralised. The floor area should be slightly raised at the edges to prevent spills from leaking out of the building and flood water from getting in<sup>12</sup>. Another option is smooth screeded concrete, however sealed, steel container floors are also acceptable. The doorway should be banded to a minimum height of 200 mm and this, as well as all wall to floor joints, should be made watertight. The purpose of the bund is to contain spills or fire water which could cause damage to the environment and prevent water (e.g. flood run-off) entering the store.

#### 7.4.2 Walls.

Walls should preferably be brick or concrete block with airbricks or vents 200 mm from the floor and near or at roof level. Containers are acceptable if there is adequate ventilation 200 mm from floor level and near roof level. The container should where possible be placed in a shaded area. If this is not possible ensure good permanent ventilation. The store walls should have outside sills that drain spilled chemicals into a sump. Internal walls should be smooth and free from cracks and ledges to allow for easy cleaning<sup>12</sup>. There should be walls between sections to act as fire breaks.

#### 7.4.3 Roof.

The roof should be constructed of a light material, possibly glass fibre or asbestos substitute which collapses in an event of a fire to allow smoke and fumes to get out and avoid explosions. The material should be firm however so that it is not blown away during severe wind or storms. The roof should be leak-free and have some form of insulation to maintain temperatures at a reasonable level. Vent in the roof will allow for the escape of hot air during the summer months.

#### 7.4.4 Doors.

Steel doors with an effective locking system are preferred. A wooden door should have a security gate to reduce the risk of forced entry. Containers with fitted security gates can be left open to cool the contents during the heat of the day. Only authorized personnel should have access to keys and be allowed in the store. There should be an emergency exit in addition to the entry and exit doors, preferably at the other end of the store.

#### 7.4.5 Windows.

It is important to note that windows should not be built into a store if there are alternative means of ventilation and lighting; otherwise they should be shaded (or



prevent sunlight from heating the pesticides causing them to degrade and/or volatilise) and barred or burglar bars installed to prevent unauthorised entry<sup>12</sup>.

#### 7.4.6 Lighting.

There should be sufficient lighting (200 lux) to allow for reading of product labels. If electric lighting is required it must be secure in order to reduce fire risk. Electric fittings should be mineral insulated or armoured cable should be used with flame/dust-proof fittings<sup>12</sup>. The mains control should be outside the store itself.

#### 7.4.7 Sanitation.

Staff should have immediate access to washing facilities with running water, soap and towels. They should be encouraged to use it frequently. An eye wash bottle or similar object must be available at all times for the flushing of contamination from the eyes should it occur. A shower facility is recommended.

#### 7.4.8 *Ventilation*

Ventilation is one of the most important requirements within the store as it prevents the build-up of vapours. Toxic vapours may affect the health of the store workers and flammable vapours are a fire risk. Ventilation also keeps the store as cool as possible. This is important as pesticides deteriorate more slowly and therefore last longer in a cooler environment. Many pesticides are destabilised by high temperatures, which in exceptional cases may even cause explosions. The ventilation area should be equivalent to 1/150 of the floor area, or outside doors should be open for at least six hours per week. Exhaust fans should be fitted to large stores, preferably on a time-delay switch. Roof- and floor-level ventilation is required to extract light fumes, hot air and heavy vapours<sup>12</sup>.

### 7.5 Equipment.

7.5.1 Equip the room with a table of suitable strength and height to facilitate reading of labels, decanting and measuring out of Pesticides.

7.5.2 Measuring jugs, funnels, pumps and buckets must be kept on hand and kept specifically for the purpose of measuring out Pesticides. Do not use household items for this purpose.

7.5.3 For the sake of good housekeeping, have on hand a broom, spade and a supply of dry fine soil as absorbent material to contain and absorb spills (spill kit). This is available in "kit form" from a number of suppliers.

### 7.6 Handling.

7.6.1 The handling of pesticides concentrates requires strict precautions and personnel handling product concentrates must be fully aware of precautions to be observed.

7.6.2 Suitable protective clothing must be available and use thereof is compulsory.

7.6.2.1 Chemical resistant plastic aprons, butile rubber gloves or chemical resistant nitrile gloves and eye protection and half-face respirator must be worn when handling concentrates<sup>6,8,14</sup>.

7.6.3 Adequate hygiene aids such as plentiful water, soap, towels and eye wash must be readily available.

- 7.6.4 Suitable absorbent material such as fine dry soil and cleaning equipment must be available to handle accidental spillage, including hazardous materials spill kits<sup>12,13</sup>.
- 7.6.5 In the case of spillage, the spill must be contained immediately and cleaned up with absorbent material such as fine dry soil and the relevant spill kit. The contaminated material should then be disposed of according to the guidelines<sup>7,12,13</sup>.
- 7.6.6 Concentrates should if possible be decanted in a safe, suitable place and not in the field. Such a handling and mixing area should have a hard impermeable floor, be bunded and have an adequate sump to accommodate run-off from washing, flooding or fire containment. A 1m<sup>3</sup>sump /10m<sup>2</sup>floor space is recommended.
- 7.6.7 Concentrates and mixtures should never be decanted into or be mixed in drinking bottles or other food containers.
- 7.6.8 Suitable equipment must be available to prepare spray mixtures. These include plastic measuring cylinders and beakers, mixing containers (buckets) and funnels.
  
- 7.7 In the field the following must be observed:
  - 7.7.1 If concentrates must be handled in the field, observe the precautions listed under 7.6.1, 7.6.2, 7.6.3, 7.6.4, 7.6.5, 7.6.6, 7.6.7 and 7.6.8
  - 7.7.2 Spray mixtures must be kept in leak-proof, non-spill containers. The containers should be kept away from personal belongings, foodstuff, drinking water and eating and living areas.
  - 7.7.3 Containers should stand on suitable absorbent material, for example, a large piece of thick hessian sack, which will absorb minor drips, out of direct sunlight in a cool place.
  - 7.7.4 Containers must be kept at least 20m away from water bodies to prevent possible contamination.
  - 7.7.5 Filling sites should be selected to prevent damage to desirable vegetation and to enable spillage to be cleaned up and disposed of.
  - 7.7.6 Spray mixture containers must be clearly labelled and only reused for the specific pesticide.
  - 7.7.7 Application equipment and containers should not be cleaned on site but at a suitable designated area at the store.
  - 7.7.8 Suitable protective clothing, overalls, rubber boots, gloves and eye protection must be worn by operators when handling and applying Pesticides<sup>6,8,14</sup>.
  
- 7.8 Transportation<sup>5,7</sup>.
  - 7.8.1 Pesticides and application equipment must be carried on a separate vehicle or in a part of the vehicle isolated from people, food and clothing.
  - 7.8.2 Vehicles should carry absorbent material to absorb any spillage.
  - 7.8.3 Pesticides and equipment must be secured to prevent spillage and damage.
  - 7.8.4 Pesticides, spray mixtures and equipment must not be left unattended where there is a danger of theft or abuse.
  - 7.8.5 Pesticides should not be left uncovered in the sun but in shaded areas and covered.
  
- 7.9 Disposal<sup>11,12,13,15</sup>.
  - 7.9.1 A designated officer should be responsible to ensure that pesticide containers are correctly and safely disposed of, according to Croplife guidelines.

- 7.9.2 Empty containers must be triple rinsed and disposed of after use and not be used for any other purpose. Under no circumstances may containers be taken home for personal use.
- 7.9.3 Empty containers should be returned to the store for safe keeping and disposal under the Waste Management Programme.
- 7.9.4 Where arrangements have been made containers should be returned to the supplier.
- 7.9.5 Containers that have to be destroyed should be triple rinsed, punctured and flattened. See attached pamphlets for details of triple rinsing and details of accredited suppliers in the Waste Management Programme for collection of empty containers.
- 7.9.5 Only sufficient spray mixture that can be used in a day should be prepared. Left- over material should be returned to the depot for safe storage and re-use in the spray mixture the following day.
- 7.9.6 Certain spray mixtures should not be left standing overnight and should be safely disposed of. Consult the product label. If mixtures can be left overnight with no adverse effects, they should be kept to reduce costs and pollution from pesticide and wash water.

## **PUBLIC SAFETY**

- 8.1 Due regard must be paid at all times to the health and safety of the public.
- 8.2 Public should be kept out of operational areas where any hazards exist. Warning notices should be displayed to this effect where necessary.
- 8.3 Pesticides must only be applied strictly according to label recommendations.
- 8.4 Product and spray mixtures should be stored so that they are inaccessible to the public.
- 8.5 Treatment of areas within 50 m of habitations, schools, hospitals and public areas (e.g. parks) should be avoided or only carried out in consultation with the parties effected.
- 8.6 Public should be informed of control operations in their area by means of verbal communication, notices, pamphlets, the press etc prior to the commencement of spray operations.

## **ENVIRONMENTAL SAFETY**

Most alien vegetation control operations are carried out in riparian situations which are regarded as environmentally sensitive. Non-plant control operations need to follow the same instructions in order to minimize the impact of the operation on the natural environment the following must be observed.

- 9.1 Area contamination must be minimised by careful accurate application with a minimum amount of pesticide to achieve good control.
- 9.2 All care must be taken to prevent contamination of any water bodies. This includes due care in storage, application, cleaning equipment and disposal of containers, product and spray mixtures.
- 9.3 Equipment should be washed where there is no danger of contaminating water sources and washings used in the next spray mix.

9.4 To avoid damage to indigenous or other desirable vegetation product should be selected that will have the least effect on non-target vegetation.

9.4.1 Coarse droplet nozzles should be fitted to avoid drift onto neighbouring vegetation, e.g. TG-1 or equivalent.

9.5 Only polyethoxylated tallow amine free, or aquatic safe herbicide formulations should be used in the riparian and aquatic environments so as to limit the impact on aquatic invertebrates.

## APPLICATION

### 10.1 Equipment.

Only application equipment and accessories specified (see PROVISION OF EQUIPMENT) shall be used by operating teams.

10.1.1 Equipment shall be inspected regularly between and during applications and necessary repairs carried out<sup>12</sup>.

10.1.2 Leaking sprayers or sprayers not applying correctly should be withdrawn until repairs have been carried out. Spare applicators and parts should always be available so as not to impede operations<sup>12,13</sup>.

10.1.3 Ensure that correct nozzles are fitted and pressure settings are checked regularly.

10.1.4 Where possible use low water volumes to keep turn around (refilling) time down to a minimum. Caution must be observed to limit drift when using minimum output nozzles<sup>12</sup>.

10.1.5 Always ensure that knapsacks are filled to 70% capacity. In aquatic programmes, never fill the knapsacks more than 50% to increase buoyancy of the sprayer in aquatic environments.

10.1.6 Equipment must be emptied and cleaned thoroughly after spraying ceases. Spray mixture must not be left in the apparatus overnight.

10.1.7 Apparatus should be stored under lock and key when not in use.

### 10.2 Rates of Application.

10.2.1 Products shall be mixed and applied at rates recommended on the label. This shall not be deviated from without consultation with Working for Water Technical Advisor and suppliers.

10.2.2 Applications should be checked regularly to ensure that they comply with recommendations.

### 10.3 Precautions.

10.3.1 Appropriate protective clothing must be changed and washed regularly and should be removed immediately if contaminated<sup>6-9</sup>.

10.3.2 Spillage must be attended to immediately and appropriately disposed of<sup>3,4,7,1,12,13</sup>.

10.3.3 Application teams must be trained to avoid damage to non-target species.

10.3.4 Contamination of all water bodies must be strictly avoided.

10.3.5 Hygiene aids - clean water, soap, towels and eye wash must always be available to spray operators.

#### 10.4 Adjuvants.

10.4.1 Where recommended adjuvants (wetting and spreading agents) should be added to spray mixtures. Adjuvants should always be mixed in accordance with label recommendations. Recommended adjuvant must be used as stipulated on the pesticide label.

10.4.2 Dye must be added to all applications where the product has no built in dye to ensure that no target species are missed and plants are correctly treated.

10.4.3 In areas where alkaline water is used for spraying the use of a buffering agent may be necessary. Consult the product label. Buffers should always be added to the water before the herbicide.

10.4.4 In sensitive areas where drift must be controlled, the use of drift control agents may be necessary. Seek expert advice on the use of these agents.

#### 10.5 Water Sources.

10.5.1 Only clean water may be used for spray mixtures.

10.5.2 Where particulate matter occurs in water, e.g. water drawn from rivers, the water must be filtered to avoid nozzle blockages.

10.5.3 Funnels with filters should be used for filling or filters should be fitted in the application equipment.

10.5.4 Where large volumes of water are transported, tankers or tanks should be fitted with buffer plates particularly where operating in rough terrain.

10.5.5 The product label should be consulted regarding the quality of water suitable for the specific pesticide.

### WEATHER CONDITIONS

11.1 Applications should not be carried out under unfavourable weather conditions that could affect the control obtained or endanger nearby desirable vegetation, water bodies or personnel.

11.2 Label recommendations regarding suitable application conditions must be followed.

11.3 The following conditions must be taken into consideration, depending on the method of application.

11.3.1 Application to wet or dew covered plants.

11.3.2 Imminent rain, moist or humid conditions.

11.3.3 Wind conditions <15km/h

11.3.4 Hot, dry conditions and volatility of active ingredients under high temperatures

#### 11.4 Conditions of target plants.

11.4.1 Poor results may result if target plants are not in a suitable condition for treatment. The following conditions may result in poor control.

11.4.1.1 Water stressed plants.

11.4.1.2 Water logged plants.

11.4.1.3 Dormant plants.

11.5 Seasonal variability. Some non-plant invasive species do not feed on bait in some seasons due to high availability of food.

### MIXING PESTICIDES

12.1 Mixing must take place according to label instructions.

12.2 Suitable protective clothing must be worn when handling pesticide concentrates<sup>8,14</sup>.

12.3 Liquid pesticide concentrates should be added to the half full tank of water which is then topped up with water.

12.4 Adjuvants should be added to the tank as per the label instruction prior to the addition of the pesticide when buffering and afterwards for adjuvants and dyes.

12.5 Do not mix pesticide concentrates together before adding them to the tank. Consult product labels.

12.6 Proper mixing in knapsacks and hand held applicators is difficult and spray mixtures should be mixed in bulk containers or if necessary (e.g. wettable powders) buckets before pouring into the knapsacks or hand held applicators.

12.7 Spray mixtures should be agitated continuously as recommended. This is essential after they have been standing for a while.

### CALIBRATION

13.1 Application equipment must be correctly calibrated to obtain optimum results and prevent wastage through over-application.

13.2 Calibration should be carried out in the area to be treated.

13.3 Calibration should be checked frequently during application. The following should be checked:

13.3.1 Correct spray pressure.

13.3.2 Correct nozzle size and spray pattern.

13.3.3 Correct nozzle output.

13.3.4 Volume of application over a specific area.

## ESTIMATED VOLUMES OF PRODUCT PER HECTARE

THIS IS FOR PLANNING PURPOSES AND TO BE USED, AS A GUIDE TO CALCULATE THE REQUIRED HERBICIDE NEEDED TO TREAT THE INTENDED AREA. (THIS IS NOT FOR CALIBRATION PURPOSES.) AS THERE IS NO OR LITTLE DIFFERENCE IN HERBICIDE USE FOR A CLOSED OR DENSE STAND, THE VOLUMES PER HECTARE ARE GIVEN FOR A DENSE / CLOSED STAND OF THE SPECIFIC SPECIES. FOR LOWER INFESTATIONS, VOLUMES SHOULD BE REDUCED ACCORDINGLY.

THE % FIGURE OF THE DENSE/CLOSED APPLICATION RATE FOR THE LOWER INFESTATION GROUPS IS CALCULATED AT THE MID POINT OF THE DESITY RANGE. IE MEDIUM, 25% TO 50% THE MID POINT IS 37.5%

THEREFORE IF THE RECOMMENDED RATE IS 6 LITRES OF A SPECIFIC PRODUCT PER HECTARE, THE RATE FOR A MEDIUM DENSITY WILL BE 37.5% OF THE 6 LITRES. THIS WILL BE EQUAL TO 2.25 LITRES PER HECTARE.

DENSE	=	75 % OF CLOSED
MEDIUM	=	40 % OF CLOSED
SCATTERED	=	15 % OF CLOSED
VERY SCATTERED	=	3 % OF CLOSED
OCCASIONAL	=	1 % OF CLOSED
RARE	=	1 % OF CLOSED

- **FOR WATER BASED APPLICATIONS, A SUITABLE ADJUVANT (WETTER) SHOULD BE ADDED WHERE RECOMMENDED ON THE LABEL. THE WETTER QUANTITIES CAN BE CALCULATED AS A RATIO (%) OF THE HERBICIDE QUANTITY, AS THE LABEL PRESCRIBES. E.G. IF HERBICIDE IS 1% MIX AND WETTER IS 0.1%, HALF THE HERBICIDE QUANTITY IS THE WETTER QUANTITY. OR IT CAN BE CALCULATED AS % WETTER REQUIRED X TOTAL MIXTURE TO BE APPLIED / HA = Lt (0.1% X 300lt =1.5lt)**

**RATE PER HECTARE FOR DENSE / CLOSED STAND – 1.75 l / ha**

## HERBICIDE DOSAGE AND LITRES PER HECTARE SUMMARY






The list of PESTICIDES, BIOCONTROL and BIOPESTICIDES are available in the WfW species and herbicide spreadsheet obtainable from the Technical Manager. Please ensure that you have the latest version. The following page contains a table of active ingredients and a list of some brand names that can be used. For more examples please consult the “Master species and herbicides spreadsheet” issued by the Technical Unit. This guide is updated from time to time, as new pesticides are being developed and registered as an ongoing process.







However before choosing other products please consult the National Office Technical Advisor. *The \** indicates the Biopesticides available.






**Table 1: Herbicide Table**







Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
<i>Cylindrobasidium leave*</i>	Stumpout	None	Only registered for <i>A. Cyclops</i> , <i>A. mearnsii</i> , <i>A. dealbata</i> , <i>A. decurrans</i> , <i>A. melanoxylon</i> , <i>A. pycnantha</i>	None
<i>Colletotrichum acutatum*</i>	Hakea gummosis	Grahamstown hakea resistant to pathogen	Only used on <i>Hakea sericea</i> , <i>H. drupacea</i> and <i>H. sericifolia</i>  Effective on all growth stages	None
<i>Puccinia eupatori*</i>	Leaf pathogen		Only for <i>C. macrocephalum</i>	None
<i>Uromycladium tepperianum*</i>	Rust fungus		Only for <i>A. saligna</i>	None
<i>Cercospora rodmannii*</i>			Only for <i>E. crassipes</i>	None
<i>Mycovellociella lantanae*</i>	Leaf pathogen		Only for <i>L. camara</i>	None
<i>Pasalora agaritinae*</i>	Leaf pathogen		Only for <i>A. adenophora</i>	None
<i>Entyloma ageratinae*</i>	Leaf pathogen		Only for <i>A. riparia</i>	None
<i>Puccinia abrupt*</i>	Leaf pathogen		Only for <i>P. hysterothorus</i>	None
<i>Puccinia xanthii*</i>	Leaf pathogen		Only for <i>P. hysterothorus</i>	None














Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
<i>Prospodium transformans*</i>	Leaf pathogen		Only for <i>T. sans</i>	None
Triclopyr 270 g/L + Clopyralid 90g/L	Confront Astra	Eye irritant, skin irritant  Don't use in aquatic environments		2- acute toxicity to mammals and birds  GHS 07 WARNING   5 – Developmental and reproductive toxicity  GHS08 DANGER   8 – Persistence in soil/water and soil absorption potential & biomagnification & bioaccumulation  GHS09 WARNING 
Fluroxypyr 200g/L	Starane Tomahawk Voloxypr	Exclusion period	Limited species on Starane and Voloxypr  Flammable	8 – Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation  GHS09 WARNING 
Picloram 80g/L + Fluroxypyr 80g/L	Plenum	Don't use in aquatic environments  Eye and skin irritant	Toxic to aquatic invertebrates	2- acute toxicity to mammals and birds  GHS 07 WARNING 






Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
				<p>3 - Carcinogenicity GHS07 WARNING </p> <p>6 – Endocrine Disrupting Chemicals (EDC) GHS08 DANGER </p> <p>7 – Acute toxicity to aquatic organisms GHS09 WARNING </p> <p>8 – Persistence in soil/water and soil absorption potential &amp; bio magnification &amp; bioaccumulation GHS09 WARNING </p>
<p>Picloram (as potassium salt) 54g/L + Triclopyr (as triethylamine salt) 46g/L</p>	<p>Kaput gel</p>	<p>Limited species registered currently</p>	<p>No mixing necessary</p>	<p>2- acute toxicity to mammals and birds GHS 07 WARNING </p> <p>3 - Carcinogenicity GHS07 WARNING </p>







Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
				<p>5 – Developmental and reproductive toxicity</p> <p>GHS08 DANGER</p>  <p>6 – Endocrine Disrupting Chemicals (EDC)</p> <p>GHS08 DANGER</p>  <p>7 – Acute toxicity to aquatic organisms</p> <p>GHS09 WARNING</p>  <p>8 – Persistence in soil/water and soil absorption potential &amp; bio magnification &amp; bioaccumulation</p> <p>GHS09 WARNING</p> 
<p>2-4D (as dimethyl amine salt) 480g/L</p>	<p>2,4D 2,4D Amine</p>	<p>Limited registrations, herbaceous species</p>	<p>Weedy species such as <i>D. ferox</i></p>	<p>2- acute toxicity to mammals and birds</p> <p>GHS 07 WARNING</p>  <p>3 - Carcinogenicity</p> <p>GHS07 WARNING</p>

Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
				 5 – Developmental and reproductive toxicity GHS08 DANGER  8 – Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING 
Glyphosate (as isopropylamine salt) 360g/L	Enviro-glyphosate	Not to be used in riparian or aquatic environments, unless tallow amine free adjuvants incorporated	Ensure polyethoxylated tallow amine free as some of the products are toxic to aquatic environments	2- acute toxicity to mammals and birds GHS 07 WARNING 
Glyphosate (as isopropylamine salt) 480g/L	Seismic	Only seismic tallow amine free and recommended for aquatic weed control	Polyethoxylated tallow amine free only	2- acute toxicity to mammals and birds GHS 07 WARNING 
Glyphosate (as sodium salt) 500g/L	Kilo	Kilo registered for aquatic weeds, polyethoxylated tallow amine free. 3km exclusion zone for aerial applications	Poisonous if swallowed, eye irritant	2- acute toxicity to mammals and birds GHS 07 WARNING 






Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
Glyphosate (as sodium salt) 700g/L	Kilo max	Registered for aquatic weeds  Polyethoxylated tallow amine free  Aerial spray exclusion zones	Eye irritant	2- acute toxicity to mammals and birds  GHS 07 WARNING  
Imazapyr 100 g/L	Chopper  Hatchet	Hatchet, limited registrations	Poisonous if swallowed	2- acute toxicity to mammals and birds  GHS 07 WARNING    8 – Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation  GHS09 WARNING  
Imazapyr 250g/L	Format	Consult the technical unit for minor use registrations		2- acute toxicity to mammals and birds  GHS 07 WARNING    8 – Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation  GHS09 WARNING  







Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
Chlorimuron ethyl 500g/L	Extreme Nicanor	Bush encroachment only	Consult technical unit for assistance	2- acute toxicity to mammals and birds  GHS 07 WARNING   7 – Acute toxicity to aquatic organisms  GHS09 WARNING 
Metsulfurion methyl 600g/L	Brushoff Climax	28 days withholding period	Eyes, nose skin irritant	2- acute toxicity to mammals and birds  GHS 07 WARNING   7 – Acute toxicity to aquatic organisms  GHS09 WARNING 
Picloram (as potassium salt) 240g/L	Access Browser	Not to be used as foliar applications		2- acute toxicity to mammals and birds  GHS 07 WARNING   3 - Carcinogenicity  GHS07 WARNING   6 – Endocrine Disrupting Chemicals (EDC)






Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
				<p>GHS08 DANGER</p>  <p>7 – Acute toxicity to aquatic organisms</p> <p>GHS09 WARNING</p>  <p>8 – Persistence in soil/water and soil absorption potential &amp; bio magnification &amp; bioaccumulation</p> <p>GHS09 WARNING</p> 
Tebuthiuron 200g/kg	Molopo	<p>Bush encroachment only</p> <p>Consult the technical unit PRIOR to application</p>	<p>Extremely residual in soil, acutely toxic</p>	<p>2- acute toxicity to mammals and birds</p> <p>GHS 07 WARNING</p>  <p>7 – Acute toxicity to aquatic organisms</p> <p>GHS09 WARNING</p>  <p>8 – Persistence in soil/water and soil absorption potential &amp; bio magnification &amp; bioaccumulation</p> <p>GHS09 WARNING</p>





Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
				
Tebuthiuron 500g/L	Molopo	Bush encroachment only  Consult the technical unit PRIOR to application	Extremely residual in soil, acutely toxic	2- acute toxicity to mammals and birds  GHS 07 WARNING    7 – Acute toxicity to aquatic organisms  GHS09 WARNING    8 – Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation  GHS09 WARNING  
Tebuthiuron 800g/kg	Molopo Limpopo	Bush encroachment only  Consult the technical unit PRIOR to application	Extremely residual in soil, acutely toxic	2- acute toxicity to mammals and birds  GHS 07 WARNING    7 – Acute toxicity to aquatic organisms  GHS09 WARNING    8 – Persistence in soil/water and soil absorption



Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
				potential & bio magnification & bioaccumulation GHS09 WARNING 
Triclopyr (as butoxy ethyl ester) 240g/L	Ranger	Eye irritant Volatile over 25 degrees	Toxic to fish and animals Skin and eye irritant	2- acute toxicity to mammals and birds GHS 07 WARNING  5 – Developmental and reproductive toxicity GHS08 DANGER  8 – Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING 
Triclopyr (as butoxy ethyl ester) 480g/L	Garlon Triclon Viroaxe	Volatile over 25 degrees Do not use in riparian and aquatic environments Diesel mix not allowed	Toxic to fish and animals Skin and eye irritant Poisonous if swallowed	2- acute toxicity to mammals and birds GHS 07 WARNING  5 – Developmental and reproductive toxicity GHS08 DANGER




Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
				 8 – Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING 
Triclopyr (as pyridyloxy compound) 360 g/L	Lumberjack Timbrel	Adjuvant as indicated on the label	Skin, eye irritant, burns Flammable Possible weed resistant	2- acute toxicity to mammals and birds GHS 07 WARNING  8 – Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING 
Triclopyr (as butoxy ethyl ester) 240g/L + Aminopyralid 30g/L	Garlon max	Volatile over 25 degrees Do not use in riparian and aquatic environments Diesel mix not allowed	Toxic to fish and animals Skin and eye irritant Poisonous if swallowed	2- acute toxicity to mammals and birds GHS 07 WARNING  5 – Developmental and reproductive toxicity GHS08 DANGER 








Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
				<p>7 – Acute toxicity to aquatic organisms</p> <p>GHS09 WARNING</p>  <p>8 – Persistence in soil/water and soil absorption potential &amp; bio magnification &amp; bioaccumulation</p> <p>GHS09 WARNING</p> 
<p>Triclopyr (as thiethyl ammonium) 120g/L + Aminopyralid (as triisopropanol) 12g/L</p>	<p>Confront super</p>	<p>Eye irritant, skin irritant</p> <p>Don't use in aquatic environments</p>	<p>Limited registrations</p>	<p>2- acute toxicity to mammals and birds</p> <p>GHS 07 WARNING</p>  <p>5 – Developmental and reproductive toxicity</p> <p>GHS08 DANGER</p>  <p>7 – Acute toxicity to aquatic organisms</p> <p>GHS09 WARNING</p>  <p>8 – Persistence in soil/water and soil absorption potential &amp; bio</p>






Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
				magnification & bioaccumulation GHS09 WARNING 
Bromacil 250g/L + Tebuthionon 250g/L	Bundu	Bush encroachers only		2- acute toxicity to mammals and birds GHS 07 WARNING  7 – Acute toxicity to aquatic organisms GHS09 WARNING  8 – Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING 
Wetter/Adjuvant	H&R crop oil BP crop oil Actipron super	Ensure the adjuvant used is the approved adjuvant as per the relevant herbicide label	Please see the master species and herbicide list for which formulations require adjuvants	
Blue/red/white dye	Ecoblue Ecowhite	Only marker dyes or pigments to be used, not food colouring		

Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
Blue Dye =Approximately 0.5% per litre water	Medium = 37.5% of Closed/Dense			
Medium = 37.5% of Closed/Dense	Medium = 37.5% of Closed/Dense	Medium = 37.5% of Closed/Dense		
Red Dye (diesel) = Approximately 0.5% per litre diesel.	Very Scattered = 3% of Closed/Dense			
	Occasional = 0.5% of Closed/Dense			
	Rare = 0.5% of Closed/Dense			

Table 2: Pesticide table

Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
Brodifacoum 0.025g/kg	Pest off bait	Control of mice on off-shore Islands	Secondary poisoner  Anti-coagulant	2- acute toxicity to mammals and birds GHS 07 WARNING  7 – Acute toxicity to aquatic organisms GHS09 WARNING  8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation GHS09 WARNING 

Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
2,2,2-trichloroethylidene	Alphachloralose	<p>To not use near water bodies. Toxic if swallowed.</p> <p>Inhalation risk</p> <p>CNS depressant</p>	Used as a sedative in invasive bird control such as Mallard control programmes	<p>2- acute toxicity to mammals and birds</p> <p>GHS06 – DANGER</p>  <p>GHS 07 WARNING</p>  <p>7 – Acute toxicity to aquatic organisms</p> <p>GHS09 WARNING</p>  <p>8 – Persistence in soil/water and soil absorption potential &amp; bio magnification &amp; bioaccumulation</p> <p>GHS09 WARNING</p> 
3-chloro-p-toluidine hydrochloride	DRC-1336/Starlicide	<p>Toxic if swallowed</p> <p>Toxic in contact with skin</p> <p>Skin irritation, eye irritation</p> <p>Inhalation risk</p> <p>Toxic to aquatic environments 4</p>	Avicide powder to mix into bait to control corvids	<p>2- acute toxicity to mammals and birds</p> <p>GHS06 – DANGER</p>  <p>GHS 07 WARNING</p>  <p>7 – Acute toxicity to aquatic organisms</p> <p>GHS09 WARNING</p>  <p>8 – Persistence in soil/water and soil</p>

Active ingredients	Trade names	Restrictions	Comments	Hazard criteria
				absorption potential & bio magnification & bioaccumulation GHS09 WARNING 
1,2,12,12a-tetrahydrochromeno[3,4-b]furo[2,3-h]chromen-6(6aH)-one	Rotenone	Toxic if swallowed  Causes skin and eye irritation  Toxic to aquatic environments	Used to control invasive fish, monitoring programmes necessary to ensure recovery after potassium permanganate recovery process implemented	2- acute toxicity to mammals and birds  GHS06 – DANGER   GHS 07 WARNING  7 – Acute toxicity to aquatic organisms GHS09 WARNING   8 – Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING 

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**ANNEXURE 1: CHEMICAL GROUPS AND HAZARD GROUPS OF PESTICIDES**









**This must be read in conjunction with the International Chemical Groups and Hazard groups and listed in UN, 2011. *Globally Harmonised System of Classification and Labelling of Chemicals (GHS)*. 4<sup>th</sup> Revised Edition. United Nations, New York and Geneva, 2011.**




HERBICIDES FOR ALIEN PLANT CONTROL










HERBICIDES FOR ALIEN PLANT CONTROL					PPE			Medical Biomonitoring		Frequency and Duration		Environmental monitoring
Chemical group	MOA	Examples	Hazard Group	Hazard Criterion	Type	Pictogram	Classification	Blood	Urine	Blood	Urine	
1	Imidazolinones	Group 2: ALS: AHAS inhibitors	2	<p><b>Acute toxicity to mammals and birds</b>  <b>GHS07</b>  <b>WARNING</b></p>  <p>H319 (causes serious eye irritation)                      H335 (Respiratory irritant)                      H315 (causes skin irritation)</p>	<p>1. Chemically resistant nitrile gloves</p> <p>2. Type 3 and Type 4 protective clothing</p> <p>3. Safety boots</p> <p>4. Face &amp; Eye protection</p> <p>5. Half-face respirators</p> <p>6. Particulate air filters for respirators</p> <p>7. Apron/ Knapjack</p> <p>8. Long-sleeved shirts</p>	     	<p>EN 374:2016</p> <p>EN 14605:2005</p> <p>EN 345:1993</p> <p>EN ISO 20345</p> <p>EN 166:2001                      EN 140,                      EN149, EN 143:200</p> <p>R95, R99, R100</p>	N/A	<p>5cc fresh urine sample refrigerated.                      Tested using ELIZA dipstick test</p>	N/A	<p>1. All workers need to be tested before they start working.                      2. If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years.                      3. All workers need to be tested once they leave the programme</p>	

				8	<p>Persistence in soil/water and soil absorption potential &amp; bio magnification &amp; bioaccumulation</p> <p>GHS09 WARNING</p>  <p>H412 (harmful to aquatic life with long lasting effects)</p>								Hazard criterion 7 and 8 are linked to environmental risks
2	Sulfonylureas	Group 2: ALS: AHAS inhibitors	Metsulfuron-methyl (Brush-off, Climax, Forester, Extreme, Nikanor)	7	<p>Acute toxicity to aquatic organisms</p> <p>GHS09 WARNING</p>  <p>H400 (Very toxic to aquatic life)</p>								
				2	<p>Acute toxicity to mammals and birds</p> <p>GHS07 WARNING</p>  <p>H315 ( causes skin irritation) H335 (Respiratory tract irritant) H319 (Causes serious eye irritation)</p>	<p>1.Chemically resistant nitrile gloves</p> <p>2.Type 3 and Type 4 protective clothing</p> 	<p>EN 374:2016</p> <p>EN 14605:2005</p> <p>EN 345: 1993</p>	N/A	<p>5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test</p>	N/A	<p>1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years. 3. All workers need to be</p>		







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						<p>3.Safety boots</p> <p>4.Face &amp; Eye protection</p> <p>5.Half-face respirators</p> <p>6.Particulate air filters for respirators</p> <p>7.Apron/ Knapjack</p> <p>8. Long-sleeved shirts</p>	  	<p>EN ISO 20345</p> <p>EN 166:2001 EN 140, EN149, EN 143:200</p> <p>R95, R99, R100</p>			<p>tested once they leave they programme</p>
Carboxylic acids	Group 4: Synthetic auxins	Picloram (Access, Browser, Scrubber)	2	<p>Acute toxicity to mammals and birds GHS07 WARNING</p>  <p>H302 (harmful if swallowed) H312 (harmful in contact with skin) H319 (Causes serious eye irritation) H332 (harmful if inhaled)</p>	<p>1.Chemically resistant nitrile gloves</p> <p>2.Type 3 and Type 4 protective clothing</p> <p>3.Safety boots</p> <p>4.Face &amp; Eye protection</p>	   	<p>EN 374:2016</p> <p>EN 14605:2005</p> <p>EN 345: 1993</p> <p>EN ISO 20345</p>	<p>5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test</p>	<p>1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every year. 3. All workers need to be tested once they leave they programme</p>		










						<p>5. Half-face respirators</p> <p>6. Particulate air filters for respirators</p> <p>7. Apron/ Knapjack</p> <p>8. Long-sleeved shirts</p>	  	<p>EN 166:2001 EN 140, EN149, EN 143:200</p> <p>R95, R99, R100</p>				
				3	<p>Carcinogenicity GHS07 WARNING</p>  <p>H335 (May cause respiratory irritation)</p>	Same as above	Same as above	Same as above	20cc fresh blood sample. AChE tests done with Test-Mate model 400 device	<p>1. All workers need to be tested before they start working.</p> <p>2. If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years..</p> <p>3. All workers need to be tested once they leave the programme</p>		

						<p>1.Chemically resistant nitrile gloves</p> <p>2.Type 3 and Type 4 protective clothing</p>   <p>Type 5 protective clothing</p>  <p>3.Safety boots</p>  <p>4.Face &amp; Eye protection</p>  <p>5.Half-face respirators</p>  <p>6.Particulate air filters for respirators</p>  <p>7.Apron/ Knapjack</p>  <p>8. Long-sleeved shirts</p> 	<p>EN ISO 20345</p> <p>EN 166:2001</p> <p>EN140 EN 149</p> <p>EN 143:2000</p> <p>R95, R99, R100</p>	<p>20cc fresh blood sample. AChE tests done with Test-Mate model 400 device</p>	<p>1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years.. 3. All workers need to be tested once they leave the programme</p>
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				7	Acute toxicity to aquatic organisms GHS09 WARNING  H400 (Very toxic to aquatic life)							
				8	Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING  H410 (Very toxic to aquatic life with long lasting effects) H412 (harmful to aquatic life with long lasting effects)							
Phenoxy acids	Group 4: Synthetic auxins	Alkylchloro phenoxy (2,4D)	2	Acute toxicity to mammals and birds GHS07 WARNING  H302 (Harmful if swallowed) H317 ( May cause an allergic reaction)	1.Chemically resistant nitrile gloves  2.Type 3 and Type 4 protective clothing 	  	EN 374:2016  EN 14605:2005  EN 345: 1993		5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test		1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every year.	

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					H318 (causes serious eye damage)	3.Safety boots 4.Face & Eye protection 5.Half-face respirators 6.Particulate air filters for respirators 7.Apron/ Knapjack	   	EN ISO 20345  EN 166:2001 EN 140, EN149, EN 143:200				3. All workers need to be tested once they leave they programme
			3	Carcinogenicity GHS07 WARNING  H335 (May cause respiratory irritation)	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing 3.Safety boots 4.Face & Eye protection 5.Half-face respirators	   	EN 374:2016  EN 14605:2005  EN 345: 1993  EN ISO 20345  EN 166:2001	20cc fresh blood sample. AChE tests done with Test-Mate model 400 device			1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years.. 3. All workers need to be tested	











STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

						<p>6.Particulate air filters for respirators</p> <p>7.Apron/ Knapjack</p>	 	<p>EN 140, EN149, EN 143:200</p> <p>R95, R99, R100</p>			once they leave the programme	
			5	<p>Developmental &amp; Reproductive toxicity</p> <p>GHS08 DANGER</p>  <p>H361 (Suspected of damaging fertility or the unborn child)</p>	<p>1.Chemically resistant nitrile gloves</p> <p>2.Type 3 and Type 4 protective clothing</p>   <p>Type 5 protective clothing</p>  <p>3.Safety boots</p> <p>4.Face &amp; Eye protection</p> <p>5.Half-face respirators</p> <p>6.Particulate air</p>	     	<p>EN ISO 20345</p> <p>EN 166:2001</p> <p>EN140 EN 149</p> <p>EN 143:2000</p> <p>R95, R99, R100</p>	<p>20cc fresh blood sample. AChE tests done with Test-Mate model 400 device</p>		<p>1.All workers need to be tested before they start working.</p> <p>2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years..</p> <p>3. All workers need to be tested once they leave the programme</p>		






STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

						filters for respirators						
						7.Apron/ Knapjack						
						8. Long-sleeved shirts						
					Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING  H412 (Harmful to aquatic life with long lasting effects)							
				8								
			Pyridine compounds as butoxy ethyl esters (Garlon 4, Garlon max, Nuvogon, Triclon, Viroaxe, Tricloxmax, Turbador)	2	Acute toxicity to mammals and birds GHS07 WARNING  H302 (Harmful if swallowed) H317 ( May cause an allergic reaction)	1.Chemically resistant nitrile gloves  2.Type 3 and Type 4 protective clothing  	EN 374:2016  EN 14605:2005  EN 345: 1993		5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test		1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years. 3. All workers need to be	









STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

					<p>H319 (causes serious eye irritation) H373 (May cause damage to organs – heart, liver, kidneys)</p>	<p>3.Safety boots 4.Face &amp; Eye protection 5.Half-face respirators 6.Particulate air filters for respirators 7.Apron/ Knapjack</p>	    	<p>EN ISO 20345  EN 166:2001 EN 140, EN149, EN 143:200  R95, R99, R100</p>			<p>tested once they leave they programme</p>
				5	<p>Developmental and Reproductive toxicity GHS08 DANGER  H360 (May damage fertility or the unborn child)</p>	<p>1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing Type 5 protective clothing 3.Safety boots</p>	      	<p>EN ISO 20345  EN 166:2001  EN140 EN 149  EN 143:2000  R95, R99, R100</p>	<p>20cc fresh blood sample. AChE tests done with Test-Mate model 400 device</p>	<p>1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 5 years.. 3. All workers need to be tested once they</p>	








STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

						<p>4.Face &amp; Eye protection </p> <p>5.Half-face respirators</p> <p>6.Particulate air filters for respirators </p> <p>7.Apron/ Knapjack</p> <p>8. Long-sleeved shirts</p>				leave the programme		
				8	<p>Persistence in soil/water and soil absorption potential &amp; bio magnification &amp; bioaccumulation</p> <p>GHS09 WARNING </p> <p>H411 (Toxic to aquatic life with long lasting effects)</p>							
Quinoline carboxylic acid	Group 4: Synthetic auxins	Pyridine compounds such As Triclopyr as amine salts (Lumberjack , Timbrel)	2	<p>Acute toxicity to mammals and birds</p> <p>GHS07 WARNING </p>	<p>1.Chemically resistant nitrile gloves </p> <p>2.Type 3 and Type 4</p>	<p>EN 374:2016</p> <p>EN 14605:2005</p>		5cc fresh urine sample refrigerated. Tested using		<p>1.All workers need to be tested before they start working.</p> <p>2.If the worker sprays</p>		







STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

					<p>H302 (Harmful if swallowed)  H317 ( May cause an allergic reaction)  H318 (Causes serious eye damage)  H315 (Causes skin irritation)  H335 (may cause respiratory irritation)  H336 (may cause drowsiness or dizziness)  H360 (may damage fertility or the unborn child)</p>	<p>protective clothing        3.Safety boots    4.Face &amp; Eye protection    5.Half-face respirators    6.Particulate air filters for respirators    7.Apron/ Knapjack</p>	<p>EN 345: 1993  EN ISO 20345  EN 166:2001  EN 140, EN149, EN 143:200  R95, R99, R100</p>	<p>ELIZA dipstick test</p>	<p>8 hours per day for 5 days per week, an additional test is needed every 2 years.  3. All workers need to be tested once they leave they programme</p>
			8	<p>Persistence in soil/water and soil absorption potential &amp; bio magnification &amp; bioaccumulation  GHS09  WARNING    H411 (Toxic to aquatic life with</p>					














STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

					long lasting effects)							
Quinoline carboxylic acid	Group 4: Synthetic auxins	Pyridine compounds such as fluroxypyr (Tomahawk, Starane, Voloxypyr)	8	Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING  H411 (Toxic to aquatic life with long lasting effects)								
Quinoline carboxylic acid	Group 4: Synthetic auxins	Pyridine compounds such as Aminopyralids ( Sendero)	2	Acute toxicity to mammals and birds GHS07 WARNING  H315 (Causes skin irritation) H318 (causes serious eye damage) H319 (Causes serious eye irritation) H335 (may cause respiratory irritation)	1.Chemically resistant nitrile gloves  2.Type 3 and Type 4 protective clothing  3.Safety boots  4.Face & Eye protection  5.Half-face respirators  6.Particulate air	EN 374:2016  EN 14605:2005  EN 345: 1993  EN ISO 20345  EN 166:2001 EN 140, EN149, EN 143:200		5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test		1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years. 3. All workers need to be tested once they leave they programme		

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021












					filters for respirators								
					7.Apron/ Knapjack			R95, R99, R100					
				7	Acute toxicity to aquatic organisms GHS09 WARNING  H400 (Very toxic to aquatic life)								
				8	Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING  H411 (Toxic to aquatic life with long lasting effects)								
Combinations	Group 4: Synthetic auxins	Quinoline carboxylic acid such as Picloram + Pyridine compound such as Fluroxypyr (	2	Acute toxicity to mammals and birds GHS07 WARNING  H302 (harmful if swallowed)	1.Chemically resistant nitrile gloves  2.Type 3 and Type 4 protective clothing	  	EN 374:2016  EN 14605:2005		5cc fresh urine sample refrigerated. Tested using ELIZA		1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days		

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021





			Plenum, Gladiator)		H312 (harmful in contact with skin) H319 (Causes serious eye irritation) H332 (harmful if inhaled)	  3.Safety boots 4.Face & Eye protection 5.Half-face respirators 6.Particulate air filters for respirators 7.Apron/ Knapjack	    	EN 345: 1993 EN ISO 20345 EN 166:2001 EN 140, EN149, EN 143:200 R95, R99, R100	dipstick test	per week, an additional test is needed every 2 years. 3. All workers need to be tested once they leave they programme
		3		Carcinogenicity GHS07 WARNING  H335 (May cause respiratory irritation)	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing   3.Safety boots	  	EN 374:2016 EN 14605:2005 EN 345: 1993 EN ISO 20345	20cc fresh blood sample. AChE tests done with Test-Mate model 400 device	1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done	










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						<p>4.Face &amp; Eye protection </p> <p>5.Half-face respirators </p> <p>6.Particulate air filters for respirators </p> <p>7.Apron/ Knapjack </p>	<p>EN 166:2001 EN 140, EN149, EN 143:200</p> <p>R95, R99, R100</p>		<p>every 2 years.. 3. All workers need to be tested once they leave the programme</p>	
				6	<p>Endocrine Disrupting Chemicals (EDC) GHS08 DANGER </p> <p>H370 (causes damage to organs – lungs)</p>	<p>1.Chemically resistant nitrile gloves </p> <p>2.Type 3 and Type 4 protective clothing  </p> <p>Type 5 protective clothing </p> <p>3.Safety boots </p> <p>4.Face &amp; Eye protection </p>	<p>EN ISO 20345</p> <p>EN 166:2001</p> <p>EN140 EN 149</p> <p>EN 143:2000</p> <p>R95, R99, R100</p>	<p>20cc fresh blood sample. AChE tests done with Test-Mate model 400 device</p>	<p>1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years.. 3. All workers need to be tested once they leave the</p>	

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						<p>5. Half-face respirators</p> <p>6. Particulate air filters for respirators</p> <p>7. Apron/ Knapjack</p> <p>8. Long-sleeved shirts</p>	 				programme		
			7	<p>Acute toxicity to aquatic organisms</p> <p>GHS09</p> <p>WARNING</p>  <p>H400 (Very toxic to aquatic life)</p>									
			8	<p>Persistence in soil/water and soil absorption potential &amp; bio magnification &amp; bioaccumulation</p> <p>GHS09</p> <p>WARNING</p>  <p>H410 (Very toxic to aquatic life with long lasting effects)</p>									

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					H412 (harmful to aquatic life with long lasting effects)								
Combinations	Group 4: Synthetic auxins	Pyridine compounds such as Fluroxypyr + Pyridine compounds such as Triclopyr as Pyridyloxy compound ( Impala)	2	<p>Acute toxicity to mammals and birds GHS07 WARNING</p>  <p>H302 (Harmful if swallowed) H317 ( May cause an allergic reaction) H319 (causes serious eye irritation) H373 (May cause damage to organs – heart, liver, kidneys)</p>	<p>1.Chemically resistant nitrile gloves</p> <p>2.Type 3 and Type 4 protective clothing</p> <p>3.Safety boots</p> <p>4.Face &amp; Eye protection</p> <p>5.Half-face respirators</p> <p>6.Particulate air filters for respirators</p> <p>7.Apron/ Knapjack</p> <p>8. Long-sleeved shirt</p>	     	<p>EN 374:2016</p> <p>EN 14605:2005</p> <p>EN 345: 1993</p> <p>EN ISO 20345</p> <p>EN 166:2001 EN 140, EN149, EN 143:200</p> <p>R95, R99, R100</p>	<p>5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test</p>	<p>1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years. 3. All workers need to be tested once they leave they programme</p>				




















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				8	<p>Persistence in soil/water and soil absorption potential &amp; bio magnification &amp; bioaccumulation</p> <p>GHS09 WARNING</p>  <p>H411 (Toxic to aquatic life with long lasting effects)</p>							
Combinations	Group 4: Synthetic auxins	Quinoline carboxylic acid such as Picloram + Pyridine compound such Triclopyr as trimethylamine salt (Kaput gel)	2	<p>Acute toxicity to mammals and birds</p> <p>GHS07 WARNING</p>  <p>H302 (harmful if swallowed) H312 (harmful in contact with skin) H315 (causes skin irritation) H317(May cause allergic skin reaction) H319 (Causes serious eye irritation) H332 (harmful if inhaled) H335 (May cause respiratory irritation)</p>	<p>1.Chemically resistant nitrile gloves</p>  <p>2.Type 3 and Type 4 protective clothing</p>  <p>3.Safety boots</p>  <p>4.Face &amp; Eye protection</p>  <p>5.Half-face respirators</p>  <p>6.Particulate air</p>	<p>EN 374:2016</p> <p>EN 14605:2005</p> <p>EN 345: 1993</p> <p>EN ISO 20345</p> <p>EN 166:2001 EN 140, EN149, EN 143:200</p>						

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					H336 (may cause drowsiness or dizziness)	filters for respirators 7. Apron/ Knapjack			R95, R99, R100			
			3	Carcinogenicity GHS07 WARNING  H335 (May cause respiratory irritation)	1. Chemically resistant nitrile gloves 2. Type 3 and Type 4 protective clothing  3. Safety boots 4. Face & Eye protection 5. Half-face respirators 6. Particulate air filters for respirators 7. Apron/ Knapjack	     	EN 374:2016 EN 14605:2005 EN 345:1993 EN ISO 20345 EN 166:2001 EN 140, EN149, EN 143:200	20cc fresh blood sample. AChE tests done with Test-Mate model 400 device	1. All workers need to be tested before they start working. 2. If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years.. 3. All workers need to be tested once they leave the programme			

				5	<p>Developmental and Reproductive toxicity GHS08 DANGER</p>  <p>H360 (May damage fertility or the unborn child)</p>	<p>1.Chemically resistant nitrile gloves</p> <p>2.Type 3 and Type 4 protective clothing</p> <p>Type 5 protective clothing</p> <p>3.Safety boots</p> <p>4.Face &amp; Eye protection</p> <p>5.Half-face respirators</p> <p>6.Particulate air filters for respirators</p> <p>7.Apron/ Knapjack</p> <p>8. Long-sleeved shirts</p>	      	<p>EN ISO 20345</p> <p>EN 166:2001</p> <p>EN140 EN 149</p> <p>EN 143:2000</p> <p>R95, R99, R100</p>	<p>20cc fresh blood sample. AChE tests done with Test-Mate model 400 device</p>	<p>1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 5 years.. 3. All workers need to be tested once they leave the programme</p>		










				6	<p>Endocrine Disrupting Chemicals (EDC) GHS08 DANGER</p>  <p>H370 (causes damage to organs – lungs)</p>	<p>1. Chemically resistant nitrile gloves</p>  <p>2. Type 3 and Type 4 protective clothing</p>  <p>Type 5 protective clothing</p>  <p>3. Safety boots</p>  <p>4. Face &amp; Eye protection</p>  <p>5. Half-face respirators</p>  <p>6. Particulate air filters for respirators</p>  <p>7. Apron/ Knapjack</p>  <p>8. Long-sleeved shirts</p>	<p>EN ISO 20345</p> <p>EN 166:2001</p> <p>EN140 EN 149</p> <p>EN 143:2000</p> <p>R95, R99, R100</p>	<p>20cc fresh blood sample. AChE tests done with Test-Mate model 400 device</p>	<p>1. All workers need to be tested before they start working. 2. If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years.. 3. All workers need to be tested once they leave the programme</p>		
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				7	<p>Acute toxicity to aquatic organisms GHS09 WARNING</p>  <p>H400 (Very toxic to aquatic life)</p>							
				8	<p>Persistence in soil/water and soil absorption potential &amp; bio magnification &amp; bioaccumulation GHS09 WARNING</p>  <p>H410 (Very toxic to aquatic life with long lasting effects) H411 (Toxic to aquatic life with long lasting effects) H412 (harmful to aquatic life with long lasting effects)</p>							
Combinations	Group 4: Synthetic auxins	Pyridine compounds such Triclopyr as amine salt + Pyridine compounds such as	2	<p>Acute toxicity to mammals and birds GHS07 WARNING</p> 	<p>1. Chemically resistant nitrile gloves</p>  <p>2. Type 3 and Type 4</p>	EN 374:2016	EN 14605:2005	5cc fresh urine sample refrigerated. Tested using ELIZA	1. All workers need to be tested before they start working. 2. If the worker sprays 8 hours per			

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			Clopyralid (Confront, Astra)		<p>H302 (Harmful if swallowed) H315 (Causes skin irritation) H317 ( May cause an allergic reaction) H318 (causes serious eye damage) H319 (causes serious eye irritation) H335 (May cause respiratory irritation) H373 (May cause damage to organs – heart, liver, kidneys)</p>	<p>protective clothing </p> <p>3.Safety boots </p> <p>4.Face &amp; Eye protection </p> <p>5.Half-face respirators </p> <p>6.Particulate air filters for respirators </p> <p>7.Apron/ Knapjack</p>	<p>EN 345: 1993</p> <p>EN ISO 20345</p> <p>EN 166:2001 EN 140, EN149, EN 143:200</p> <p>R95, R99, R100</p>		dipstick test	day for 5 days per week, an additional test is needed every 2 years. 3. All workers need to be tested once they leave they programme
				5	<p>Developmental and Reproductive toxicity GHS08 DANGER  H360 (May damage fertility or the unborn child)</p>	<p>1.Chemically resistant nitrile gloves </p> <p>2.Type 3 and Type 4 protective clothing </p> <p>Type 5 protective clothing </p>	<p>EN ISO 20345</p> <p>EN 166:2001</p> <p>EN140 EN 149</p>	20cc fresh blood sample. AChE tests done with Test-Mate model 400 device		<p>1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs</p>

						 3.Safety boots  4.Face & Eye protection  5.Half-face respirators  6.Particulate air filters for respirators  7.Apron/ Knapjack 8. Long-sleeved shirts	EN 143:2000  R95, R99, R100			to be done every 5 years.. 3. All workers need to be tested once they leave the programme	
			8	Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING  H411 (Toxic to aquatic life with							









STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

					long lasting effects)							
Combinations	Group 4: Synthetic auxins	Pyridine compounds such as Triclopyras triethyl ammonium + Aminopyralid (Confront super)	2	<p>Acute toxicity to mammals and birds GHS07 WARNING</p>  <p>H317 (May cause an allergic skin reaction) H318 (Causes serious eye damage) H319 (Causes serious eye irritation) H315 (Causes skin irritation) H335 (may cause respiratory irritation) H336 ( may cause drowsiness or dizziness)</p>	<p>1.Chemically resistant nitrile gloves</p> <p>2.Type 3 and Type 4 protective clothing</p>   <p>3.Safety boots</p> <p>4.Face &amp; Eye protection</p> <p>5.Half-face respirators</p> <p>6.Particulate air filters for respirators</p> <p>7.Apron/ Knapjack</p>	     	<p>EN 374:2016</p> <p>EN 14605:2005</p> <p>EN 345: 1993</p> <p>EN ISO 20345</p> <p>EN 166:2001 EN 140, EN149, EN 143:200</p> <p>R95, R99, R100</p>	<p>5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test</p>	<p>1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years. 3. All workers need to be tested once they leave they programme</p>			
			5	<p>Developmental and Reproductive toxicity GHS08 DANGER</p>	<p>1.Chemically resistant nitrile gloves</p>		<p>EN ISO 20345</p>	<p>20cc fresh blood sample. AChE tests</p>	<p>1.All workers need to be tested before</p>			












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				 <p>H360 (may damage fertility or the unborn child)</p>	<p>2.Type 3 and Type 4 protective clothing</p>  <p>Type 5 protective clothing</p>  <p>3.Safety boots</p>  <p>4.Face &amp; Eye protection</p>  <p>5.Half-face respirators</p>  <p>6.Particulate air filters for respirators</p>  <p>7.Apron/ Knapjack</p> <p>8. Long-sleeved shirts</p>	<p>EN 166:2001</p> <p>EN140 EN 149</p> <p>EN 143:2000</p> <p>R95, R99, R100</p>	<p>done with Test-Mate model 400 device</p>	<p>they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 5 years.. 3. All workers need to be tested once they leave the programme</p>		
			7	<p>Acute toxicity to aquatic organisms GHS09 WARNING</p>						






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					 H400 (Very toxic to aquatic life)							
				8	Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING  H410 (Very toxic to aquatic life with long lasting effects) H11 (Toxic to aquatic life with long lasting effects)							
Combinations	Group 4: Synthetic auxins	Pyridine compounds such as Triclopyr as Butoxy ethyl ester + Aminopyralid (Garlon Max)	2	Acute toxicity to mammals and birds GHS07 WARNING  H302 (Harmful if swallowed) H315 (causes skin irritation) H317 ( May cause an allergic reaction) H318 (causes serious eye damage)	1.Chemically resistant nitrile gloves  2.Type 3 and Type 4 protective clothing   3.Safety boots  4.Face & Eye protection 	EN 374:2016  EN 14605:2005  EN 345: 1993  EN ISO 20345		5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test	1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years. 3. All workers need to be tested once they leave they programme			

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					<p>H319 (causes serious eye irritation)  H335 (may cause respiratory irritation)  H336 (may cause drowsiness or dizziness)  H373 (May cause damage to organs – heart, liver, kidneys)</p>	<p>5. Half-face respirators  6. Particulate air filters for respirators  7. Apron/ Knapjack</p>	 	<p>EN 166:2001  EN 140,  EN149, EN 143:200</p> <p>R95, R99, R100</p>				
			5	<p>Developmental and Reproductive toxicity  GHS08 DANGER    H360 (May damage fertility or the unborn child)</p>	<p>1. Chemically resistant nitrile gloves  2. Type 3 and Type 4 protective clothing    Type 5 protective clothing    3. Safety boots  4. Face &amp; Eye protection  </p>	    	<p>EN ISO 20345  EN 166:2001  EN140  EN 149  EN 143:2000  R95, R99, R100</p>	<p>20cc fresh blood sample. AChE tests done with Test-Mate model 400 device</p>	<p>1. All workers need to be tested before they start working.  2. If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 5 years..  3. All workers need to be tested once they leave the programme</p>			

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						5. Half-face respirators						
						6. Particulate air filters for respirators						
						7. Apron/ Knapjack						
						8. Long-sleeved shirts						
				8	Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING  H410 (Very toxic to aquatic life with long lasting effects)							
Uracils	Group 5: Photosynthetic inhibitors at Photosystem II, Site A.	Bromacil (Bushwacker)	2	Acute toxicity to mammals and birds GHS07 WARNING  H302 (Harmful if swallowed)	1. Chemically resistant nitrile gloves  2. Type 3 and Type 4 protective clothing 	EN 374:2016  EN 14605:2005		5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test		1. All workers need to be tested before they start working. 2. If the worker sprays 8 hours per day for 5 days per week, an		











STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

					<p>H315 (Causes skin irritation)                  H319 (Causes serious eye irritation)                  H335 (may cause respiratory irritation)</p>	  <p>3.Safety boots                  4.Face &amp; Eye protection                  5.Half-face respirators                  6.Particulate air filters for respirators                  7.Apron/ Knapjack</p>	   	<p>EN 345: 1993                  EN ISO 20345                  EN 166:2001 EN 140, EN149, EN 143:200                  R95, R99, R100</p>				<p>additional test is needed every 2 years.                  3. All workers need to be tested once they leave they programme</p>
			7	<p>Acute toxicity to aquatic organisms                  GHS09                  WARNING                    H400 (Very toxic to aquatic life)</p>								
			8	<p>Persistence in soil/water and soil absorption potential &amp; bio magnification &amp; bioaccumulation                  GHS09                  WARNING</p>								





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					 H410 (Very toxic to aquatic life with long lasting effects)							
Ureas	Group 7: Photosynthetic inhibitors at Photosystem II, Site B.	Tebuthiuron (Limpopo, Molopo)	2	Acute toxicity to mammals and birds GHS07 WARNING  H302 (Harmful if swallowed)	1. Chemically resistant nitrile gloves 2. Type 3 and Type 4 protective clothing   3. Safety boots  4. Face & Eye protection  5. Half-face respirators  6. Particulate air filters for respirators  7. Apron/ Knapjack 	EN 374:2016  EN 14605:2005  EN 345:1993  EN ISO 20345  EN 166:2001 EN 140, EN149, EN 143:200  R95, R99, R100	5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test	1. All workers need to be tested before they start working. 2. If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years. 3. All workers need to be tested once they leave the programme				


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				7	Acute toxicity to aquatic organisms GHS09 WARNING  H400 (Very toxic to aquatic life)							
				8	Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING  H410 (Very toxic to aquatic life with long lasting effects)							
Combinations	Group 5 (Uracil) + Group 7 (urea)	Bromacil + Tebuthiuron (Bundu)	2	Acute toxicity to mammals and birds GHS07 WARNING  H302 (Harmful if swallowed) H315 (Causes skin irritation) H319 (Causes serious eye irritation) H335 (may cause respiratory irritation)	1.Chemically resistant nitrile gloves  2.Type 3 and Type 4 protective clothing   3.Safety boots  4.Face & Eye protection 	EN 374:2016  EN 14605:2005  EN 345: 1993  EN ISO 20345	5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test	1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years. 3. All workers need to be tested once they leave they programme				













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					<p>5. Half-face respirators</p> <p>6. Particulate air filters for respirators</p> <p>7. Apron/ Knapjack</p>	 	<p>EN 166:2001 EN 140, EN149, EN 143:200</p> <p>R95, R99, R100</p>					
			7	<p>Acute toxicity to aquatic organisms GHS09 WARNING</p>  <p>H400 (Very toxic to aquatic life)</p>								
			8	<p>Persistence in soil/water and soil absorption potential &amp; bio magnification &amp; bioaccumulation GHS09 WARNING</p>  <p>H410 (Very toxic to aquatic life with long lasting effects)</p>								













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						<p>1.Chemically resistant nitrile gloves</p> <p>2.Type 3 and Type 4 protective clothing</p> <p>3.Safety boots</p> <p>4.Face &amp; Eye protection</p> <p>5.Half-face respirators</p> <p>6.Particulate air filters for respirators</p> <p>7.Apron/ Knapjack</p>	<p>EN 374:2016</p> <p>EN 14605:2005</p> <p>EN 345: 1993</p> <p>EN ISO 20345</p> <p>EN 166:2001 EN 140, EN149, EN 143:200</p> <p>R95, R99, R100</p>	<p>5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test</p>	<p>1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years. 3. All workers need to be tested once they leave they programme</p>
	Glycines	Group 9: Inhibitors of EPSP synthesis.	Phosphonoglycines such as Glyphosate isopropylamine salts (Seismic, tampleweed) POE-T free	2	<p>Acute toxicity to mammals and birds GHS07 WARNING</p>  <p>H318 (Causes serious eye damage)</p>	<p>1.Chemically resistant nitrile gloves</p> <p>2.Type 3 and Type 4 protective clothing</p>	<p>EN 374:2016</p> <p>EN 14605:2005</p>	<p>5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test</p>	<p>1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an</p>







STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

					H318 (Causes serious eye damage)	  3.Safety boots  4.Face & Eye protection  5.Half-face respirators  6.Particulate air filters for respirators  7.Apron/ Knapjack	EN 345: 1993  EN ISO 20345  EN 166:2001 EN 140, EN149, EN 143:200  R95, R99, R100			additional test is needed every 2 years. 3. All workers need to be tested once they leave the programme
Glycines	Group 9: Inhibitors of EPSP synthesis.	Phosphonoglycines such as glyphosate (all GBH's containing POE-T such as Roundup etc)	2	Acute toxicity to mammals and birds GHS07 WARNING  H318 (Causes serious eye damage)	1.Chemically resistant nitrile gloves  2.Type 3 and Type 4 protective clothing    3.Safety boots 	EN 374:2016  EN 14605:2005  EN 345: 1993  EN ISO 20345	5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test	1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years. 3. All workers need to be tested once they leave		

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					<p>4.Face &amp; Eye protection </p> <p>5.Half-face respirators </p> <p>6.Particulate air filters for respirators </p> <p>7.Apron/ Knapjack </p>	<p>EN 166:2001 EN 140, EN149, EN 143:200</p> <p>R95, R99, R100</p>			they programme
			3	<p>Carcinogenicity GHS07 WARNING </p> <p>H335 (May cause respiratory irritation) H336 (may cause drowsiness or dizziness) H315 (Causes skin irritation) H319 (causes serious eye irritation)</p>	<p>1.Chemically resistant nitrile gloves </p> <p>2.Type 3 and Type 4 protective clothing </p> <p> </p> <p>3.Safety boots </p> <p>4.Face &amp; Eye protection </p> <p>5.Half-face respirators </p> <p>6.Particulate air</p>	<p>EN 374:2016</p> <p>EN 14605:2005</p> <p>EN 345: 1993</p> <p>EN ISO 20345</p> <p>EN 166:2001 EN 140, EN149, EN 143:200</p>	<p>20cc fresh blood sample. AChE tests done with Test-Mate model 400 device</p>	<p>1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years.. 3. All workers need to be tested once they leave the</p>	











STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

					filters for respirators 7.Apron/ Knapjack			R95, R99, R100			programm e	
				8	Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING  H411 (Toxic to aquatic life with long lasting effects)							
Organoarsenicals	Group 17: Unknown	Monosodium methylarsenate (MSMA)	2	Acute toxicity to mammals and birds GHS07 WARNING  H302 (Harmful if swallowed) H315 (causes skin irritation) H319 (Causes serious eye irritation) H332 (Harmful if inhaled)	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing 3.Safety boots	  	EN 374:2016 EN 14605:2005 EN 345: 1993 EN ISO 20345		5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test		1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years. 3. All workers need to be tested once they leave	











STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021



						4.Face & Eye protection 5.Half-face respirators 6.Particulate air filters for respirators 7.Apron/ Knapjack	  	EN 166:2001 EN 140, EN149, EN 143:200  R95, R99, R100				they programme
			3	Carcinogenicity GHS07 WARNING  H335 (May cause respiratory irritation) H336 (May cause drowsiness or dizziness)	1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing 3.Safety boots 4.Face & Eye protection 5.Half-face respirators 6.Particulate air	    	EN 374:2016  EN 14605:2005  EN 345: 1993  EN ISO 20345  EN 166:2001 EN 140, EN149, EN 143:200	20cc fresh blood sample. AChE tests done with Test-Mate model 400 device		1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years.. 3. All workers need to be tested once they leave the programme		

					filters for respirators							
					7.Apron/ Knapjack		R95, R99, R100					
			6	<p>Endocrine Disrupting Chemicals (EDC) GHS08 DANGER</p>  <p>H371 (may cause damage to organs (kidneys and liver)) H372 (causes damage to organs through prolonged effect (liver and kidneys))</p>	<p>1.Chemically resistant nitrile gloves</p>  <p>2.Type 3 and Type 4 protective clothing</p>  <p>Type 5 protective clothing</p>  <p>3.Safety boots</p>  <p>4.Face &amp; Eye protection</p>  <p>5.Half-face respirators</p>  <p>6.Particulate air filters for respirators</p> 	<p>EN ISO 20345</p> <p>EN 166:2001</p> <p>EN140 EN 149</p> <p>EN 143:2000</p> <p>R95, R99, R100</p>	<p>20cc fresh blood sample. AChE tests done with Test-Mate model 400 device</p>	<p>1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years.. 3. All workers need to be tested once they leave the programme</p>				



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						7.Apron/ Knapjack							
						8. Long- sleeved shirts							
	Bipyridyliums	Group 22: Cell membrane disruptors	Diquat dibromide (Scuba, Midstream) & Paraquat (Gramoxone )	2	<p>Acute toxicity to mammals and birds GHS06 DANGER</p>  <p>H301( Toxic if swallowed) H311(Toxic in contact with skin) H330(Fatal if inhaled)</p> <p>GHS07 WARNING</p>  <p>H315(Causes skin irritation) H319(causes serious eye irritation) H335(May cause respiratory irritation) H372(Causes damage to organs)</p>	<p>1.Chemical ly resistant nitrile gloves</p> <p>2.Type 3 and Type 4 protective clothing</p> <p>3.Safety boots</p> <p>4.Face &amp; Eye protection</p> <p>5.Half-face respirators</p> <p>6.Particula te air filters for respirators</p> <p>7.Apron/ Knapjack</p>	          	<p>EN 374:2016</p> <p>EN 14605:2005</p> <p>EN 345: 1993</p> <p>EN ISO 20345</p> <p>EN 166:2001 EN 140, EN149, EN 143:200</p> <p>R95, R99, R100</p>	<p>5cc fresh urine sample refrigerat ed. Tested using ELIZA dipstick test</p>	<p>1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years. 3. All workers need to be tested once they leave they programme</p>			











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				7	Acute toxicity to aquatic organisms  H400 (Very toxic to aquatic life)								
				8	Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING  H411 (Toxic to aquatic life with long lasting effects)								










PESTICIDES FOR NON-PLANT INVASIVES CONTROL

	Chemical group	MOA	Examples	Hazard Group	Hazard Criterion	PPE			Medical Biomonitoring		Frequency and Duration		Environmental monitoring
						Type	Pictogram	Classification	Blood	Urine	Blood	Urine	
1	Rodenticides	Inhibits vitamin K, anti-coagulant	Difenacoum, Brodifacoum Coumatetralyl	2	Acute Toxicity to mammals and birds GHS06 DANGER 	1. Chemically resistant nitrile gloves		EN ISO 20345  EN 166:2001	20cc fresh blood sample. AChE tests		1. All workers need to be tested before they		

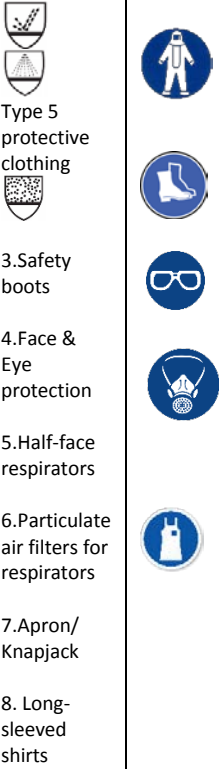

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

				<p>H300 (Fatal if swallowed)                  H310 (Fatal in contact with skin)                  GHS07                  WARNING</p>  <p>H373 (Causes damage to organs through prolonged or repeated exposure – blood)</p>	<p>2.Type 3 and Type 4 protective clothing</p>  <p>Type 5 protective clothing</p>  <p>3.Safety boots</p> <p>4.Face &amp; Eye protection</p> <p>5.Half-face respirators</p> <p>6.Particulate air filters for respirators</p> <p>7.Apron/ Knapjack</p> <p>8. Long-sleeved shirts</p>	    	<p>EN140                  EN 149</p> <p>EN 143:2000</p> <p>R95, R99,                  R100</p>	<p>done with Test-Mate model 400 device</p>	<p>start working.                  2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years..                  3. All workers need to be tested once they leave the programme</p>		
			5	<p>Developmental and Reproductive toxicity                  GHS08 DANGER</p> 	<p>1.Chemically resistant nitrile gloves</p> <p>2.Type 3 and Type 4</p>		<p>EN ISO 20345</p> <p>EN 166:2001</p>	<p>20cc fresh blood sample.                  AChE tests done</p>	<p>1.All workers need to be tested before they start working.</p>		












STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

					<p>H360D (May damage the unborn child)</p> <p>protective clothing</p>  <p>Type 5 protective clothing</p>  <p>3.Safety boots</p>  <p>4.Face &amp; Eye protection</p>  <p>5.Half-face respirators</p>  <p>6.Particulate air filters for respirators</p>  <p>7.Apron/ Knapjack</p>  <p>8. Long-sleeved shirts</p>	<p>EN140 EN 149</p> <p>EN 143:2000</p> <p>R95, R99, R100</p>	<p>with Test-Mate model 400 device</p>	<p>2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years..</p> <p>3. All workers need to be tested once they leave the programme</p>		
			6	<p>Endocrine Disrupting Chemicals (EDC) GHS08 DANGER</p>  <p>H372 (Causes damage to organs through</p>	<p>1.Chemically resistant nitrile gloves</p>  <p>2.Type 3 and Type 4 protective clothing</p>	<p>EN ISO 20345</p> <p>EN 166:2001</p>	<p>20cc fresh blood sample. AChE tests done with Test-</p>	<p>1.All workers need to be tested before they start working.</p> <p>2.If the worker</p>		









STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

					<p>prolonged or repeated exposure – blood)</p>  <p>Type 5 protective clothing</p> <p>3.Safety boots</p> <p>4.Face &amp; Eye protection</p> <p>5.Half-face respirators</p> <p>6.Particulate air filters for respirators</p> <p>7.Apron/ Knapjack</p> <p>8. Long-sleeved shirts</p>	<p>EN140 EN 149</p> <p>EN 143:2000</p> <p>R95, R99, R100</p>	<p>Mate model 400 device</p>	<p>sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years..</p> <p>3. All workers need to be tested once they leave the programme</p>			
			7	<p>Acute toxicity to aquatic organisms</p>  <p>H400 (Very toxic to aquatic life)</p>							<p>Ensure environmental monitoring is complied with such as ESRA protocols</p>
			8	<p>Persistence in soil/water and soil absorption</p>							<p>Ensure environmental monitoring is</p>












STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

				<p>potential &amp; bio magnification &amp; bioaccumulation GHS09 WARNING</p>  <p>H410 (Very toxic to aquatic life with long lasting effects)</p>							<p>complied with such as ESRA protocols</p>
			Cholecalciferol	2	<p>Acute Toxicity to mammals and birds GHS06 DANGER</p>  <p>H301 (Toxic is swallowed) H311 (Toxic in contact with skin) H330 (fatal if inhaled)</p>	<p>1. Chemically resistant nitrile gloves</p>  <p>2. Type 3 and Type 4 protective clothing</p>   <p>Type 5 protective clothing</p>  <p>3. Safety boots</p>  <p>4. Face &amp; Eye protection</p>  <p>5. Half-face respirators</p>  <p>6. Particulate air filters for respirators</p>  <p>7. Apron/ Knapjack</p> 	<p>EN ISO 20345</p> <p>EN 166:2001</p> <p>EN140 EN 149</p> <p>EN 143:2000</p> <p>R95, R99, R100</p>	<p>20cc fresh blood sample. AChE tests done with Test-Mate model 400 device</p>	<p>1. All workers need to be tested before they start working. 2. If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years.. 3. All workers need to be tested once they leave the programme</p>		









						8. Long-sleeved shirts						
			6	<p>Endocrine Disrupting Chemicals (EDC) GHS08 DANGER</p>  <p>H372 (Causes damage to organs through prolonged or repeated exposure)</p>	<p>1. Chemically resistant nitrile gloves</p>  <p>2. Type 3 and Type 4 protective clothing</p>  <p>Type 5 protective clothing</p>  <p>3. Safety boots</p>  <p>4. Face &amp; Eye protection</p>  <p>5. Half-face respirators</p> <p>6. Particulate air filters for respirators</p>  <p>7. Apron/ Knapjack</p> 	<p>EN ISO 20345</p> <p>EN 166:2001</p> <p>EN140 EN 149</p> <p>EN 143:2000</p> <p>R95, R99, R100</p>	<p>20cc fresh blood sample. AChE tests done with Test-Mate model 400 device</p>	<p>1. All workers need to be tested before they start working. 2. If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years.. 3. All workers need to be tested once they leave the programme</p>				








STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

						8. Long-sleeved shirts						
2	Avicides	Sedative powder	alphachloralose	2	<p>Acute Toxicity to mammals and birds GHS06 DANGER</p>  <p>H301 (Toxic if swallowed)</p> <p>GHS07 WARNING</p>  <p>H332 (Harmful if inhaled) H336 (may cause drowsiness or dizziness)</p>	<p>1. Chemically resistant nitrile gloves</p>  <p>2. Type 3 and Type 4 protective clothing</p>   <p>Type 5 protective clothing</p>  <p>3. Safety boots</p>  <p>4. Face &amp; Eye protection</p>   <p>5. Half-face respirators</p>  <p>6. Particulate air filters for respirators</p> <p>7. Apron/ Knapjack</p> 	<p>EN ISO 20345</p> <p>EN 166:2001</p> <p>EN140 EN 149</p> <p>EN 143:2000</p> <p>R95, R99, R100</p>	<p>20cc fresh blood sample. AChE tests done with Test-Mate model 400 device</p>	<p>1. All workers need to be tested before they start working. 2. If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years.. 3. All workers need to be tested once they leave the programme</p>			












STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

					8. Long-sleeved shirts							
				7	Acute toxicity to aquatic organisms  H400 (Very toxic to aquatic life)							Ensure environmental monitoring is complied with such as ESRA protocols
				8	Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING  H410 (Very toxic to aquatic life with long lasting effects)							Ensure environmental monitoring is complied with such as ESRA protocols
		Uptake orally resulting in hepatic necrosis and eventual death	DRC 1336/Starlicide	2	Acute Toxicity to mammals and birds GHS06 DANGER  H301 (Toxic if swallowed) H311 (Toxic in contact with skin)  GHS07 WARNING	1. Chemically resistant nitrile gloves  2. Type 3 and Type 4 protective clothing 	  	EN ISO 20345  EN 166:2001  EN140 EN 149	20cc fresh blood sample. AChE tests done with Test-Mate model 400 device	1. All workers need to be tested before they start working. 2. If the worker sprays 8 hours per day for 5 days per week, an additional		



STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

					 H315 (Causes skin irritation) H317 (May cause an allergic skin reaction) H319 (Causes serious eye irritation) H332 (Harmful if inhaled)	Type 5 protective clothing  3.Safety boots 4.Face & Eye protection 5.Half-face respirators 6.Particulate air filters for respirators 7.Apron/ Knapjack 8. Long-sleeved shirts	   	EN 143:2000  R95, R99, R100			test needs to be done every 2 years.. 3. All workers need to be tested once they leave the programme	
			7	Acute toxicity to aquatic organisms  H400 (Very toxic to aquatic life)								Ensure environmental monitoring is complied with such as ESRA protocols
			8	Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation								Ensure environmental monitoring is complied with such as ESRA protocols

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

					<p>GHS09 WARNING</p>  <p>H410 (Very toxic to aquatic life with long lasting effects)</p>							
3	Piscicides	Mitochondrial NADH: ubiquinone reductase inhibitor and toxin	Rotenone	2	<p>Acute Toxicity to mammals and birds</p> <p>GHS06 DANGER</p>  <p>H301 (Toxic if swallowed)</p> <p>GHS07 WARNING</p>  <p>H315 (Causes skin irritation)</p> <p>H319 (Causes serious eye irritation)</p> <p>H335 (May cause respiratory irritation)</p>	<p>1. Chemically resistant nitrile gloves</p> <p>2. Type 3 and Type 4 protective clothing</p>  <p>Type 5 protective clothing</p>  <p>3. Safety boots</p> <p>4. Face &amp; Eye protection</p> <p>5. Half-face respirators</p> <p>6. Particulate air filters for respirators</p> <p>7. Apron/ Knapjack</p>	     	<p>EN ISO 20345</p> <p>EN 166:2001</p> <p>EN140 EN 149</p> <p>EN 143:2000</p> <p>R95, R99, R100</p>	<p>20cc fresh blood sample. AChE tests done with Test-Mate model 400 device</p>	<p>1. All workers need to be tested before they start working.</p> <p>2. If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years..</p> <p>3. All workers need to be tested once they leave the programme</p>		

STRATEGY: ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY, 2021

						8. Long-sleeved shirts							
				7	Acute toxicity to aquatic organisms  H400 (Very toxic to aquatic life)								Ensure environmental monitoring is complied with such as ESRA protocols
				8	Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING  H410 (Very toxic to aquatic life with long lasting effects)								Ensure environmental monitoring is complied with such as ESRA protocols

**Appendix F: Plant Rescue and Protection Plan**

# MSENGE EMOYENI WIND ENERGY FACILITY

## PLANT RESCUE AND PROTECTION PLAN



**Prepared for:**  
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**JUNE 2022**



**SCHERMAN ENVIRONMENTAL**  
Aquatic & Environmental Management  
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## LIST OF ACRONYMS AND ABBREVIATIONS

AIP	Alien Invader Plant
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and Environment
EA	Environmental Authorisation
ECO	Environmental Control Officer
LEK	Local Ecological Knowledge
LOO	Likelihood of Occurrence
NFA	National Forest Act (Act of 1988)
OHPs	Overhead Powerlines
SSC	Species of Special Concern
TBC	The Biodiversity Company
WEF	Wind Energy Facility
WTG	Wind Turbine Generator

## Management Plan Objectives

The purpose of the Msenge Emoyeni Wind Energy Facility (WEF) **Plant Rescue and Protection Plan** is to provide a framework for the management key plant Species of Special Concern (SSC) during the construction and operation of the Msenge Emoyeni Wind Energy Facility (WEF). The broad objectives of the plan include the following:

- Conduct accurate baseline surveys<sup>1</sup> for all declared SSC in the Msenge Emoyeni WEF development footprint.
- Create awareness and information regarding SSC for all Msenge Emoyeni WEF staff and contractors, as well as the landowners.
- To compile a spatial database<sup>2</sup> of the localities for all SSC that will require removal based on the tables below.
- To ensure compliance with Provincial and National Legislation in terms of declared SSC<sup>3</sup>

## Species of Special Concern

South Africa has been declared a megadiverse country in terms of our biodiversity. We have three international biodiversity hotspots as defined by Conservation International (see Mittermeier *et al.* 2004), numerous centres of plant endemism and thousands of species that are endemic. Sadly, many species are listed as threatened and many species have already gone extinct (see Hilton Taylor 2000, Golding 2002).

The TBC (2020) report provides a recent Plant Rescue and Protection Plan for the Msenge Emoyeni WEF development, and should provide some insights. **Table 1** presented below (TBC (2020) lists 46 species but only those highlighted in yellow warrant inclusion in the Plant Rescue and Protection Plan. The lack of a comprehensive list of SSC in the TBC (2020) Plant Rescue and Protection Plan, is puzzling given the long list provided by the previous studies, especially Hoare (2010) and Savanna (2014).

**Table 1. SSC listed in the TBC report for the Msenge Emoyeni WEF<sup>4</sup>.**

No	Species	Threat Status	Comment
1	<i>Agave americana</i>		Category 3 Declared Alien Invader in W Cape
2	<i>Albuca sp.</i>		Species identification needed for searching
3	<i>Aloe ferox</i>	Least Concern	
4	<i>Aloe striata</i>	Schedule 4: Protected	All individuals to be relocated and replanted
5	<i>Arctotis arctotoides</i>	Least Concern	
6	<i>Argemone ochroleuca</i>		Category 1 Declared Alien Invader
7	<i>Asparagus setaceus</i>	Least Concern	
8	<i>Asparagus striatus</i>	SA Endemic, Least	
9	<i>Boophone disticha</i>	Schedule 4: Protected	All individuals to be relocated and replanted
10	<i>Carissa bispinosa</i>	Schedule 4: Protected	Incorrectly listed as Protected
11	<i>Cirsium vulgare</i>		Naturalised alien invasive species
12	<i>Cotyledon cf velutina</i>	Least Concern	
13	<i>Crassula capitella</i>	Least Concern	

<sup>1</sup> This includes areas outside of the development and buffer zones.

<sup>2</sup> The spatial database should include areas outside of the development and buffer zones.

<sup>3</sup> We have included some species that are not listed based on the Precautionary Principle.

<sup>4</sup> It is worth noting that the footprint for the study area of this report is significantly smaller than TBC report.

No	Species	Threat Status	Comment
14	<i>Crassula sp</i>		Species identification needed for searching
15	<i>Cussonia paniculata</i>	Least Concern	
16	<i>Cussonia spicata</i>	Least Concern	
17	<i>Cyrtanthus contractus</i>	Schedule 4: Protected	All individuals to be relocated and replanted
18	<i>Digitaria eriantha</i>	Least Concern	
19	<i>Drosanthemum hispidum</i>	Schedule 4: Protected	Super abundant but requires a permit for clearing
20	<i>Duvalia sp</i>	Schedule 4: Protected	All individuals to be relocated and replanted
21	<i>Echinopsis spachiana</i>		Category 1 Declared Alien Invader
22	<i>Ehretia rigida</i>	SA Endemic	
23	<i>Eragrostis capensis</i>	Least Concern	
24	<i>Eragrostis curvula</i>	Least Concern	
25	<i>Euclea undulata</i>	Least Concern	
26	<i>Euphorbia globosa</i>	Endangered	Incorrectly identified and not present on WEF
27	<i>Euphorbia mauritanica</i>	Least Concern	
28	<i>Euphorbia meloformis</i>	Near Threatened	All individuals to be relocated and replanted. Mass propagation is recommended and will require permits.
29	<i>Euphorbia micrantha</i> <sup>5</sup>	Schedule 4: Protected	All individuals to be relocated and replanted
30	<i>Gomphocarpus physocarpus</i>	Schedule 4: Protected	Weedy asclepiad but requires a permit for clearing
31	<i>Gymnosporia buxifolia</i>	Least Concern	
32	<i>Haemanthus sp.</i>	Schedule 4: Protected	All individuals to be relocated and replanted
33	<i>Holothrix/Satyrium</i>	Schedule 4: Protected	All individuals to be relocated and replanted
34	<i>Ledebouria revoluta</i>	Least Concern	
35	<i>Moraea sp.</i>	Schedule 4: Protected	All individuals to be relocated and replanted
36	<i>Olea europaea subsp.</i>	Least Concern	
37	<i>Opuntia aurantiaca</i>		Category 1 Declared Alien Invader
38	<i>Opuntia ficus-indica</i>		Category 1 Declared Alien Invader
39	<i>Pelargonium cf sidoides</i>	Schedule 4: Protected	All individuals to be relocated and replanted
40	<i>Ruschia sp.</i>	Schedule 4: Protected	Species identification needed for searching
41	<i>Schotia afra</i> var. <i>afra</i>	SA Endemic	
42	<i>Searsia glauca</i>	SA Endemic	
43	<i>Tagetes minuta</i>		Naturalised alien invasive
44	<i>Tritonia sp.</i>	Schedule 4: Protected	All individuals to be relocated and replanted
45	<i>Vachellia karoo</i>	Least Concern	Bush encroacher species
46	<i>Xanthium sp</i>		Category 1 Declared Alien Invader

Agricultural activities and developments have a key role to play in slowing the rate of South African plants going extinct, and the Msenge Emoyeni WEF has the opportunity to be a leading light in terms of actively restoring locally extinct populations and preventing some species from going extinct.

The field work during March-May 2022, yielded close to 200 plant species, with at least 23 having either provincial or national threat status. These are listed in **Table 2** below, and it should be emphasized that a number of key SSC were not located in the field, but reported in previous studies (Hoare 2010, Savanna 2014, Sherman Colloty & Associates 2017, Nkurenkuru 2018 and TBC 2020). This can be attributed to: 1) flowering time not coinciding with field trips, 2) limited field time 3) large buffer areas 4) cryptic habits.

#### Previous Field Work

In light of the previous statement, we undertook to review the SSC from previous studies but firstly only included those recorded in the field. A number of reports have covered the study area of the period 2010-2020 (Hoare 2010, Savanna 2014, Sherman Colloty & Associates 2017, Nkurenkuru 2018 and TBC 2020). These

<sup>5</sup> Correct spelling: *E. micracantha*.

SSC are presented in **Table 3** and should be viewed as a preliminary composite list<sup>6</sup> of SSC for the Msenge Emoyeni WEF development<sup>7</sup>.

Other useful data can be gleaned from previous studies that estimated or hypothesized about species that could occur in the study site. Firstly, we took the most recent study (TBC 2020) and categorised their listed SCC plants for protected areas status (provincial and national) and systematically assessed the Likelihood of Occurrence (LOO) for the study area using a variety of web-based platforms and botanical reference books. The results for the TBC (2020) report are presented as **Appendix 1**.

We repeated the same exercise for the potential SCC listed by Hoare (2010) as well as all the potential species listed for the study site by Hoare (2010). These results are attached as **Appendix 2 and Appendix 3** respectively. These lists will be instrumental for the incumbent ECO to implement baselines and monitoring.

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<sup>6</sup> Species highlighted in yellow should be excluded

<sup>7</sup> There will be other species that will be added to the list by the ECO over time.

**Table 12.** Plant Species of Special Concern identified on or adjacent to the properties during the RRRG 2022 field visits.

No	Genus	species	Family	Provincial Conservation Status	Current Threat Status SANBI	Comment
1	<i>Aloe</i>	<i>maculata</i>	Asphodelaceae	Protected	Least Concern	
2	<i>Aloe</i>	<i>striata</i>	Asphodelaceae	Protected	Least Concern	
3	<i>Aloiampelos</i>	<i>tenuior</i>	Asphodelaceae	Protected	Least Concern	
4	<i>Anacampseros</i>	<i>arachnoides</i>	Anacampserotaceae	Protected	Least Concern	
5	<i>Boophane</i>	<i>disticha</i>	Amaryllidaceae	Protected	Least Concern	
6	<i>Chasmatophyllum</i>	<i>musculinum</i>	Aizoaceae	Protected	Least Concern	
7	<i>Diascia</i>	<i>cuneata</i>	Scrophulariaceae	Protected	Least Concern	
8	<i>Duvalia</i>	<i>caespitosa</i>	Apocyanaceae	Protected	Least Concern	
9	<i>Duvalia</i>	<i>modesta</i>	Apocyanaceae	Protected	Least Concern	
10	<i>Euphorbia</i>	<i>meloformis</i>	Euphorbiaceae	Protected	Near Threatened. Protected under NEMBA (2007).	
11	<i>Faucaria</i>	<i>tuberculosa</i>	Aizoaceae	Protected	Least Concern	T. Dold believes the populations to be much more in danger and would classify them as Vulnerable
12	<i>Huernii</i>	<i>thurettii</i>	Apocyanaceae	Protected	Least Concern	
13	<i>Mestoklema</i>	<i>albanicum</i>	Aizoaceae	Protected	Near Threatened	
14	<i>Mestoklema</i>	<i>tuberosum</i>	Aizoaceae	Protected	Least Concern	
15	<i>Radamanthus</i>	<i>New species</i>	Hyacinthaceae		Not Determined	
16	<i>Ruschia</i>	<i>britteniae</i>	Aizoaceae	Protected	Least Concern	Being an undescribed species, T. Dold recommends Data Deficient
17	<i>Ruschia</i>	<i>cradockensis</i>	Aizoaceae	Protected	Least Concern	
18	<i>Stapelia</i>	<i>grandiflora</i>	Apocynaceae	Protected	Least Concern	
19	<i>Syringodea</i>	<i>bifucata</i>	Iridiaceae	Protected	Least Concern	
20	<i>Trichodiadema</i>	<i>introrsum</i>	Aizoaceae	Protected	Data Deficient	
21	<i>Trichodiadema</i>	<i>pomeridianum</i>	Aizoaceae	Protected	Least Concern	
22	<i>Trichodiadema</i>	<i>sp1.</i>	Aizoaceae	Protected		
23	<i>Tritonia</i>	<i>securigera</i>	Iridaceae	Protected	Least Concern	

Table 3. Species of Special Concern recorded in the Msenge Emoyeni WEF field study sites from 2010 to 2022<sup>8</sup>.

No	Genus	Species	Sub-species / Variation	RRRG (2022)	The Biodiversity Company (2020)	Scherman <sup>9</sup> Colloty (2017)	Nkurenkuru (2018)	Hoare (2010) <sup>10</sup>	Savanna Environmental (2014)	Comment
1	<i>Aloe</i>	<i>humilis</i>							X	
2	<i>Aloe</i>	<i>maculata</i>		X					X	
3	<i>Aloe</i>	<i>striata</i>		X	X	X			X	
4	<i>Aloiampelos</i>	<i>tenuior</i>		X					X	
5	<i>Aloe</i>	<i>ferox</i>							X	Savanna report lists the species as protected by CITIES, and the 2013 NEMBA regulations
6	<i>Aloe</i>	<i>pluridens</i>								
7	<i>Ammocharis</i>	<i>coranica</i>		X					X	
8	<i>Anacampseros</i>	<i>arachnoides</i>		X			X		X	
9	<i>Berberanthus</i>	<i>addoensis</i>					X			
10	<i>Berberanthus</i>	<i>sp.</i>							X	Sp. level identification needed
11	<i>Boophane</i>	<i>distichia</i>		X	X				X	
12	<i>Bulbine</i>	<i>sp.</i>							X	
13	<i>Carpobrotus</i>	<i>edulis</i>				X				Useful for landscaping and restoration but not a SSC
14	<i>Brachystelma</i>	<i>sp.</i>							X	Sp. level identification needed
15	<i>Brunsvigia</i>	<i>radulosa</i>							X	
16	<i>Brunsvigia</i>	<i>gregaria</i>						X	X	
17	<i>Carissa</i>	<i>bispinosa</i>			X					Mistaken as a SSC due to the Family Apocyanaceae
18	<i>Ceropegia</i>	<i>fimbriata</i>								incorporating the previooius
19	<i>Chasmatophyllum</i>	<i>musculinum</i>		X					X	
20	<i>Corycium</i>	<i>tricuspidatum</i>						X		
21	<i>Crassula</i>	<i>decidua</i>						X		
22	<i>Crinum</i>	<i>macowanii</i>						X	X	
23	<i>Delosperma</i>	<i>sp.</i>				X				Sp. level identification needed

<sup>8</sup> The study area for the various reports has changed significantly, which could explain our report not listed key iconic species such as *Aloe pluridens*.

<sup>9</sup> Only three *Crassula* sp. are protected by the provincial ordinance (*C. columnaris*, *C. perfoliata*, *C. pyramidalis*)

<sup>10</sup> Hoare (2010) does not provide a list of species identified on the Msenge Emoyeni WEF *per se*, but an exhaustive list all plant species recorded for the study area from his previous studies, as well as a suggested list of protected tree species (National Forest Act, NFA) that are likely to occur. These will be assessed in detail in the Basic Assessment Report.

No	Genus	Species	Sub-species / Variation	RRRG (2022)	The Biodiversity Company (2020)	Scherman's Colloty (2017)	Nkurenkuru (2018)	Hoare (2010) <sup>10</sup>	Savanna Environmental (2014)	Comment
24	<i>Cyrtanthus</i>	<i>contractus</i>			X					
25	<i>Drosanthemum</i>	<i>hispidum</i>			X				X	
26	<i>Delosperma</i>	<i>adelaidensis</i>		X						
27	<i>Drimia</i>	<i>altissima</i>								Least concern and abundant (not protected provincially)
28	<i>Diascia</i>	<i>cuneata</i>		X						Listed as Least Concern (Williams et al. 2016)
29	<i>Duvalia</i>	<i>caespitosa</i>		X						Less than 5 remaining populations, Uitenhage to Port Elizabeth, 20km from the coast
30	<i>Duvalia</i>	<i>sp.</i>			X					Sp. level identification needed
31	<i>Duvalia</i>	<i>modesta</i>		X					X	Mistaken for <i>E. tridentata</i> .
32	<i>Encephalartos</i>	<i>lehmannii</i>						X		
33	<i>Euphorbia</i>	<i>globosa</i>			X					Mistaken for <i>E. tridentata</i>
34	<i>Euphorbia</i>	<i>gatbergensis</i>							X	Mistaken for <i>E. gorgonis</i> .
35	<i>Euphorbia</i>	<i>mauritanica</i>							X	Not protected with the Provincial Ordinance
36	<i>Euphorbia</i>	<i>gorgonis</i>		X						
37	<i>Euphorbia</i>	<i>meloformis</i>		X	X		X	X	X	
38	<i>Euphorbia</i>	<i>micrantha</i>		X			X		X <sup>11</sup>	
	<i>Euphorbia</i>	<i>stellata</i>		X						
39	<i>Euphorbia</i>	<i>tridentata</i>		X						
40	<i>Faucaria</i>	<i>tuberculosa</i>		X			X		X	
41	<i>Gasteria</i>	<i>sp.</i>							X	Only <i>Gasteria beckeri</i> is protected. Sp identification needed
42	<i>Glottiphyllum</i>	<i>longum</i>		X						
43	<i>Gomphocarpus</i>	<i>physocarpus</i>			X					
44	<i>Haemanthus</i>	<i>montanus</i>							X	
45	<i>Haemanthus</i>	<i>albiflos</i>		X	X <sup>12</sup>					

<sup>11</sup> Listed as *E. micrantha*.

<sup>12</sup> Only listed as *Haemanthus* sp. but most likely *H. albiflos*.



No	Genus	Species	Sub-species / Variation	RRRG (2022)	The Biodiversity Company (2020)	Scherman's Colloty (2017)	Nkurenkuru (2018)	Hoare (2010) <sup>10</sup>	Savanna Environmental (2014)	Comment
46	<i>Haworthia</i>	<i>bolusii</i>							X	
47	<i>Hereroa</i>	<i>granulata</i>		X						
48	<i>Hermannia</i>	<i>violacea</i>						X		Listed as Rare, EC endemic and a narrow range
49	<i>Holothrix</i>	<i>sp.</i>			X					Sp. level identification needed
50	<i>Holothrix</i>	<i>macowaniana</i>						X		
51	<i>Huernia</i>	<i>brevirostris</i>			X		X			
52	<i>Huernia</i>	<i>kennedyana</i>						X		
53	<i>Huernia</i>	<i>thuretii</i>		X						
54	<i>Mestoklema</i>	<i>sp.</i>							X	Sp. level identification needed
55	<i>Mestoklema</i>	<i>albanucum</i>		X						
56	<i>Mestoklema</i>	<i>tuberosum</i>		X						
57	<i>Moraea</i>	<i>sp.</i>			X				X	
58	<i>Nerine</i>	<i>huttonae</i>						X		Only likely on alluvial gravel plains
59	<i>Orbea</i>	<i>sp.</i>							X	Sp. level identification needed
60	<i>Pachycarpus</i>	<i>Cf.</i>							X	
61	<i>Pachypodium</i>	<i>succulentum</i>		X			X		X	
62	<i>Pelargonium</i>	<i>sidoides</i> <sup>13</sup>		X	X		X		X <sup>14</sup>	Listed as Least Concern (De Castro et al. 2005)
63	<i>Radamanthus</i>	<i>sp.</i>		X						Sp. level identification needed
64	<i>Ruschia</i>	<i>sp.</i>			X				X	Sp. level identification needed
65	<i>Ruschia</i>	<i>brittinae</i>		X						
66	<i>Ruschia</i>	<i>cradockensis</i>		X						
67	<i>Scadoxus</i>	<i>puniceus</i>							X	
68	<i>Sideroxlon</i>	<i>inerme</i>	<i>inerme</i>			X				
69	<i>Stapelia</i>	<i>grandiflora</i>		X						
70	<i>Syringodea</i>	<i>bifucata</i>		X						
71	<i>Trichodiadema</i>	<i>introrosum</i>		X						
72	<i>Trichodiadema</i>	<i>sp.</i>							X	Sp. level identification needed
73	<i>Trichodiadema</i>	<i>orientalis</i>					X			

<sup>13</sup>Although listed in numerous reports as Protected – the species is Declining but has not other threat status.

<sup>14</sup> Savanna 2014 Environmental report suggests *P. sidoides* to be Protected in the NEMBA 2013 revised regulations.

No	Genus	Species	Sub-species / Variation	RRRG (2022)	The Biodiversity Company (2020)	Scherman's Colloty (2017)	Nkurenkuru (2018)	Hoare (2010) <sup>10</sup>	Savanna Environmental (2014)	Comment
74	<i>Trichodiadema</i>	<i>pormeridianum</i>		X						
75	<i>Tritonia</i>	<i>laxifolia</i>							X	
76	<i>Tritonia</i>	<i>securigera</i>		X						
77	<i>Ceropegia</i>	<i>linearis</i>								
78	<i>Brachystelma</i>	<i>huttonae</i> <sup>*15</sup>								
79	<i>Ornithogalum</i>	<i>nannoides</i> <sup>*</sup>								

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<sup>15</sup> Species marked with \* have been added on the advice of T. Dold and highly likely to occur on site.

## Mitigation and Avoided Degradation

### Early detection

SSC management and monitoring is heavily reliant on accurate and up-to-date spatial data. The appointment of an ECO should be a top priority following a successful EA process. The ECO will need to become familiar with all the SCC species mentioned in previous studies and this report and use all the time before construction commences to search and mark out SSC that will need to be removed.

### Set Asides

A Set Aside is a small piece of land, typically on productive agricultural land, where the dominant land-use (in this case livestock or game) is excluded for ecological or biodiversity reasons. The tables above have a large number of succulent species that are listed as SSC. They are all to varying degrees susceptible to damage from livestock. If a small number of Set Asides can be established on the Msenge Emoyeni WEF, it could literally prevent a species from going extinct. This can be turned into a huge advantage for marketing and Corporate Social Responsibility reporting. For the paltry opportunity costs (~R150-R250 per hectare per year for livestock) a contribution can be made by the developer to the conservation of unique and irreplaceable species. The landowner should also be encouraged to contribute to biodiversity conservation – even if it only means maintaining the integrity of the fences for the next 30 years.

### Re-Wilding

A large number of species have suffered severely from livestock over the last 100 years. The increasing threat status and range contraction is best exhibited (but not limited to) in genera such as *Euphorbia*, *Orbea*, *Fauraria*, *Huernia* and *Duvalia*. The scale and rate of the degradation often creates contradictions in the national Red Data List Classification system. A good example is *Faucaria tuberculosa* which is listed as **Least Concern** by SANBI (Burgoyne *et al.* 2006), but regarded as **Vulnerable** by T. Dold (pers. Comm). We only found 1 specimen and it was in poor condition due to trampling. Some Red Data List assessments are nearly two decades out of date. The mass propagation of local, high profile species (provided genetic pollution protocols are followed), and implemented in conjunction with Set Asides could make a real, tangible and valuable contribution to biodiversity in the area. It is worth noting that the International Textile Exchange is in the process of implementing Sustainability Monitoring for all supplies and farmers will need to demonstrate sustainability across a wide number of indicators. Traceability and Accountability are key criteria for continued exports. Those farmers in the WEF footprint could become pioneers in this field.

### Reduced Buffer and Footprint sizes

Engineers need to come out of their comfort zones and make an effort to reduce actual footprint size to minimise the chance for unnecessary SSC being lost due to careless design. This is especially applicable to access roads for construction and for maintenance, and storage areas for construction materials. The roads in the layouts we received, were poorly designed with little understanding of the ecological implications. A simple site visit with the landowner would have made a vast improvement on the design process. Even with the best efforts, not all the SSC will be located and transplanted. The reduced size of the actual footprint size of buffer zones can be make a significant reduction in the number of plants that require transplanting.

### Use Existing farm Road networks where possible

The Local Ecological Knowledge (LEK) of the farmers and landowners is not being used in the planning phases for these developments. This is best exhibited in the layout plans for the service and maintenance roads. The farm roads almost always avoid the rocky outcrops and should be used as much as possible – even if they are slightly longer.

### Avoid Bushclumps

Bushclumps are isolated pockets of the Albany Thicket Biome<sup>16</sup> and hence will have endemic, rare and SSC plants. The nature of the vegetation and the cryptic habit of the species makes the location of the species difficult. *Sideroxylon inerme* is a protected tree under the Forest Act and is spatially correlated with these bushclumps. *Zanthoxylum capense* is protected under provincial legislation and also linked to bushclumps.

### Avoid Rocky Outcrops

As with the previous section, the rocky outcrops often (not all) harbour a disproportionate number and abundance of SSC. The linear infrastructure (road and underground power cables) as well as the bases for the pylons should avoid these at much as possible with slightly less linear and direct routes (roads).

## SSC Rescue and Protection Plan

The threat status and narrow distributions of key species, such as *Euphorbia meloformis* or *Faucaria tuberculosa* in conjunction with farmers wishing to continue pastoralism – warrants drastic steps. The destocking mentioned above might be an unpopular requirement in the beginning but the dividends will be appreciated later. The Set Asides may be easier to negotiate and could become a major success. The Msenge Emoyeni WEF requires a zonation map for the implementation of a Plant Rescue and Protection Plan, based on species and distribution densities.

## Pre-Construction Phase Activities

Action	Frequency
Develop SS field guide for Msenge Emoyeni WEF Staff and contractors	Once at the onset
Commission a botanist with extensive experience <sup>17</sup> in rare and threatened plant species for this area to identify suitable Set Asides	Onset
Update Msenge Emoyeni WEF SCC inventory	Annual
Establish fenced-off botanical Set Asides	Year 1
Undertake training for identification of new SSC species	Quarterly

<sup>16</sup> Plant species are recorded as 20% endemic in thicket (Vlok *et al.* 2003).

<sup>17</sup> There are only a handful of people that could do this crucial innovation successfully (Tony Dold, David Hoare, Adriaan Grobler, Jan Vlok, Vatiswa Vikishe or Doug Euston Brown).

Action	Frequency
Complete a zonation map for the Plant Rescue and Protection Plan, based on species and distribution densities	Once at the onset
Locate and remove SCCs from the Phase 1 Development	Ongoing
Destock rangelands	First 2 years
Replant SCCs in suitable habitats, restoration areas and Set Asides	Ongoing

## Construction Phase Activities

Soil disturbance in the construction phase should be kept to a minimum, to prevent the loss of SSC species (especially geophytes) – but will also reduce the number and abundance of AIP and weed species. The activities in the Bush Encroachment Plan, the Revegetation and Restoration Plan and this plan all need careful synchronisation and coordination. A good example would be the clearing of *Vachellia karoo* in the Bush Encroachment Plan could provide material for brush-packing the newly rehabilitated areas as well as protect SCC outside of Set Asides.

Action	Frequency
Update SSC field guide for Msenge Emoyeni WEF Staff and contractors	Year 1
Undertake training for identification of new SSC species	Quarterly
Update Msenge Emoyeni SCC inventory and spatial data set	Annual
Locate and remove SCCs from the Phase 2 Development	Ongoing
Replant SCCs in suitable habitats, restoration areas and Set Asides	Ongoing

## Monitoring – Construction Phase

The following monitoring actions should be implemented during the construction phase of the development.

Monitoring Action	Indicator	Timeframe
Establish baseline for SCC awareness: Test WEF staff for SCC identification	Test scores	Onset
Document SCC plant distribution	SCC plant distribution map within priority areas	Quarterly
Document & record SCC planting success and mortalities	% survivorship	Quarterly
Complete Veld Condition Assessments	% grass cover, spp richness	Annual
Review & evaluation of SCC planting success rate	% survivorship	Annual

## Operational Phase Activities

The following management actions are aimed at reducing the abundance of alien species within the site and maintaining non-invaded areas clear of aliens.

Action	Frequency
Establish additional set asides	Ongoing
Identify additional SSC populations and new species	Ongoing
Relocate SSCs to Set Asides or better habitat to prevent trampling	Ongoing
Replenish areas that were brush-packed with new material	Quarterly
Restock areas suitable for SCC Rewilding	Ongoing

## Monitoring – Operational Phase

The monitoring during the operational phase is a vital aspect of the Plant Rescue and Protection Plan. The Environmental Control Officer will have to implement monthly monitoring program and to be in a position to complete an annual meta-reflection to senior management.

Monitoring Action	Indicator	Timeframe
Update Msenge Emoyeni WEF SSC Field Guide	No of species	Annually
An extensive baseline for the identification and spatial distribution of SSC across the entire properties.	Hectares of SSC being monitored	Early in year 1
Document SCC plant distribution	Hectares of SSC being monitored	Annual
Document & record SSC planting success and mortalities	% survivorship	Annual
Review & evaluation of SCC planting success rate	% survivorship	Annual
Complete Veld Condition Assessments	% grass cover, spp richness	Annual
Update Msenge Emoyeni SSC Field Guide	% survivorship	Annually

## Conclusions and Recommendations

- The properties should be destocked from livestock and game for a period of two years. This would allow for the recovery of the grass sward and start the process towards increasing the grass species richness, as

well as reduce the rate of the spread of *O. aurantiaca*. It would also give the rare, endemic and threatened species a chance to recover.

- The novel concept of Set Asides should be included as a condition of the EA to leverage farmers to take responsibility for rare and threatened species on their properties.
- Establish a collaboration with botanical specialists for mass production of key species for Set Asides.
- Collaborations should be established with professional botanists to mass propagate genetically pure individuals from “captive” adults plants and then reintroduce these into Set Asides and suitable areas on WEF properties.

The following species (**Table 4**) are deemed to be super-abundant on the site (but not sufficiently rare or threatened)<sup>18</sup> and actively locating every individual, carefully extracting them, storing them in a holding facility and replanting would be tedious and costly. If the mitigation measures mentioned above are implemented, it will drastically reduce the number of plants that will be destroyed.

**Table 4. A list of plant species that will require permits for clearing and not form part of the Plant Rescue and Protection Plan.**

No	Genus	Species	Sub-species / Variation	Comment
1	<i>Chasmatophyllum</i>	<i>musculinum</i>		Wherever possible this species should be removed and donated to an indigenous nursery for water wise gardening. This species makes a good ground cover. The species could also be used extensively for restoration and rehabilitation during and after
2	<i>Delosperma</i>	<i>adelaidensis</i>		Ideal for revegetation and restoration of road, WTGs and substations verges.
3	<i>Drosanthemum</i>	<i>hispidum</i>		
4	<i>Gomphocarpus</i>	<i>physocarpus</i>		Weedy species but listed as Asclepiadaceae in 1974 Ordinance
5	<i>Hermannia</i>	<i>violacea</i>		Unlikely to survive transplanting and relocation. Ideal for revegetation and restoration of road, WTGs and substations verges.
6	<i>Mestoklema</i>	<i>tuberosum</i>		
7	<i>Ruschia</i>	<i>brittiniae</i>		
8	<i>Ruschia</i>	<i>cradockensis</i>		
9	<i>Sideroxlon</i>	<i>inerme</i>	<i>inerme</i>	The species can be avoided by ensuring the road network does not traverse bushclums. It is highly likely that there will be some individuals sacrificed in
10	<i>Trichodiadema</i>	<i>orientalis</i>		Ideal for revegetation and restoration of road, WTGs and substations verges.
11	<i>Trichodiadema</i>	<i>introrosum</i>		
12	<i>Trichodiadema</i>	<i>pormeridianum</i>		

<sup>18</sup> Many of the species listed are a function of the 1974 Cape Provincial Ordinance that lumped all Mesembryanthemaceae (now Aizoaceae), and all Asclepiadaceae (now Apocyanaceae) in the Schedule 4 for Protected Status.

13	<i>Zanthoxylum</i>	<i>capense</i>		Although not located by the field team the species is protected under the provincial ordinance (all Rutaceae). The same mitigation measures as for <i>S. inerme</i> apply.
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The species listed on **Table 5** are those that will require classis “search and rescue” activities. Where large populations of *E. tridentata* (not a SCC) cannot be saved and the mitigation measures mentioned above are not possible, these populations should be excavated and included in relocation efforts. Similarly, *Aloe ferox* is not protected, but could be really useful for landscaping and revegetation.

**Table 5. A list of plant species that will require permits for “harvesting”, transporting, mass propagation and rewilding.**

No	Genus	Species	Sub-species / Variation	Comment
1	<i>Aloe</i>	<i>humilis</i>		
2	<i>Aloe</i>	<i>maculata</i>		
3	<i>Aloe</i>	<i>pluridens</i>		Likely to have been included when the WEF footprint included other properties: Farms 224, RE223, RE227, RE169 and 2/223
4	<i>Aloe</i>	<i>striata</i>		
5	<i>Aloiampelos</i>	<i>tenuior</i>		
6	<i>Ammocharis</i>	<i>coranica</i>		
7	<i>Anacampseros</i>	<i>arachnoides</i>		
8	<i>Bergeranthus</i>	<i>addoensis</i>		
9	<i>Boophane</i>	<i>distichia</i>		
10	<i>Brachystelma</i>	<i>huttonae*</i>		Unlikely to find this unless flowering
11	<i>Brunsvigia</i>	<i>gregaria</i>		
12	<i>Brunsvigia</i>	<i>radulosa</i>		
13	<i>Ceropegia</i>	<i>fimbriata</i>		
14	<i>Ceropegia</i>	<i>linearis*</i>		
15	<i>Corycium</i>	<i>tricuspidatum</i>		
16	<i>Crassula</i>	<i>decidua</i>		Unlikely to find this unless flowering
17	<i>Crinum</i>	<i>macowanii</i>		
18	<i>Cyrtanthus</i>	<i>contractus</i>		
19	<i>Diascia</i>	<i>cuneata</i>		Very difficult to identify unless in flower, small plant
20	<i>Duvalia</i>	<i>caespitosa</i>		
21	<i>Duvalia</i>	<i>modesta</i>		
22	<i>Encephalartos</i>	<i>lehmannii</i>		
23	<i>Euphorbia</i>	<i>gorgonis</i> <sup>19</sup>		
24	<i>Euphorbia</i>	<i>meloformis</i>		
25	<i>Euphorbia</i>	<i>micracantha</i> <sup>20</sup>		
26	<i>Euphorbia</i>	<i>stellata</i>		
27	<i>Faucaria</i>	<i>tuberculosa</i>		A key species for Set Asides and mass propagation
28	<i>Glotiphyllum</i>	<i>longum</i>		

<sup>19</sup> Not Determined by SANBI for Red Data List Status, or Golding 2002, or Hilton-Taylor 1996. Eastern Cape endemic (Uitenhage and Grahamstown areas) - Moller and Becker.

<sup>20</sup> Not Determined by SANBI for Red Data List Status (Archer and Victor 2005) but described as Least Concern by Becker and Moller (2019).



No	Genus	Species	Sub-species / Variation	Comment
29	<i>Haemanthus</i>	<i>albibos</i>		
30	<i>Haemanthus</i>	<i>montanus</i>		
31	<i>Haworthia</i>	<i>bolusii</i>		
32	<i>Hereroa</i>	<i>granulata</i>		
33	<i>Holothrix</i>	<i>macowaniana</i>		Unlikely to find this unless
34	<i>Huernia</i>	<i>brevirostris</i>		
35	<i>Huernia</i>	<i>kennedyana</i>		
36	<i>Huernia</i>	<i>thuretii</i>		
37	<i>Mestoklema</i>	<i>albanucum</i>		The only <i>Mestoklema</i> included for permitting and search and rescue due to the <b>Near Threatened</b> status (Victor & Dold 2004)
38	<i>Nerine</i>	<i>huttonae</i>		Only likely on alluvial gravel beds
39	<i>Ophiosnella</i>	<i>arcuata</i> *		
40	<i>Ornithogalum</i>	<i>nannoides</i> *		Unlikely to find this unless flowering
41	<i>Pachypodium</i>	<i>succulentum</i>		
42	<i>Pelargonium</i>	<i>sidoides</i> <sup>21</sup>		Species is not protected but populations are declining
43	<i>Radamanthus</i>	<i>sp.</i>		New species to science, so endemism and rarity unknown
44	<i>Scadoxus</i>	<i>puniceus</i>		Unlikely to find this unless flowering
45	<i>Stapelia</i>	<i>grandiflora</i>		
46	<i>Syringodea</i>	<i>bifucata</i>		Unlikely to find this unless flowering
47	<i>Tritonia</i>	<i>laxifolia</i>		
48	<i>Tritonia</i>	<i>securigera</i>		

\* are all highly likely to occur in the study area, but have not yet been recorded (T. Dold pers comm).

<sup>21</sup>Although listed in numerous reports as Protected – the species is Declining but has no other threat status.

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<sup>22</sup> The report does not have a title page and the reference used here comes from the letter-type heading as recorded.

**APPENDIX 1: Plants listed in the tbc 2020 reports as Species of Special Concern, but limited to those likely to occur in the study area.**

No	Genus	species	Subsp / Variation	TBC 2020 Threat Status	Family	Provincial Conservation Status	Current National Conservation Status	RRRG Comment	RRRG LOO	RRRG Found on site	Reference
16	<i>Euphorbia</i>	<i>meloformis</i>	<i>meloformis</i>	Near threatened	Euphorbiaceae	Protected	Near Threatened B1ab(i,ii,iii,iv,v). Listed as Protected in NEMBA 2007 (both in Feb and Dec Government Gazettes)	EOO = 4030 km <sup>2</sup> , but a dwindling meta-population due to collectors and over-grazing	<b>100</b>	<b>YES</b>	Raimondo, D., Dold, A.P., Berrington, W., Archer, R.H., Victor, J.E. & von Staden, L. 2014. <i>Euphorbia meloformis</i> Aiton. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/24
11	<i>Crinum</i>	<i>campanulata</i>		Near threatened	Amaryllidaceae	Protected	Near Threatened B1ab(iii)	Species linked to freshwater systems, e.g. seasonal vleis in various types of thickets.	<b>HIGH</b>	<b>NO</b>	Dold, A.P., Snijman, D.A. & Victor, J.E. 2005. <i>Crinum campanulatum</i> Herb. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/24
15	<i>Disa</i>	<i>lugens</i>		Vulnerable	Orchidaceae	Protected	Vulnerable C2a(i)	Widely distributed in the Eastern and Western Cape and associated with a host of vegetation types	<b>HIGH</b>	<b>NO</b>	von Staden, L., Liltved, W.R., Oliver, E.G.H. & Oliver, T.A. 2012. <i>Disa lugens</i> Bolus var. <i>lugens</i> . National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/24
24	<i>Mestoklema</i>	<i>albanicum</i>		Near threatened	Aizoaceae	Protected	Near Threatened D2	Wide distribution from Uitenhage to Graaff Reinet, linked to Albany Thickets. Threatened with overgrazing.	<b>HIGH</b>	<b>YES</b>	Victor, J.E. & Dold, A.P. 2004. <i>Mestoklema albanicum</i> N.E.Br. ex Glen. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/24
25	<i>Nerine</i>	<i>huttoniae</i>		Vulnerable	Amaryllidaceae	Protected	Vulnerable B1ab(iii,v)	Wide distribution in the Fish River Valley and linked to the following vegetation types: Eastern Upper Karoo, Southern Karoo Riveire and Fish Valley Thicket. If developments were to take place in sandy flood plains then the LOO rating would be high.	<b>MEDIUM</b>	<b>NO</b>	Dold, A.P., McMaster, C. & Raimondo, D. 2016. <i>Nerine huttoniae</i> Schönland. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/24
27	<i>Orthopterum</i>	<i>waltoniae</i>		Near threatened	Aizoaceae	Protected	<b>Near Threatened D2</b>	Range is from Addo to Makhana and favours shales within Albany Thickets. Threatened from collecting and livestock. In the study area most likely linked to Double Drift Karroid Thickets.	<b>MEDIUM</b>	<b>NO</b>	Dold, A.P. & Raimondo, D. 2011. <i>Orthopterum waltoniae</i> L.Bolus. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/24

**APPENDIX 2. Plants listed as potential SSC by Hoare (2010) as Species of Special Concern, but limited to those we believe likely to occur in the study area.**

No	Genus	species	Subsp / Variation	Hoare 2010 Threat Status	Provincial Conservation Status	Current Threat Status SANBI	RRRG Comment	RRRG LOO	RRRG Found on site	Reference
1	<i>Apodolirion</i>	<i>macowanii</i>				Vulnerable A3c; B1ab(i,ii,iii,iv,v)	Wide distribution and cryptic species associated with Thicket	HIGH	NO	Dold, A.P., Snijman, D.A. & Raimondo, D. 2007. <i>Apodolirion macowanii</i> Baker. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/19
3	<i>Corycium</i>	<i>tricuspidatum</i>			Protected EC Prov Ordinance 1974.	Not determined SANBI	Eastern Cape and KZN distribution, key threat is afforestation (site is dry). "Lower Risk" category in Golding 2002.	MEDIUM	NO	Golding, J. 2002. South African Red Data Plant List. South African Biodiversity Network Report no 14. National Biodiversity Institute, Pretoria, South Africa.
5	<i>Crinum</i>	<i>macowanii</i>			Protected EC Prov Ordinance 1974.	Least Concern	Not endemic to South Africa, widely distributed and occurs in a number of biomes.	MEDIUM	NO	Williams, V.L., Raimondo, D., Crouch, N.R., Cunningham, A.B., Scott-Shaw, C.R., Lötter, M., Ngwenya, A.M. & Brueton, V.J. 2016. <i>Crinum macowanii</i> Baker. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/19
7	<i>Encephalartos</i>	<i>lehmannii</i>			Protected EC Prov Ordinance 1974.	Near Threatened A2d	Wide distribution through a number of biomes. The species is declining and goats are listed as a key driver, with poaching as well. Nkurenkuru 2018 could not locate this species in the WEF	MEDIUM	NO	Donaldson, J.S. 2009. <i>Encephalartos lehmannii</i> Lehm. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/20. Botha G. 2018. ECOLOGICAL COMMENTS: PROPOSED AMENDMENT TO THE AUTHORISED MSENGE WIND ENERGY FACILITY WIND ENERGY FACILITY (DEA REF 12/12/20/1754/2) – AMENDMENTS TO TURBINE SPECIFICATIONS.
10	<i>Huernia</i>	<i>kennedyana</i>				Least Concern	Species is rare with a restricted range (escarpment mountains between Cradock and Pearston)	MEDIUM	NO	Raimondo, D. & Dold, A.P. 2019. <i>Huernia kennedyana</i> Lavranos. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/25
11	<i>Nerine</i>	<i>huttoniae</i>			Protected EC Prov Ordinance 1974.	Vulnerable	Unlikely to be at risk from the proposed developments due to the riparian buffering. Species niche is alluvial floodplains.	MEDIUM	NO	Dold, A.P., McMaster, C. & Raimondo, D. 2016. <i>Nerine huttoniae</i> Schönland. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/19

**APPENDIX 3. A list of potential SSC from the full list of species listed by Hoare (2010), with comments, updated taxonomic status, LOO ratings, located *in situ* data and relevant references for threat status – but limited to the species that could possibly occur in the WEF.**

No	Genus	species	Subsp / Variation	Family	Provincial Conservation Status	Current National Status SANBI	RRRG Comment	RRRG LOO	RRRG Found on site	Reference
80	<i>Ceropegia</i>	<i>zeyheri</i>		Apocynaceae	Protected	Least Concern	Eastern Cape and Western Cape Endemic		NO	Manyama, P.A. & Kamundi, D.A. 2006. <i>Ceropegia zeyheri</i> Schltr. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/23
125	<i>Cyrtanthus</i>	<i>huttonii</i>		Amaryllidaceae	Protected	Least Concern	Eastern Cape and Mpumalanga.		NO	Snijman, D.A. & Victor, J.E. 2004. <i>Cyrtanthus huttonii</i> Baker. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/23
127	<i>Cyrtanthus</i>	<i>smithiae</i>		Amaryllidaceae	Protected		Eastern Cape endemic		NO	Snijman, D.A. & Victor, J.E. 2004. <i>Cyrtanthus smithiae</i> Watt ex Harv. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/2
151	<i>Erica</i>	<i>caespitosa</i>		Ericaceae	Protected	Least Concern	Eastern Cape and KZN		NO	Raimondo, D., von Staden, L., Foden, W., Victor, J.E., Helme, N.A., Turner, R.C., Kamundi, D.A. and Manyama, P.A. 2009. Red List of South African Plants. Strelitzia 25. South African National Biodiversity Institute, Pretoria.
177	<i>Faucaria</i>	<i>felina</i>	<i>felina</i>	Aizoaceae	Protected	Least Concern			NO	Victor, J.E. & Dold, A.P. 2007. <i>Faucaria felina</i> (L.) Schwantes. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/23
211	<i>Haworthia</i>	<i>altilinea</i>		Asphodelaceae	Protected	Not Determined	Species changed to <i>mucronata</i> subsp. <i>mucronata</i>		NO	SANBI. 2020. <i>Haworthia mucronata</i> Haw. var. <i>mucronata</i> . National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/29
266	<i>Lampranthus</i>	<i>stayneri</i>		Aizoaceae	Protected		Eastern Cape and Western Cape Endemic		NO	Klak, C., Raimondo, D. & Matlamela, P.F. 2008. <i>Lampranthus stayneri</i> (L.Bolus) N.E.Br. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/28
362	<i>Ruschia</i>	<i>orientalis</i>		Aizoaceae	Protected	Least Concern.	Eastern Cape endemic		NO	Foden, W. & Potter, L. 2005. <i>Ruschia orientalis</i> L.Bolus. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/23
363	<i>Ruschia</i>	<i>complanata</i>		Aizoaceae	Protected	Data Deficient - Taxonomically Problematic	Eastern Cape endemic		NO	Raimondo, D. & Cholo, F. 2008. <i>Ruschia complanata</i> L.Bolus. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/25
436	<i>Tritonia</i>	<i>gladiolaris</i>		Iridaceae	Protected	Least Concern	Wide distribution: Eastern Cape, KwaZulu-Natal, Mpumalanga, Western Cape		NO	Foden, W. & Potter, L. 2005. <i>Tritonia gladiolaris</i> (Lam.) Goldblatt & J.C.Manning. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/22
10	<i>Aizoon</i>	<i>glinoides</i>		Aizoaceae	Protected	Least Concern	Ubiquitous weedy species in the Eastern and Western Cape.	100	YES	Foden, W. & Potter, L. 2005. <i>Aizoon glinoides</i> L.f. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/25

No	Genus	species	Subsp / Variation	Family	Provincial Conservation Status	Current National Status SANBI	RRRG Comment	RRRG LOO	RRRG Found on site	Reference
17	<i>Aloe</i>	<i>striata</i>	<i>striata</i>	Asphodelaceae	Protected	Least Concern	Eastern and Western Cape Endemic - wide distribution	100	YES	Mtshali, H. & von Staden, L. 2018. <i>Aloe striata</i> Haw. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/25
19	<i>Ammocharis</i>	<i>coranica</i>		Amaryllidaceae	Protected	Least Concern	Extremely wide distribution	100	YES	Snijman, D.A. & Victor, J.E. 2004. <i>Ammocharis coranica</i> (Ker Gawl.) Herb. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/25
20	<i>Anacampseros</i>	<i>arachnoides</i>		Anacampserotaceae	Protected	Least Concern	Little Karoo to Kingwilliamstown. Favours rocky areas	100	YES	von Staden, L. 2015. <i>Anacampseros arachnoides</i> (Haw.) Sims. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/25
63	<i>Boophane</i>	<i>distichia</i>		Amaryllidaceae	Protected	Least Concern	Found across these vegetation types: Albany Thicket, Fynbos, Grassland, Indian Ocean Coastal Belt, Nama Karoo, Savanna, Succulent Karoo	100	YES	Williams, V.L., Raimondo, D., Brueton, V.J., Crouch, N.R., Cunningham, A.B., Scott-Shaw, C.R., Lötter, M. & Ngwenya, A.M. 2016. <i>Boophane disticha</i> (L.f.) Herb. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/25
81	<i>Chasmatophyllum</i>	<i>musculinum</i>		Aizoaceae	Protected	Least Concern	Widespread and not endemic to SA: Eastern Cape, Free State, Gauteng, Mpumalanga, Northern Cape, North West, Western Cape	100	YES	Burgoyne, P.M. 2006. <i>Chasmatophyllum musculinum</i> (Haw.) Dinter & Schwantes. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/23
132	<i>Diascia</i>	<i>cuneata</i>		Scrophulariaceae	Protected	Least Concern	Eastern Cape and Free State	100	YES	Foden, W. & Potter, L. 2005. <i>Diascia cuneata</i> E.Mey. ex Benth. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/05/02
178	<i>Faucaria</i>	<i>tuberculosa</i>		Aizoaceae	Protected	Least Concern		100	YES	Burgoyne, P.M. 2006. <i>Faucaria tuberculosa</i> (Rolfe) Schwantes. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/23. Regarded as Vulnerable by T. Dold but Least Concern by SANBI.
208	<i>Haemanthus</i>	<i>albiflos</i>		Amaryllidaceae	Protected	Least Concern	Widely distributed:	100	YES	Snijman, D.A. & Victor, J.E. 2004. <i>Haemanthus albiflos</i> Jacq. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/24
263	<i>Lachenalia</i>	<i>bowkeri</i>		Hyacinthaceae	Protected	Least Concern	Eastern Cape Endemic: Albany Thicket, Fynbos, Nama Karoo, Succulent Karoo	100	YES	Duncan, G.D. & Victor, J.E. 2005. <i>Lachenalia bowkeri</i> Baker. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/23

No	Genus	species	Subsp / Variation	Family	Provincial Conservation Status	Current National Status SANBI	RRRG Comment	RRRG LOO	RRRG Found on site	Reference
315	<i>Pachypodium</i>	<i>succulentum</i>		Apocynaceae	Protected	Least Concern	Widespread spp in the old Cape provinces	100	YES	Raimondo, D., van Jaarsveld, E.J. & Vlok, J.H. 2007. <i>Pachypodium succulentum</i> (Jacq.) Sweet. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/28
364	<i>Ruschia</i>	<i>cradockensis</i>	<i>cradockensis</i>	Aizoaceae	Protected	Least Concern	Eastern and Western Cape endemic	100	YES	Burgoyne, P.M. 2006. <i>Ruschia cradockensis</i> (Kuntze) H.E.K.Hartmann & Stüber subsp. <i>cradockensis</i> . National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/23
417	<i>Stapelia</i>	<i>macowanii</i>	<i>conformis</i>	Asclepiadaceae	Protected	Not Determined	Widely distributed - but and Eastern Cape endemic. Species name has changed to <i>S. grandiflora</i>	100	YES	Victor, J.E. 2005. <i>Stapelia grandiflora</i> Masson var. <i>conformis</i> (N.E.Br.) Bruyns. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/29
4	<i>Adiantum</i>	<i>capillus-veneris</i>		Pteridaceae	Protected	Least Concern	Widely distributed fern spp.	HIGH	NO	Foden, W. & Potter, L. 2005. <i>Adiantum capillus-veneris</i> L. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/25
49	<i>Bergeranthus</i>	<i>verpertinus</i>		Aizoaceae	Protected	Least Concern	Eastern Cape Endemic	HIGH	NO	Burgoyne, P.M. 2006. <i>Bergeranthus vespertinus</i> (A.Berger) Schwantes. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/25
79	<i>Catha</i>	<i>edulis</i>		Celastraceae		Protected Tree: National Forests Act	Found in dry woodland and on rocky outcrops.	HIGH	NO	Geldenhuis, C.J. & Victor, J.E. 2004. <i>Catha edulis</i> (Vahl) Forssk. ex Endl. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/25. Pooley 1997. The Complete Guide to Trees of Natal, Zululand and Transkei. Nata
97	<i>Crassula</i>	<i>perfoliata</i>	<i>perfoliata</i>	Crassulaceae	Protected	Least Concern	Eastern Cape endemic preferring dry karroid scrub on lower stony slopes. Port Elizabeth to Graaff Reinet.	HIGH	NO	Smith, G.F., Crouch, N.R., & Figueiredo, E. 2017. Field Guide to the Succulents in Southern Africa. Struik Nature, Cape Town Foden, W. & Potter, L. 2005. <i>Crassula perfoliata</i> L. var. <i>perfoliata</i> . National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/26
112	<i>Crinum</i>	<i>campanulatum</i>		Amaryllidaceae	Protected	Near Threatened B1ab(iii)	Species linked to freshwater systems, e.g. seasonal vleis in various types of thickets.	HIGH	NO	Dold, A.P., Snijman, D.A. & Victor, J.E. 2005. <i>Crinum campanulatum</i> Herb. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/26
129	<i>Delosperma</i>	<i>affine</i>		Aizoaceae	Protected	Least Concern	Largely Western and Eastern Cape (GBIF)	HIGH	NO	<a href="https://www.gbif.org/species/3707590">https://www.gbif.org/species/3707590</a> . Burgoyne, P.M. 2006. <i>Delosperma affine</i> Lavis. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/05/02

No	Genus	species	Subsp / Variation	Family	Provincial Conservation Status	Current National Status SANBI	RRRG Comment	RRRG LOO	RRRG Found on site	Reference
133	<i>Dietes</i>	<i>iridioides</i>		Iridaceae	Protected	Least Concern	From the Riviersondernd Mountains to Ethiopia ( Manning et al 2002) but Foden and Potter 2005 - Eastern Cape, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, North West, Western Cape	HIGH	<b>NO</b>	Manning, J., Goldblatt, P. & Snijman, D. 2002. The Colour Encyclopedia of Cape Bulbs. Timber Press, Cambridge, UK. Foden, W. & Potter, L. 2005. <i>Dietes iridioides</i> (L.) Sweet ex Klatt. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/05/02
134	<i>Dioscorea</i>	<i>elephantipes</i>		Dioscoreaceae	Protected	Least Concern	Endemic to the old Cape Provinces - specifically favouring East facing slopes, quartzic and shale: Albany Thicket, Desert, Fynbos, Grassland, Succulent Karoo	HIGH	<b>NO</b>	Victor, J.E. & Dold, A.P. 2016. <i>Dioscorea elephantipes</i> (L'Hér.) Engl. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/23
139	<i>Disa</i>	<i>sagittalis</i>		Orchidaceae	Protected	Least Concern	Eastern and Western Cape endemic - wide distribution but limited to stony, rocky soils, along streams and often in semi-shade	HIGH	<b>NO</b>	Johnson, S. & Bytebier, B. 2015. Orchids of South Africa. Struik, Cape Town. Foden, W. & Potter, L. 2005. <i>Disa sagittalis</i> (L.f.) Sw. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/05/02
146	<i>Drosanthemum</i>	<i>hispidum</i>		Aizoaceae	Protected	Least Concern	Widely distributed: Eastern Cape, Free State, Northern Cape, Western Cape	HIGH	<b>NO</b>	Foden, W. & Potter, L. 2005. <i>Drosanthemum hispidum</i> (L.) Schwantes. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/05/03
148	<i>Encephalartos</i>	<i>cycadifolius</i>		Zamiaceae	Protected	Least Concern	Narrow range in the Eastern Cape on the Bedford District: Semi-dry grassland areas in shallow shale soils on the northern and eastern slopes of the mountains	HIGH	<b>NO</b>	Donaldson, J.S. 2009. <i>Encephalartos cycadifolius</i> (Jacq.) Lehm. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/05/03
149	<i>Encephalartos</i>	<i>lehmannii</i>		Zamiaceae	Protected	Near Threatened A2d	Dry areas, Eastern Cape endemic - Arid, low succulent	HIGH	<b>NO</b>	Donaldson, J.S. 2009. <i>Encephalartos lehmannii</i> Lehm. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/05/03



No	Genus	species	Subsp / Variation	Family	Provincial Conservation Status	Current National Status SANBI	RRRG Comment	RRRG LOO	RRRG Found on site	Reference
							shrubland on rocky ridges and slopes. Albany Thicket, Nama Karoo and Succulent Karoo			
199	<i>Gladiolus</i>	<i>ochroleucus</i>		Iridaceae	Protected	Least Concern	A common sp. Suurberg west of Grahamstown and the southern foothills of the Amathole Mountains near Kings William's Town in the Eastern Cape eastwards towards Byrne in southern Kwazulu-Natal. The species has no particular soil preference, but can most often be found in coastal sandstone-derived soils on light clay. Flowering period - Dec - May. Widespread in the Eastern Cape :Grahamstown and Kingwilliams town moving NE towards KZN (Saunders & Saunders 2021).	HIGH	<b>NO</b>	Saunders, R. & Saunders, R. 2021. Saunders Field Guide to the Gladioli of South Africa. Struik Nature, Cape Town Goldblatt, P. & Manning, J. 1988. Gladiolus in Southern Africa. Fernwood Press, Johannesburg. von Staden, L. 2020. Gladiolus ochroleucus Baker. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/05/02.
206	<i>Habenaria</i>	<i>epipactidea</i>		Orchidaceae	Protected	Least Concern	Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, North West. The southern range distribution limit may be north of study site - Foden & Potter (2005). Johnson & Bytebier (2015) - the distribution looks to include the study site	HIGH	<b>NO</b>	Johnson, S. & Bytebier, B. 2015. Orchids of South Africa. Struik, Cape Town. Foden, W. & Potter, L. 2005. Habenaria epipactidea Rchb.f. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/23

No	Genus	species	Subsp / Variation	Family	Provincial Conservation Status	Current National Status SANBI	RRRG Comment	RRRG LOO	RRRG Found on site	Reference
207	<i>Habenaria</i>	<i>lithophila</i>		Orchidaceae	Protected	Least Concern	Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Mpumalanga, Western Cape (Foden & Potter 2005). Johnson & Bytebier (2015) seem to include the distribution in the study site location	HIGH	NO	Foden, W. & Potter, L. 2005. <i>Habenaria lithophila</i> Schltr. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/23
212	<i>Haworthia</i>	<i>deltoidea</i>	<i>deltoidea</i>	Asphodelaceae	Protected	Least Concern	Genus changed to <i>Astroloba</i> and species changed to <i>congesta</i> . Prince Albert to Victoria West and east to Cradock and Grahamstown.	HIGH	NO	Raimondo, D. 2016. <i>Astroloba congesta</i> (Salm-Dyck) Uitewaal. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/29
214	<i>Haworthia</i>	<i>nigra</i>	<i>nigra</i>	Asphodelaceae	Protected	Not Determined	Genus changed to <i>Haworthiopsis</i> . Widely distributed in the Eastern Cape	HIGH	NO	Bayer, B. 1999. <i>Haworthia</i> revisited - A revision of the genus. Umdaus Press, Pretoria. SANBI. 2020. <i>Haworthiopsis nigra</i> (Haw.) G.D.Rowley var. <i>nigra</i> . National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/29
215	<i>Haworthia</i>	<i>reinwardtii</i>	<i>reinwardtii</i>	Asphodelaceae	Protected	Not Determined	Wide distribution in the Eastern Cape	HIGH	NO	Bayer, B. 1999. <i>Haworthia</i> revisited - A revision of the genus. Umdaus Press, Pretoria. SANBI. 2020. <i>Haworthia reinwardtii</i> (Salm-Dyck) Haw. var. <i>reinwardtii</i> forma <i>reinwardtii</i> . National Assessment: Red List of South African Plants version 2020.1. accessed on 2022/04/29
265	<i>Lampranthus</i>	<i>productus</i>		Aizoaceae	Protected	Least Concern	Western Cape	HIGH	NO	Foden, W. & Potter, L. 2005. <i>Lampranthus productus</i> (Haw.) N.E.Br. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/28
289	<i>Mesembryanthemum</i>	<i>aitonis</i>		Aizoaceae	Protected	Least Concern	Wide distribution in old Cape provinces	HIGH	NO	Goldblatt, P. & Manning, J. 2000. Cape Plants - A conspectus of the Cape Flora of South Africa. Strelitzia 9. National Botanical Institute, Pretoria Burgoyne, P.M. 2006. <i>Mesembryanthemum aitonis</i> Jacq. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/29
296	<i>Moraea</i>	<i>polystachya</i>		Iridaceae	Protected	Least Concern	Wide distribution old Cape Provinces, Free State and Namibia. Flowering time is limited to one day per flower and populations flowering time 6-8 weeks per annum.	HIGH	NO	Goldblatt, P. & Anderson, F. 1986. The <i>Moraeas</i> of Southern Africa. National Botanical Gardens, Pretoria. Foden, W. & Potter, L. 2005. <i>Moraea polystachya</i> (Thunb.) Ker Gawl. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/23

No	Genus	species	Subsp / Variation	Family	Provincial Conservation Status	Current National Status SANBI	RRRG Comment	RRRG LOO	RRRG Found on site	Reference
341	<i>Psilocaulon</i>	<i>granulicaule</i>		Aizoaceae	Protected	Least Concern	Eastern Cape, Free State, Northern Cape, Western Cape	HIGH	NO	Burgoyne, P.M. 2006. <i>Psilocaulon granulicaule</i> (Haw.) Schwantes. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/05/02
342	<i>Ptaeroxylon</i>	<i>obliquum</i>		Rutaceae	Protected	Least Concern	Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga, Western Cape	HIGH	NO	Foden, W. & Potter, L. 2005. <i>Ptaeroxylon obliquum</i> (Thunb.) Radlk. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/05/02
448	<i>Zanthoxylum</i>	<i>capense</i>		Rutaceae	Protected	Least Concern	Widespread in southern Africa	HIGH	NO	Williams, V.L., Raimondo, D., Crouch, N.R., Cunningham, A.B., Scott-Shaw, C.R., Lötter, M. & Ngwenya, A.M. 2008. <i>Zanthoxylum capense</i> (Thunb.) Harv. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/22
16	<i>Aloe</i>	<i>speciosa</i>		Asphodelaceae	Protected	Least Concern	Occurs in the drier rocky areas of fynbos and thicket	MEDIUM	NO	Mtshali, H. 2018. <i>Aloe speciosa</i> Baker. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/25
26	<i>Aristea</i>	<i>confusa</i>		Iridaceae	Protected	Least Concern	Name changed to <i>Aristea bakeri</i> . Coastal and fold-mountain plain species in the Western and Eastern Cape	MEDIUM	NO	Foden, W. & Potter, L. 2005. <i>Aristea bakeri</i> Klatt. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/26
27	<i>Asclepias</i>	<i>gibba</i>		Asclepiaceae	Protected	Least Concern	Distribution is mostly in the northern provinces so this would be at the extreme end of the species range.	MEDIUM	NO	Foden, W. & Potter, L. 2005. <i>Asclepias gibba</i> (E.Mey.) Schltr. var. <i>gibba</i> . National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/26
62	<i>Bonatea</i>	<i>cassidea</i>		Orchidaceae	Protected	Least Concern	Widespread along the east coast of SA - study site may be too dry and at the end of its range (south west)	MEDIUM	YES	von Staden, L. 2017. <i>Bonatea cassidea</i> Sond. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/23
111	<i>Crinum</i>	<i>macowanii</i>		Amaryllidaceae	Protected		Not endemic to South Africa, widely distributed and occurs in a number of biomes.	MEDIUM	NO	Williams, V.L., Raimondo, D., Crouch, N.R., Cunningham, A.B., Scott-Shaw, C.R., Lötter, M., Ngwenya, A.M. & Brueton, V.J. 2016. <i>Crinum macowanii</i> Baker. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/19
152	<i>Erica</i>	<i>cerinthoides</i>		Ericaceae	Protected	Not Determined	Widely distributed: Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo,	MEDIUM	NO	van der Colff, D. 2015. <i>Erica cerinthoides</i> L. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/05/03

No	Genus	species	Subsp / Variation	Family	Provincial Conservation Status	Current National Status SANBI	RRRG Comment	RRRG LOO	RRRG Found on site	Reference
							Mpumalanga, Western Cape - mostly fynbos and grasslands			
204	<i>Gonialoe</i>	<i>variegata</i>		Asphodelaceae	Protected	Least Concern	Wide distribution in the arid areas of the Eastern Western and Northern Cape	MEDIUM	<b>NO</b>	Mtshali, H. & von Staden, L. 2018. <i>Gonialoe variegata</i> (L.) Boatwr. & J.C.Manning. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/25. . Van Wyb, B-E., Smith, G. Guide to the Aloes of South Africa. 2008. Briza, Pretoria.
259	<i>Kniphofia</i>	<i>triangularis</i>	<i>triangularis</i>	Asphodelaceae	Protected	Least Concern	Eastern Cape, Free State, KZN	MEDIUM	<b>NO</b>	Foden, W. & Potter, L. 2005. <i>Kniphofia triangularis</i> Kunth subsp. <i>triangularis</i> . National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/28
260	<i>Kniphofia</i>	<i>uvaria</i>		Asphodelaceae	Protected	Least Concern	Old Cape provinces. Limited to areas of high seasonal soil moisture	MEDIUM	<b>NO</b>	Foden, W. & Potter, L. 2005. <i>Kniphofia uvaria</i> (L.) Oken. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/28
371	<i>Satyrium</i>	<i>parviflorum</i>		Orchidaceae	Protected	Least Concern.	Locally uncommon but linked to a wide variety of vegetation types.	MEDIUM	<b>NO</b>	Johnson, S. & Bytebier, B. 2015. Orchids of South Africa. Struik, Cape Town. Foden, W. & Potter, L. 2005. <i>Satyrium parviflorum</i> Sw. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/23
437	<i>Tritonia</i>	<i>strictifolia</i>		Iridaceae	Protected	Least Concern	Also listed as <i>Tritonia laxifolia</i> . Eastern Cape endemic	MEDIUM	<b>NO</b>	Foden, W. & Potter, L. 2005. <i>Tritonia strictifolia</i> (Klatt) Benth. & Hook.f. ex B.D.Jacks. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/04/22
446	<i>Xysmalobium</i>	<i>parviflorum</i>		Apocynaceae	Protected		Wide distribution: Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga	MEDIUM	<b>NO</b>	Foden, W. & Potter, L. 2005. <i>Xysmalobium parviflorum</i> Harv. ex Scott-Elliot. National Assessment: Red List of South African Plants version 2020.1. Accessed on 2022/05/02

**Appendix G: Re-vegetation and Rehabilitation Plan**

**MSENGE WIND ENERGY FACILITY  
REVEGETATION AND REHABILITATION PLAN**



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**JUNE 2022**



**SCHERMAN ENVIRONMENTAL**  
Aquatic & Environmental Management  
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## LIST OF ACRONYMS AND ABBREVIATIONS

AIP	Alien Invader Plant
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and Environment
EA	Environmental Authorisation
ECO	Environmental Control Officer
OHPs	Overhead Powerlines
SSC	Species of Special Concern
SAM	Strategic Adaptive Management
TBC	The Biodiversity Company
WEF	Wind Energy Facility
WTG	Wind Turbine Generator



## MANAGEMENT PLAN OBJECTIVES

The purpose of the Msenge Emoyeni Wind Energy Facility (WEF) **Revegetation and Rehabilitation Plan** is to provide a framework for the management areas impacted by the construction and operation of the Msenge WEF. Importantly it also serves to bind the landowner and the developer into a co-management agreement for the entire properties. The same principle applies with the management of Alien Invader Plants (AIPs); the management and monitoring need to occur simultaneously for the development footprint, as well as the surrounding farmland.

The broad objectives of the plan include the following:

- To stabilise bare areas to prevent erosion, loss of topsoil and flood damage
- To ensure compliance with Provincial and National Legislation in terms of NEMBA EIA regulations
- To employ all transplantable plants from the construction phase in the revegetation efforts
- To employ where possible all Species of Special Concern (SSC) that we need to be cleared from the development site and hence strive towards full restoration
- To minimise visual impact and create a professional appearance
- To reduce the influx and establishment of AIPs and naturalised weed species.

As per the previous report (The Biodiversity Company (TBC) 2020), we concur that the implementation of this plan needs to occur simultaneously with the 1) Erosion Management Plan, 2) Alien Invasive Management Plan, 3) Plant Rescue and Protection Plan and 4) Bush Encroachment Plan. Ideally a comprehensive and holistic Farm Management Plan would also include a 5) Sustainable Livestock Management Plan – all of which would be chapters in the Greater Farm Management Plan.

## SITE SPECIFICS

The site specifics have been described in the most recent Revegetation and Rehabilitation Plan for the Msenge WEF (TBC 2020). The general terrain was described as “non-uniform” in terms of the topography, dominated by dry grassland (Bedford Dry Grassland, Mucina *et al.* 2006) with the drainage lines dominated by *Vachellia karoo* (TBC 2020). Hoare (2010) describes the general areas as a plain below the Amathole/Winterberg Mountains which is mostly gentle slopes, but with moderate slopes in some of the valleys. The underlying geology is composed of mudstones and arenite from the Bedford Group. The grassland is short <1m in height with a strong grass component and a limited dwarf karroid shrub component (TBC 2020). The area has warm summers, mild winters but frost is a regular event and the climate is influenced by the Amathole/Winterberg Mountains (Hoare 2010). Dent *et al.* (1989) cited in (Hoare 2010) state the bi-modal rainfall peaks (spring and autumn) results in mean rainfall in the range of (340-500mm pa).

The fieldwork conducted in 2022 indicate the rangelands to be in a poor ecological condition. This is partly due to the recent five-year drought (the worst in recorded history), but mostly due to unsustainable livestock management – which is largely a function of the properties being too small to be financially at ecologically sustainable at the same time. This is important context for a revegetation and rehabilitation plan, specifically when it comes to planting season and after care.

# REHABILITATION AND REVEGETATION GUIDELINES

## Facilitated Succession

Although the mean annual rainfall is low, there will be natural succession following disturbance. This needs to be exploited to the fullest to reduce costs and improve the chances of success.

**Table 1. SSC and other local that could be successful employed for the revegetation and rehabilitation activities.**

No	Genus	Species
1	<i>Aloe</i>	<i>ferox</i>
2	<i>Aloe</i>	<i>striata</i>
3	<i>Aloiampelos</i>	<i>tenuior</i>
4	<i>Bulbine</i>	<i>frutescens</i>
5	<i>Bulbine</i>	<i>narcissifolia</i>
6	<i>Carpobrotus</i>	<i>edulis</i>
7	<i>Chasmatophyllum</i>	<i>musculinum</i>
8	<i>Commelina</i>	<i>africana</i>
9	<i>Cotyledon</i>	<i>campanulata</i>
10	<i>Cotyledon</i>	<i>orbiculata</i>
11	<i>Crassula</i>	<i>corralina</i>
12	<i>Cynotis</i>	<i>speciosa</i>
13	<i>Delosperma</i>	<i>adelaidensis</i>
14	<i>Drimia</i>	<i>anomala</i>
15	<i>Drosanthemum</i>	<i>hispidum</i>
16	<i>Eriospermum</i>	<i>species</i>
17	<i>Gasteria</i>	<i>bicolor</i>
18	<i>Glotiphyllum</i>	<i>longum</i>
19	<i>Haemanthus</i>	<i>albiflos</i>
20	<i>Kalanchoe</i>	<i>rotundifolia</i>
21	<i>Ledebouria</i>	<i>ensifolia</i>
22	<i>Ledebouria</i>	<i>fishriverensis</i>
23	<i>Ledebouria</i>	<i>revoluta</i>
24	<i>Mestoklema</i>	<i>tuberosum</i>
25	<i>Pelargonium</i>	<i>abrorantifolium</i>
26	<i>Pelargonium</i>	<i>reniforme</i>
27	<i>Pelargonium</i>	<i>sidoides</i>
28	<i>Plumbago</i>	<i>auriculata</i>
29	<i>Portulacaria</i>	<i>afra</i>
30	<i>Ruschia</i>	<i>brittinae</i>
31	<i>Ruschia</i>	<i>cradockensis</i>
32	<i>Sansiviera</i>	<i>hyacinthoides</i>
33	<i>Sarcostemma</i>	<i>viminale</i>
34	<i>Senecio</i>	<i>radicans</i>
35	<i>Trichodiadema</i>	<i>introrosum</i>
36	<i>Trichodiadema</i>	<i>orientalis</i>
37	<i>Trichodiadema</i>	<i>pormeridianum</i>

## Reseeding

Given that the area is dominated by Bedford Dry Grasslands (Mucina *et al.* 2006) it follows that grass species would form a key component of the revegetation and rehabilitation. **Table 2** below lists a number of key grass species that will require seed collecting and storing and to be used in the revegetation work.

**Table 2. Grass species suitable for revegetation.**

No	Genus	Species
1	<i>Panicum</i>	<i>maximum</i>
2	<i>Digitaria</i>	<i>argyrocapta</i>
3	<i>Themeda</i>	<i>triandra</i>
4	<i>Setaria</i>	<i>sphacelata</i>
5	<i>Cynodon</i>	<i>impectus</i>
6	<i>Tristachya</i>	<i>leucothrix</i>
7	<i>Sporobolus</i>	<i>africanus</i>
8	<i>Melenis</i>	<i>repens</i>
9	<i>Eragrostis</i>	<i>curvula</i>
10	<i>Elionurus</i>	<i>muticus</i>
11	<i>Enneapogon</i>	<i>scoparius</i>
12	<i>Chloris</i>	<i>virgata</i>

### Erosion

Gully erosion is not widespread on the property, but sheet erosion is. In the absence of a Soil Erosion Management Plan, the restoration of these areas will have to be completed as part of the Revegetation and Rehabilitation Plan.



**Figure 1. Overgrazed vegetation has led to sheet and gully erosion.**

### Monitoring

The Environmental Control Officer (ECO) will be responsible for conducting appropriate baseline vegetation surveys prior to construction, and complete monitoring during the construction and operational phases. The ECO would need to have training or experience in the principles of Strategic Adaptive Management (SAM). The SAM requires regular monitoring to enable reflection and adaptation (ideally every quarter a meta-reflection exercise is needed to plan for the next quarter).

The key parameters for the monitoring would be the following:

- The number of AIP and invasive weeds on the revegetation sites
- The density of AIP and invasive weeds on the revegetation sites

- The ratio of bare soil to vegetation cover on the revegetation sites
- The survivorship of SSC
- The fecundity indices for SCC

The monitoring intervals should be quarterly for the Construction Phase, 6-monthly for the first two years of the Operational Phase and then annually thereafter.

## Conclusions and Recommendations

- The properties should be destocked from livestock for the first two years to allow for successful establishment of the plants. If the livestock or game cannot be removed then all the revegetation areas will require temporary fencing (2-3 years to allow for successful establishment).
- All erosion areas require accurate mapping to prevent further erosion and loss of topsoil.
- All AIPs (not naturalised weeds) need to be systematically eradicated or removed from the site prior to construction, to prevent the spread of species (especially *Opuntia aurantiaca*).
- All topsoil from the development sites must be stored separately from subsoil and used as topsoil for the same area.
- The construction contractor needs to undertake the construction in a phased approach to limit topsoil standing for long periods, leading to a loss of micro-fauna and flora, which will make the task more difficult for the revegetation teams.
- The ECO needs to develop a site-specific irrigation scheme for the revegetated areas.
- The collecting of grass seed, and safe storage is a top priority to have sufficient seed supply for the revegetation.
- The vegetative material from the implementation of the Bush Encroachment Plan should be used for brush-packing the bare areas that will be seeded with grass.
- *V. karoo* brush-packing should also be used to revegetate erosion areas not connected to the development footprint.
- Habitat specific restoration protocols need to be developed for each of the key habitats (rocky outcrops, riparian zones, open grassy areas, bush clumps etc.).
- Plants that are transplantable (both SCC and non-SCC) from the development zone need to be removed and located in a temporary holding facility and replanted as close to the original site as possible. Only plants in danger should be relocated.
- Relocated plants should be stored in a temporary shade facility close to the receiving site (which should also not be too far from the excavation site).
- The micro-siting of the relocated plants should be overseen by a qualified botanist, especially the SSC. All permits as per NEMBA and the Provincial Ordinance will be required.
- All irrigation needs to use water that has low salinity levels, and tests should be done to confirm that the water is within acceptable levels.
- Where re-sloping is required (e.g. embankments, large dongas) a maximum slope of 15 degrees should be used and all areas should be reseeded with grass, brush packed<sup>1</sup> and irrigated.
- The baselines conducted prior to the construction phase should be used as a guideline for the species mix and densities for reseeded and replanting. Care should be taken to obtain good advice about the

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<sup>1</sup> Brushpacking needs to be replenished when the material breaks down.

site-specific state of the degradation/ecological condition. Many of the karroid species (*Ocimum burchelliana*, *Stachys scabrida*, *Chrysocoma cilliata*, *Penztia incana*, *Asparagus striatus* etc.) are most likely to be unnaturally abundant and their percentage covers should be much less. This would be to the benefit of the grass sward.

- In a similar vein to the previous recommendation, a good reference site (which is unlikely on any of the properties) will provide a good restoration trajectory for the grass and non-karroid forb species. These baselines will guide the species mix (more *Themeda triandra* and less *Eragrostis curvula* for e.g.).
- Commercially produced seed should be avoided and seed collected locally.
- Reseeding should ideally take place in spring or early summer to get maximum root development and benefit from seed viability (which drops off rapidly for some species).
- The use of herbicides should be kept to a minimum and long-lasting residual herbicides should be avoided. Inside the areas of revegetation mechanical and biological control is recommended. For most of the weedy and naturalised weeds species, sustainable land-use management will create the conditions that exclude these species from getting established.
- A large number of succulent species have prodigious vegetative reproductive capacity (*Crassula* spp., *Cotyledon* spp., *Portulacaria afra* etc) and these can be used to effectively restore degraded bush clumps. This will require the establishment of a basic mass propagation facility on the MEF.
- Animals, pedestrians and vehicles should be excluded from revegetated areas for at least two years (excluding planting, watering, monitoring and AIP removal).
- Where woody vegetation has to be removed (e.g. substation) the larger biomass items (stems and side branches) should not be burned, but used in reclamation work (e.g. stabilising dongas and sheet erosion).
- Where woody vegetation has to be removed (e.g. substation) the smaller biomass items (minor or multi-stems and side branches) should not be burned, but used in revegetation work (e.g. stabilising re-sloping and reducing evapotranspiration). These materials may require the use of an industrial chipper.

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<sup>2</sup> The report does not have a title page and the reference used here comes from the letter-type heading as recorded.

## Appendix H: Erosion Management Plan

### 1. PURPOSE

Exposed and unprotected soils are the main cause of erosion in most situations. Therefore, this Erosion Management Plan, the Storm Water Management Plan and the Revegetation and Rehabilitation Plan are closely linked to one another and should not operate independently but should rather be seen as complementary activities within the broader environmental management of the site and should therefore be managed together.

This Erosion Management Plan addresses the management and mitigation of potential impacts relating to soil erosion. The objective of the plan is to provide:

- » A general framework for soil erosion and sediment control, which enables the Contractor to identify areas where erosion can occur and is likely to be accelerated by construction related activities.
- » An outline of general methods to monitor, manage and rehabilitate erosion prone areas, ensuring that all erosion resulting from all phases of the development is addressed.

This plan must be updated and refined once the construction/ civil engineering plans have been finalised following detailed design.

### 2. RELEVANT ASPECTS OF THE STUDY AREA

The study area (including the development area) consists of a non-uniform topography, with a slope percentage ranging from 0 to 58, and an elevation of 569 Metres Above Sea Level (MASL) to 868 MASL. Various convex topographical features are located throughout the project area and its surrounding areas which indicate watercourses or drainage features.

During construction, there will be a lot of disturbed and loose soil within the development footprint which will render the area vulnerable to erosion. Erosion is one of the greater risk factors associated with the development and it is therefore critically important that proper erosion control structures are built and maintained over the lifespan of the project.

### 3. EROSION AND SEDIMENT CONTROL PRINCIPLES

The goals of erosion control during and after construction at the site should be to:

- » Protect the land surface from erosion;
- » Intercept and safely direct run-off water from undisturbed upslope areas through the site without allowing it to cause erosion within the site or become contaminated with sediment; and
- » Progressively revegetate or stabilise disturbed areas.

These goals can be achieved by applying the management practices outlined in the following sections.

#### 3.1. On-Site Erosion Management

General factors to consider regarding erosion risk at the site includes the following:

- » Due to the sandy nature of soils in the study area, soil loss will be greater during dry periods as it is more prone to wind erosion. Therefore, precautions to prevent erosion should be present throughout the year.

- » Soil loss will be greater on steeper slopes. Ensure that steep slopes are not de-vegetated unnecessarily and subsequently become hydrophobic (i.e. have increased runoff and a decreased infiltration rate) increasing the erosion potential.
- » Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilisation. Therefore, the gap between construction activities and rehabilitation should be minimised. Phased construction and progressive rehabilitation, where practically possible, are therefore important elements of the erosion control strategy.
- » The extent of disturbance will influence the risk and consequences of erosion. Therefore, site clearing should be restricted to areas required for construction purposes only. As far as possible, large areas should not be cleared all at once, especially in areas where the risk of erosion is higher.
- » Roads should be planned and constructed in a manner which minimises their erosion potential. Roads should therefore follow the natural contour as far as possible. Roads parallel to the slope direction should be avoided as far as possible.
- » Where necessary, new roads constructed should include water diversion structures with energy dissipation features present to slow and disperse the water into the receiving area.
- » Roads used for project-related activities and other disturbed areas should be regularly monitored for erosion. Any erosion problems recorded should be rectified as soon as possible and monitored thereafter to ensure that they do not re-occur.
- » Runoff may have to be specifically channelled or storm water adequately controlled to prevent localised rill and gully erosion.
- » Compacted areas should have adequate drainage systems to avoid pooling and surface flow. Heavy machinery should not compact those areas which are not intended to be compacted as this will result in compacted hydrophobic, water repellent soils which increase the erosion potential of the area. Where compaction does occur, the areas should be ripped.
- » All bare areas should be revegetated with appropriate locally occurring species, to bind the soil and limit erosion potential.
- » Silt fences should be used where there is a danger of topsoil or material stockpiles eroding and entering streams and other sensitive areas.
- » Gabions and other stabilisation features must be used on steep slopes and other areas vulnerable to erosion to minimise erosion risk as far as possible.
- » Activity at the site after large rainfall events when the soils are wet and erosion risk is increased should be reduced. No driving off of hardened roads should occur at any time, and particularly immediately following large rainfall events.
- » Topsoil should be removed and stored in a designated area separately from subsoil and away from construction activities (as per the recommendations in the EMP). Topsoil should be reapplied where appropriate as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation in cleared areas.
- » Regular monitoring of the site for erosion problems during construction (on-going) and operation (at least twice annually) is recommended, particularly after large summer thunderstorms have been experienced. The ECD will determine the frequency of monitoring based on the severity of the impacts in the erosion prone areas.

### 3.1.1. Erosion Control Mechanisms

The Contractor may use the following mechanisms (whichever proves more appropriate/ effective) to combat erosion when necessary:

- » Reno mattresses;
- » Slope attenuation;
- » Hessian material;
- » Shade catch nets;
- » Gabion baskets;
- » Silt fences;
- » Storm water channels and catch pits;
- » Soil bindings;
- » Geofabrics;
- » Hydro-seeding and/or re-vegetating;



- » Mulching over cleared areas;
- » Boulders and size varied rocks; and
- » Tilling.

### 3.2. Engineering Specifications

A detailed engineering specifications Storm Water Management Plan describing and illustrating the proposed stormwater control measures must be prepared by the Civil Engineers during the detailed design phase and should be based on the underlying principles of the Storm Water Management Plan (Appendix I of the EMP) and this should include erosion control measures. Requirements for project design include:

- » Erosion control measures to be implemented before and during the construction period, including the final storm water control measures (post construction).
- » All temporary and permanent water management structures or stabilisation methods must be indicated within the Storm water Management Plan.
- » An on-site Engineer or Environmental Officer (EO)/ SHE Representative to be responsible for ensuring implementation of the erosion control measures on site during the construction period. The ECO should monitor the effectiveness of these measures on the interval agreed upon with the Site Manager and EO.
- » The Contractor holds ultimate responsibility for remedial action in the event that the approved Storm Water Management Plan is not correctly or appropriately implemented and damage to the environment is caused.

### 3.3. Monitoring

The site must be monitored continuously during construction and operation in order to determine any indications of erosion. If any erosion features are recorded as a result of the activities on-site the Environmental Officer (EO)/ SHE Representative (during construction) or Environmental Manager (during operation) must:

- » Assess the significance of the situation.
- » Take photographs of the soil degradation.
- » Determine the cause of the soil erosion.
- » Inform the contractor/operator that rehabilitation must take place and that the contractor/operator is to implement a rehabilitation method statement and management plan to be approved by the Site/Environmental Manager in conjunction with the ECO.
- » Monitor that the contractor/operator is taking action to stop the erosion and assist them where needed.
- » Report and monitor the progress of rehabilitation weekly and record all the findings in a site register (during construction).
- » All actions with regards to the incidents must be reported on a monthly compliance report which should be kept on file for if/when the Competent Authority requests to see it (during construction) and kept on file for consideration during the annual audits (during construction and operation).

The Contractor (in consultation with an appropriate specialist, e.g. an engineer) must:

- » Select a system/mechanism to treat the erosion.
- » Design and implement the appropriate system/mechanism.
- » Monitor the area to ensure that the system functions like it should. If the system fails, the method must be adapted or adjusted to ensure the accelerated erosion is controlled.
- » Continue monitoring until the area has been stabilised.

#### 4. CONCLUSION

The Erosion Management Plan is a document to assist the Proponent/ EPC Contractor with guidelines on how to manage erosion during all phases of the project. The implementation of management measures is not only good practice to ensure minimisation of degradation, but also necessary to ensure compliance with legislative requirements. This document forms part of the EMPr and is required to be considered and adhered to during the design, construction, operation and decommissioning phases of the project (if and where applicable). During the construction phase, the Contractor must prepare an Erosion Control Method Statement to ensure that all construction methods adopted on site do not cause, or precipitate soil erosion and shall take adequate steps to ensure that the requirements of this plan are met before, during and after construction. The designated responsible person on site, must be indicated in the Method Statement and shall ensure that relevant erosion control measures are in place throughout the construction phase.

An operation phase Erosion Management Plan should be designed and implemented if not already addressed by the mitigations implemented as part of construction, with a view to preventing the passage of concentrated flows off hardened surfaces and onto natural areas.

## Appendix I: Stormwater Management Plan

### 1. PURPOSE

By taking greater cognisance of natural hydrological patterns and processes it is possible to develop storm water management systems in a manner that reduces these potentially negative impacts and mimic nature. The main risks associated with inappropriate storm water management are increased erosion risk and risks associated with flooding. Therefore, this Storm Water Management Plan and the Erosion Management Plan are closely linked to one another and should be managed together.

This Storm Water Management Plan addresses the management of storm water runoff from the development footprint and significant impacts relating to resultant impacts such as soil erosion and downstream sedimentation. The main factors influencing the planning of storm water management measures and infrastructure are:

- » Topography and slope gradients;
- » Placing of infrastructure and infrastructure design;
- » Annual average rainfall; and
- » Rainfall intensities.

The objective of the plan is, therefore, to provide measures to address runoff from disturbed portions of the development footprint, such that they:

- » do not result in concentrated flows into natural watercourses i.e. provision should be made for temporary or permanent measures that allow for attenuation, control of velocities and capturing of sediment upstream of natural watercourses.
- » do not result in any necessity for concrete or other lining of natural watercourses to protect them from concentrated flows off the various infrastructure if not necessary.
- » do not divert flows out of their natural flow pathways, thus depriving downstream watercourses of water.

This Storm Water Management Plan must be updated and refined once the construction/ civil engineering plans have been finalised following detailed design.

### 2. STORMWATER MANAGEMENT PRINCIPLES

In the design phase, various storm water management principles should be considered including:

- » Prevent concentration of storm water flow at any point where the ground is susceptible to erosion.
- » Reduce storm water flows as far as possible by the effective use of attenuating devices (such as swales, berms, silt fences). As construction progresses, the storm water control measures are to be monitored and adjusted to ensure complete erosion and pollution control at all times.
- » Silt traps must be used where there is a danger of topsoil or material stockpiles eroding and entering streams and other sensitive areas.
- » Construction of gabions and other stabilisation features on steep slopes may be undertaken to prevent erosion, if deemed necessary.
- » Minimise the area of exposure of bare soils to minimise the erosive forces of wind, water and all forms of traffic.
- » Ensure that development does not increase the rate of storm water flow above that which the natural ground can safely accommodate at any point in the sub-catchments.
- » Ensure that all storm water control works are constructed in a safe and aesthetic manner in keeping with the overall development.
- » Plan and construct storm water management systems to remove contaminants before they pollute surface waters or groundwater resources.

- » Contain soil erosion, whether induced by wind or water forces, by constructing protective works to trap sediment at appropriate locations. This applies particularly during construction.
- » Avoid situations where natural or artificial slopes may become saturated and unstable, both during and after the construction process.
- » Design and construct roads to avoid concentration of flow along and off the road. Where flow concentration is unavoidable, measures to incorporate the road into the pre-development storm water flow should not exceed the capacity of the culvert. To assist with the storm water run-off, gravel roads should typically be graded and shaped with a 2-3% crossfall back into the slope, allowing storm water to be channelled in a controlled manner towards the, natural drainage lines and to assist with any sheet flow within the development footprint.
- » Design culvert inlet structures to ensure that the capacity of the culvert does not exceed the pre-development storm water flow at that point. Provide detention storage on the road and/or upstream of the storm water culvert.
- » Design outlet culvert structures to dissipate flow energy. Any unlined downstream channel must be adequately protected against soil erosion.
- » Where the construction of a building causes a change in the vegetative cover of the site that might result in soil erosion, the risk of soil erosion by storm water must be minimised by the provision of appropriate artificial soil stabilisation mechanisms or re-vegetation of the area. Any inlet to a piped system should be fitted with a screen or grating to prevent debris and refuse from entering the storm water system.
- » Preferably all drainage channels on site and contained within the larger area of the property (i.e. including buffer zone) should remain in the natural state so that the existing hydrology is not disturbed.

### 3.1. Engineering Specifications

Detailed engineering specifications for a Storm Water Management Plan describing and illustrating the proposed storm water control measures must be prepared by the Civil Engineers during the detailed design phase and should be based on the underlying principles of this Storm Water Management Plan. This should include erosion control measures. Requirements for project design include:

- » Erosion control measures to be implemented before and during the construction period, including the final storm water control measures (post construction) must be indicated within the Final/Updated Storm Water Management Plan.
- » All temporary and permanent water management structures or stabilisation methods must be indicated within the Final/Updated Storm Water Management Plan.
- » The drainage system for the development footprint should be designed to specifications that can adequately deal with a 1:50 year intensity rainfall event or more to ensure sufficient capacity for carrying storm water around and away from infrastructure.
- » Procedures for storm water flow through a site need to take into consideration both normal operating practice and special circumstances. Special circumstances in this case typically include severe rainfall events.
- » An on-site Engineer or Environmental Officer is to be responsible for ensuring implementation of the erosion control measures on site during the construction period.
- » The EPC Contractor holds ultimate responsibility for remedial action in the event that the approved storm water plan is not correctly or appropriately implemented and damage to the environment is caused.

During the construction phase, the contractor must prepare a Storm Water Control Method Statement to ensure that all construction methods adopted on site do not cause, or precipitate soil erosion and shall take adequate steps to ensure that the requirements of the Storm Water Management Plan are met before, during and after construction. The designated responsible person on site, must be indicated in the Storm Water Control Method Statement and shall ensure that no construction work takes place before the relevant storm water control measures are in place.

An operation phase Storm Water Management Plan should be designed and implemented if not already addressed by the mitigations implemented as part of construction, with a view to preventing the passage of concentrated flows off hardened surfaces and onto natural areas.

## Appendix J: Waste Management Plan

### 1. PURPOSE

A Waste Management Plan (WMP) plays a key role in achieving sustainable waste management throughout all phases of the project. The plan prescribes measures for the collection, temporary storage and safe disposal of the various waste streams associated with the project and includes provisions for the recovery, re-use and recycling of waste. The purpose of this plan is therefore to ensure that effective procedures are implemented for the handling, storage, transportation and disposal of waste generated from the project activities on site.

This WMP has been compiled as part of the project EMPr and is based on waste stream information available at the time of compilation. Construction and operation activities must be assessed on an ongoing basis in order to determine the efficacy of the plan and whether further revision of the plan is required. This plan should be updated once further detail regarding waste quantities and categorisation become available, during the construction and/or operation phases. This plan should be updated throughout the life cycle of the infrastructure established for the authorised Msenge Emoyeni WEF, as required in order to ensure that appropriate measures are in place to manage and control waste and to ensure compliance with relevant legislation.

Prior to the commencement of construction, a detailed Waste Management Method Statement for the site should be compiled by the Contractor.

### 2. RELEVANT ASPECTS OF THE SITE

It is expected that the development of various infrastructure will generate construction solid waste, as well as general waste and hazardous waste during the lifetime of the Msenge Emoyeni WEF.

Waste generated on site, originates from various sources, including but not limited to:

- » Concrete waste generated from spoil and excess concrete.
- » Contaminated water, soil, rocks and vegetation due to hydrocarbon spills.
- » Hazardous waste from vehicle, equipment and machinery parts and servicing, fluorescent tubes, used hydrocarbon containers, batteries situated in specially adapted shipping containers, and waste ink cartridges.
- » Recyclable waste in the form of paper, glass, steel, aluminium, wood/ wood pallets, plastic (PET bottles, PVC, LDPE) and cardboard.
- » Organic waste from food waste as well as alien and endemic vegetation removal.
- » Sewage from portable toilets and septic tanks.
- » Inert waste from spoil material from site clearance and trenching works.

### 3. LEGISLATIVE REQUIREMENTS

Waste in South Africa is currently governed by several regulations, including:

- » National Environmental Management: Waste Act (NEM: WA), 2008 (Act 59 of 2008);
- » National Environmental Management: Waste Amendment Act, 2014 (Act 26 of 2014);
- » The South African Constitution (Act 108 of 1996);
- » Hazardous Substances Act (Act 5 of 1973);
- » Health Act (Act 63 of 1977);
- » Environment Conservation Act (Act 73 of 1989);
- » Occupational Health and Safety Act (Act 85 of 1993);
- » National Water Act (Act 36 of 1998);

- » The National Environmental Management Act (Act 107 of 1998) (as amended);
- » Municipal Structures Act (Act 117 of 1998);
- » Municipal Systems Act (Act 32 of 2000);
- » Mineral and Petroleum Resources Development Act (Act 28 of 2002); and
- » Air Quality Act (Act 39 of 2004).

Storage of waste must be conducted in accordance with the National Norms and Standards for the Storage of Waste, published in GNR 926.

#### 4. WASTE MANAGEMENT PRINCIPLES

An integrated approach to waste management is needed on site. Such an approach is illustrated in Figure 1.

It is important to ensure that waste is managed with the following objectives in mind during all phases of the project:

- » Reducing volumes of waste is the greatest priority;
- » If reduction is not feasible, the maximum amount of waste is to be recycled; and
- » Waste that cannot be recycled is to be disposed of in the most environmentally responsible manner.

#### The Integrated Waste Management Approach to Waste

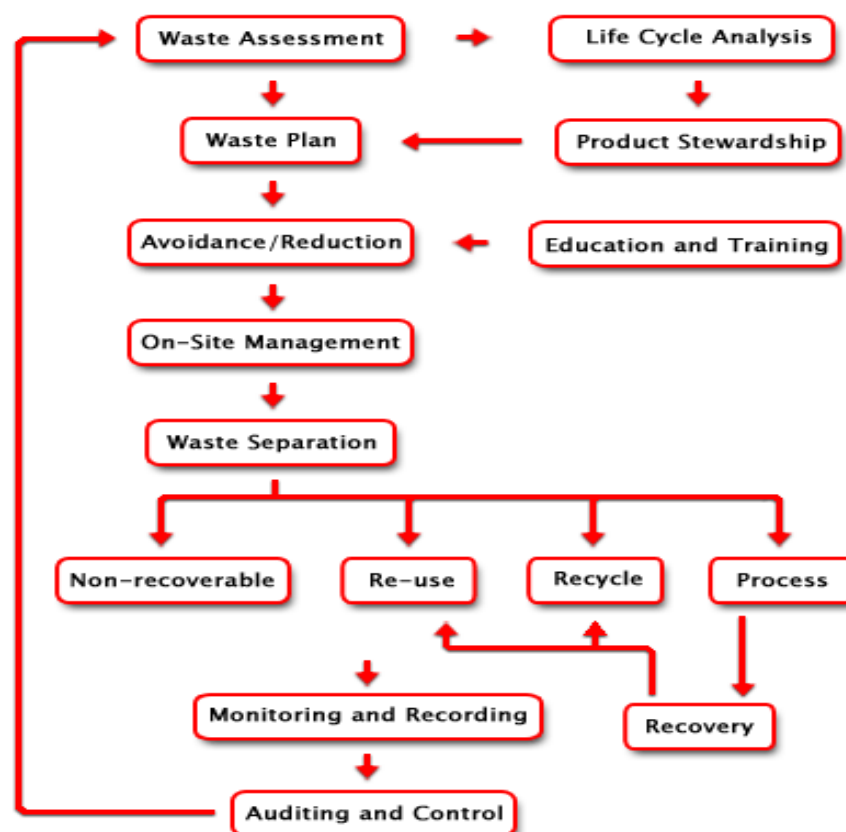


Figure 1: Integrated Waste Management Flow Diagram  
(Source: <http://www.enviroserv.co.za/pages/content.asp?SectionId=496>)

#### 4.1. Construction phase

A plan for the management of waste during the construction phase is detailed below. A Method Statement detailing specific waste management practices during construction should be prepared by the Contractor prior to the commencement of construction, for approval by the Resident Engineer.

##### 4.1.1. Waste Assessment / Inventory

- » The Environmental Officer (EO), or designated staff member, must develop, implement and maintain a waste inventory reflecting all waste generated during construction for both general and hazardous waste streams.
- » Construction methods and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities, to be pro-actively implemented.
- » Once a waste inventory has been established, targets for the recovery of waste (minimisation, re-use, recycling) should be set.
- » The EO must conduct waste classification and rating in terms of SANS 10288 and Government Notice 634 published under the NEM: WA.

##### 4.1.2. Waste collection, handling and storage

- » It is the responsibility of the EO to ensure that each subcontractor implements their own waste recycling system, i.e. separate bins for food waste, plastics, paper, wood, glass cardboard, metals, etc. Such practises must be made contractually binding upon appointment of the subcontractors.
- » Waste manifests and waste acceptance approvals (i.e. receipts) from designated waste facilities must be kept on file at the site office, in order to record and prove continual compliance for future auditing.
- » Septic tanks and portable toilets must be monitored by the EO or responsible subcontractor and maintained regularly. Below ground storage of septic tanks must withstand the external forces of the surrounding environment. The area above the tank must be demarcated to prevent any vehicles or heavy machinery from moving around in the surrounding area.
- » Waste collection bins and hazardous waste containers must be provided by the principal contractor and subcontractors and placed at strategic locations around the site for the storage of organic, recyclable and hazardous waste.
- » A dedicated waste area must be established on site for the storage of all waste streams before removal from site. The storage period must not trigger listed waste activities as per the NEMWA, GN 921 of November 2013.
- » Signage/ colour coding must be used to differentiate disposal areas for the various waste streams (i.e. paper, cardboard, metals, food waste, glass etc.).
- » Hazardous waste must be stored within a bunded area constructed according to SABS requirements and must ensure complete containment of the spilled material in the event of a breach. As such, appropriate bunding material, design, capacity and type must be utilised to ensure that no contamination of the surrounding environment will occur despite a containment breach. The net capacity of a bunded compound in a storage facility should be at least 120% of the net capacity of the largest tank.
- » Take into consideration the capacity displaced by other tanks within the same bunded area and any foundations.
- » Treat interconnected tanks as a single tank of equivalent total volume for the purposes of the bund design criteria.
- » The location of all temporary waste storage areas must aim to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control, while being reasonably placed in terms of centrality and accessibility on site. Where required, an additional temporary waste storage area may be designated, provided identical controls are exercised for these locations.
- » Waste storage shall be in accordance with all Regulations and best-practice guidelines and under no circumstances may waste be burnt on site.

- » A dedicated waste management team must be appointed by the principal contractors' SHE Officer, who will be responsible for ensuring the continuous sorting of waste and maintenance of the area. The waste management team must be trained in all areas of waste management and monitored by the SHE Officer.
- » All waste removed from site must be done by a registered/ licensed subcontractor, who must supply information regarding how waste recycling/ disposal will be achieved. The registered subcontractor must provide waste manifests for all removals at least once a month or for every disposal made, records of which must be kept on file at the site camp for the duration of the construction period.

#### 4.1.3. Management of waste storage areas

- » Waste storage must be undertaken in accordance with the relevant Norms and Standards.
- » The position of all waste storage areas must be located so as to ensure minimal degradation to the environment. The main waste storage area must have a suitable storm water system separating clean and contaminated storm water.
- » Collection bins placed around the site and at subcontractors' camps (if at a different location than the main site camp) must be maintained and emptied on a regular basis by the principal contractor to avoid overflowing receptacles.
- » Inspections and maintenance of the main waste storage area must be undertaken daily. Skips and storage containers must be clearly marked, or colour coded and well-maintained. Monitor for rodents and take corrective action if they become a problem.
- » Waste must be stored in designated containers and not on the ground.
- » Inspections and maintenance of bunds must be undertaken regularly. Bunds must be inspected for leaks or cracks in the foundation and walls.
- » It is assumed that any rainwater collected inside the bund is contaminated and must be treated by oil/water separation (or similar method) prior to dewatering, or removed and stored as hazardous waste, and not released into the environment.
- » If any leaks occur in the bund, these must be amended immediately.
- » Bund systems must be designed to avoid dewatering of contaminated water, but to rather separate oil and hydrocarbons from water prior to dewatering.
- » Following rainfall event bunds must always be dewatered in order to maintain a sufficient storage capacity in the event of a breach.
- » No mixing of hazardous and general waste is allowed.

#### 4.1.4. Disposal

- » Waste generated on site must be removed on a regular basis. This frequency may change during construction depending on waste volumes generated at different stages of the construction process, however removal must occur prior to the storage capacity being reached to avoid overflow of containers and poor waste storage.
- » Waste must be removed by a suitably qualified contractor and disposed of at an appropriately licensed landfill site. Proof of appropriate disposal must be provided by the contractor to the EO and ECO.

#### 4.1.5. Record keeping

The success of the WMP is determined by measuring criteria such as waste volumes, cost recovery from recycling and cost of disposal. Recorded data can indicate the effect of training and education, or the need for education. It will provide trends and benchmarks for setting goals and standards. It will provide clear evidence of the success or otherwise of the plan.

- » Documentation (waste manifest, certificate of issue or safe disposal) must be kept detailing the quantity, nature, and fate of any regulated waste for audit purposes.
- » Waste management must form part of the monthly reporting requirements in terms of volumes generated, types, storage and final disposal.



#### 4.1.6. Training

Training and awareness regarding waste management shall be provided to all employees and contractors as part of the toolbox talks or on-site awareness sessions with the EO and at the frequency as set out by the ECO.

#### 4.2. Operation phase

It is expected that the operation phase will result in the production of limited amounts of general waste consisting mostly of cardboard, paper, plastic, tins, metals and a variety of synthetic compounds. Hazardous wastes (including grease, oils) will also be generated. All waste generated will be required to be temporarily stored at the facility in appropriately sealed containers prior to disposal at a permitted landfill site or other facilities.

The following waste management principles apply during the operation phase:

- » The SHE Manager must develop, implement and maintain a waste inventory reflecting all waste generated during operation for both general and hazardous waste streams.
- » Adequate waste collection bins at site must be supplied. Separate bins should be provided for general and hazardous waste.
- » Recyclable waste must be removed from the waste stream and stored separately.
- » All waste must be stored in appropriate temporary storage containers (separated between different operation wastes, and contaminated or wet waste).
- » Waste storage shall be in accordance with all best-practice guidelines and under no circumstances may waste be burnt on site.
- » Waste generated on site must be removed on a regular basis throughout the operation phase.
- » Waste must be removed by a suitably qualified contractor and disposed of at an appropriately licensed landfill site. Proof of appropriate disposal must be provided by the contractor and kept on site.

#### 5. Monitoring of Waste Management Activities

Records must be kept of the volumes/ mass of the different waste streams that are collected from the site throughout the life of the project. The appointed waste contractor is to provide monthly reports to the operator containing the following information:

- » Monthly volumes/ mass of the different waste streams collected;
- » Monthly volumes/ mass of the waste that is disposed of at a landfill site;
- » Monthly volumes/ mass of the waste that is recycled;
- » Data illustrating progress compared to previous months.

This report will aid in monitoring the progress and relevance of the waste management procedures that are in place. If it is found that the implemented procedures are not as effective as required, this WMP is to be reviewed and amended accordingly. This report must form part of the EO's reports to the ECO on a monthly basis.

## Appendix K: Emergency Preparedness, Response and Fire Management Plan

### 1. PURPOSE

The purpose of the Emergency Preparedness and Response Plan is:

- » To assist contractor personnel to prepare for and respond quickly and safely to emergency incidents, and to establish a state of readiness which will enable prompt and effective responses to possible events.
- » To control or limit any effect that an emergency or potential emergency may have on site or on neighbouring areas.
- » To facilitate emergency responses and to provide such assistance on the site as is appropriate to the occasion.
- » To ensure communication of all vital information as soon as possible.
- » To facilitate the reorganisation and reconstruction activities so that normal operations can be resumed.
- » To provide for training so that a high level of preparedness can be continually maintained.

This plan outlines response actions for potential incidents of any size. It details response procedures that will minimise potential health and safety hazards, environmental damage, and clean-up efforts. The plan has been prepared to ensure quick access to all the information required in responding to an emergency event. The plan will enable an effective, comprehensive response to prevent injury or damage to the construction personnel, public, and environment during the project. Contractors are expected to comply with all procedures described in this document. A Method Statement should be prepared at the commencement of the construction phase detailing how this plan is to be implemented as well as details of relevant responsible parties for the implementation. The method statement must also reflect conditions of the IFC Performance Standard I and include the following:

- » Identification of areas where accidents and emergency situations may occur;
- » Communities and individuals that may be impacted;
- » Response procedure;
- » Provisions of equipment and resources;
- » Designation of responsibilities;
- » Communication; and
- » Periodic training to ensure effective response to potentially affected communities.

### 2. PROJECT-SPECIFIC DETAILS

Amakhala Emoyeni Renewable Energy (Pty) Ltd, proposes the establishment of various infrastructure on several properties within the authorised Msenge Emoyeni Wind Energy Facility (WEF) (DEA Ref: 12/12/20/1754/2) located approximately 20km south of the town of Bedford in the Blue Crane Route Local Municipality, Eastern Cape Province. The project development site is located within the Cookhouse Renewable Energy Development Zone (REDZ) and within the Eastern Corridor of the Strategic Transmission Corridors. The project will comprise the following key infrastructure and components:

Up to 21 turbines with a hub height of up to 135m and rotor diameter (including nacelle) of up to 160m (i.e. each blade up to 80m in length);

- » Underground cables (where practical) between the turbines;
- » Foundations (of up to 20 x 20 x 2 m) to support the turbine towers
- » One (1) Substation (of up to 250 x 200 m) (*A separate EMPR for the substation is available*)
- » Internal access roads to each turbine (4 - 8 m wide during construction, reduced to 3 - 4 m wide during operation).

Due to the scale and nature of this development, it is anticipated that the following risks could potentially arise during the construction and operation phases:

- » Fires;
- » Leakage of hazardous substances;
- » Storage of flammable materials and substances;
- » Flood events;
- » Accidents; and
- » Natural disasters.

### 3. EMERGENCY RESPONSE PLAN

There are three levels of emergency as follows:

- » Local Emergency: An alert confined to a specific locality.
- » Site Emergency: An alert that cannot be localised and which presents danger to other areas within the site boundary or outside the site boundary.
- » Evacuation: An alert when all personnel are required to leave the affected area and assemble in a safe location.

If there is any doubt as to whether any hazardous situation constitutes an emergency, then it must be treated as an Evacuation.

Every effort must be made to control, reduce or stop the cause of any emergency provided it is safe to do so. For example, in the event of a fire, isolate the fuel supply and limit the propagation of the fire by cooling the adjacent areas. Then confine and extinguish the fire (where appropriate) making sure that re-ignition cannot occur.

#### 3.1. Emergency Scenario Contingency Planning

##### 3.1.1. Scenario: Spill which would result in the contamination of land, surface or groundwater

###### i. Spill Prevention Measures

Preventing spills must be the top priority at all operations which have the potential of endangering the environment. The responsibility to effectively prevent and mitigate any scenario lies with the Contractor and the ECD. In order to reduce the risk of spills and associated contamination, the following principles should be considered during construction and operation activities:

- » All equipment refuelling, servicing and maintenance activities should only be undertaken within appropriately sealed/contained or banded designated areas.
- » All maintenance materials, oils, grease, lubricants, etc. should be stored in a designated area in an appropriate storage container.
- » No refuelling, storage, servicing, or maintenance of equipment should take place within sensitive environmental resources in order to reduce the risk of contamination by spills.
- » No refuelling or servicing should be undertaken without absorbent material or drip pans properly placed to contain spilled fuel.
- » Any fluids drained from the machinery during servicing should be collected in leak-proof containers and taken to an appropriate disposal or recycling facility.
- » If these activities result in damage or accumulation of product on the soil, the contaminated soil must be disposed of as hazardous waste. Under no circumstances shall contaminated soil be added to a spoils pile and transported to a regular disposal site.
- » Chemical toilets used during construction must be regularly cleaned. Chemicals used in toilets are also hazardous to the environment and must be controlled. Portable chemical toilets could overflow if not pumped regularly or they could spill if dropped or overturned during moving. Care and due diligence should be taken at all times.

- » Contact details of emergency services and HazMat Response Contractors are to be clearly displayed on the site. All staff are to be made aware of these details and must be familiar with the procedures for notification in the event of an emergency.

## ii. Procedures

The following action plan is proposed in the event of a spill:

1. Spill or release identified.
2. Assess person safety, safety of others and the environment.
3. Stop the spill if safely possible.
4. Contain the spill to limit entering surrounding areas.
5. Identify the substance spilled.
6. Quantify the spill (under or over guideline/threshold levels).
7. Notify the Site Manager and emergency response crew and authorities (in the event of major spill).
8. Inform users (and downstream users) of the potential risk.
9. Clean up of the spill using spill kit or by HazMat team.
10. Record of the spill incident on company database.

### a) Procedures for containing and controlling the spill (i.e. on land or in water)

Measures can be taken to prepare for quick and effective containment of any potential spills. Each contractor must keep sufficient supplies of spill containment equipment at the construction sites, at all times during and after the construction phase. These should include specialised spill kits or spill containment equipment. Other spill containment measures include using drip pans underneath vehicles and equipment every time refuelling, servicing, or maintenance activities are undertaken.

Specific spill containment methods for land and water contamination are outlined below.

#### Containment of Spills on Land

Spills on land include spills on rock, gravel, soil and/or vegetation. It is important to note that soil is a natural sorbent, and therefore spills on soil are generally less serious than spills on water as contaminated soil can be more easily recovered. It is important that all measures be undertaken to avoid spills reaching open water bodies located outside of the development footprint. The following methods could be used:

- » Dykes - Dykes can be created using soil surrounding a spill on land. These dykes are constructed around the perimeter or down slope of the spilled substance. A dyke needs to be built up to a size that will ensure containment of the maximum quantity of contaminant that may reach it. A plastic tarp can be placed on and at the base of the dyke such that the contaminant can pool up and subsequently be removed with sorbent materials or by pump into barrels or bags. If the spill is migrating very slowly, a dyke may not be necessary, and sorbents can be used to soak up contaminants before they migrate away from the source of the spill.
- » Trenches - Trenches can be dug out to contain spills. Spades, pickaxes or a front-end loader can be used depending on the size of the trench required. Spilled substances can then be recovered using a pump or sorbent materials.

### b) Procedures for transferring, storing, and managing spill related wastes

Used sorbent materials are to be placed in plastic bags for future disposal. All materials mentioned in this section are to be available in the spill kits. Following clean up, any tools or equipment used must be properly washed and decontaminated or replaced if this is not possible.

Spilled substances and materials used for containment must be placed into empty waste oil containers and sealed for proper disposal at an approved disposal facility.

### **c) Procedures for restoring affected areas**

Criteria that may be considered include natural biodegradation of oil, replacement of soil and revegetation. Once a spill of reportable size has been contained, the ECO and the relevant Authority must be consulted to confirm that the appropriate clean up levels are met.

#### **3.1.2. Scenario: Fire (and fire water handling)**

##### **i. Action Plan**

The following action plan is proposed in the event of a fire:

1. Quantify risk.
2. Assess person safety, safety of others and the environment.
3. If safe – attempt to extinguish the fire using appropriate equipment.
4. If not safe to extinguish, contain fire.
5. Notify the Site Manager and emergency response crew and authorities.
6. Inform users of the potential risk of fire.
7. Record the incident on the company database or filing register.

##### **ii. Procedures**

Because large scale fires may spread very fast it is most advisable that the employee/contractor not put his/her life in danger in the case of an uncontrolled fire.

Portable firefighting equipment must be provided at strategic locations throughout the site, in line with the Building Code of South Africa and the relevant provincial building code. All emergency equipment including portable fire extinguishers, hose reels and hydrants must be maintained and inspected by a qualified contractor in accordance with the relevant legislation and national standards.

Current evacuation signs and diagrams for the building or site that are compliant to relevant state legislation must be provided in a conspicuous position, on each evacuation route. Contact details for the relevant emergency services should be clearly displayed on site and all employees should be aware of procedures to follow in the case of an emergency.

##### **a) Procedures for initial actions**

Persons should not fight the fire if any of the following conditions exist:

- » They have not been trained or instructed in the use of a fire extinguisher.
- » They do not know what is burning.
- » The fire is spreading rapidly.

- » They do not have the proper equipment.
- » They cannot do so without a means of escape.
- » They may inhale toxic smoke.

**b) Reporting procedures**

In terms of the requirements of NEMA, the responsible person must, within 14 days of the incident, report to the Director General, provincial head of department and municipality.

- » Report fire immediately to the site manager, who will determine if it is to be reported to the relevant emergency services and authorities.
- » The Site Manager must have copies of the Report form to be completed.

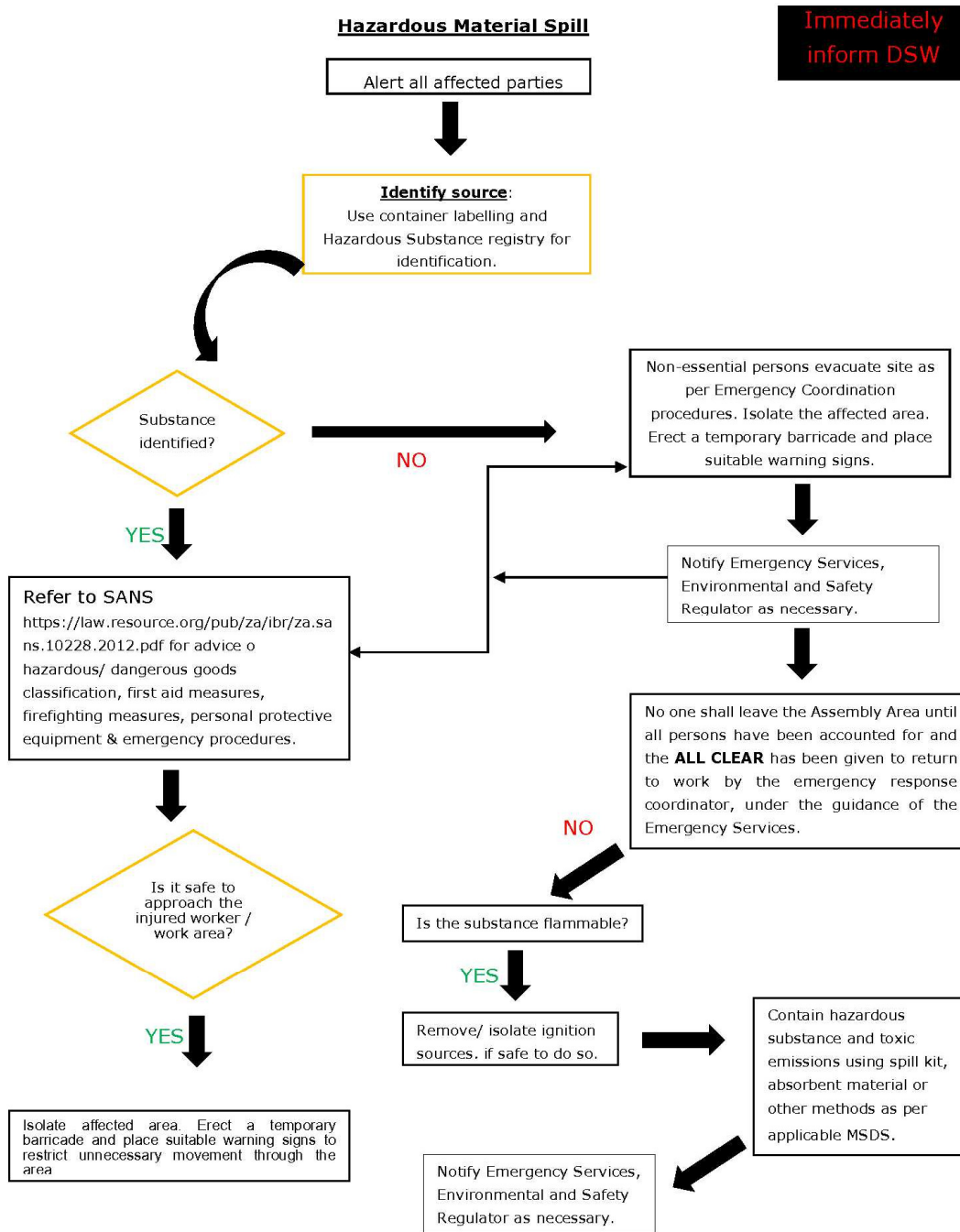


Figure 1: Hazardous Material Spill

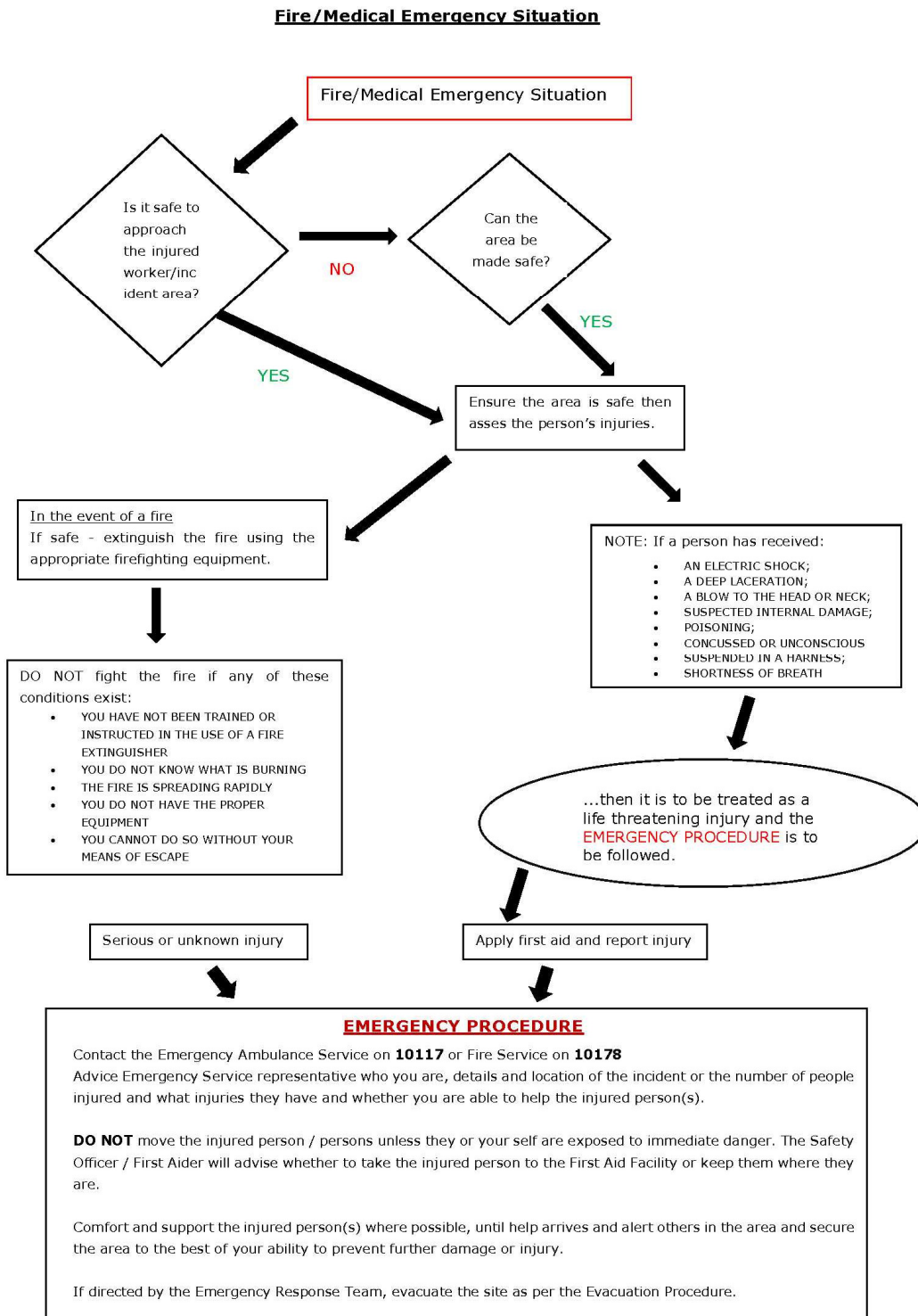


Figure 2: Emergency Fire/Medical



#### 4. PROCEDURE RESPONSIBILITY

The Contractor's Safety, Health and Environment (SHE) Representative, employed by the Contractor, is responsible for managing the day-to-day on-site implementation of this Plan, and for the compilation of regular (usually weekly) Monitoring Reports. In addition, the SHE must act as liaison and advisor on all environmental and related issues.

The local authorities will provide their assistance when deemed necessary, or when it has been requested and/or indicated in Section 30(8) of NEMA. The provincial authority will provide assistance and guidance where required and conduct awareness programmes.

## Appendix L: Key Legislation

Table I: Applicable Legislation, Policies and/or Guidelines associated with the establishment of various infrastructure at the Msenge Emoyeni WEF.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
<b>National Legislation</b>			
Constitution of the Republic of South Africa (No. 108 of 1996)	<p>In terms of Section 24, the State has an obligation to give effect to the environmental right. The environmental right states that:</p> <p><i>"Everyone has the right –</i></p> <ul style="list-style-type: none"> <li>» <i>To an environment that is not harmful to their health or well-being, and</i></li> <li>» <i>To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:</i> <ul style="list-style-type: none"> <li>* <i>Prevent pollution and ecological degradation,</i></li> <li>* <i>Promote conservation, and</i></li> <li>* <i>Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."</i></li> </ul> </li> </ul>	Applicable to all authorities	There are no permitting requirements associated with this Act. The application of the Environmental Right however implies that environmental impacts associated with proposed developments are considered separately and cumulatively. It is also important to note that the "right to an environment clause" includes the notion that justifiable economic and social development should be promoted, through the use of natural resources and ecologically sustainable development.
National Environmental Management Act (No 107 of 1998) (NEMA)	<p>The 2014 EIA Regulations have been promulgated in terms of Chapter 5 of NEMA. Listed activities which may not commence without EA are identified within the Listing Notices (GNR 327, GNR 325 and GNR 324) which form part of these Regulations (GNR 326).</p> <p>In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation.</p> <p>Considering the location of the project site within the Cookhouse Renewable Energy Development Zone (REDZ 3) and the requirements GNR114 of 16 February 2018, a Basic Assessment Process is required to be undertaken for the proposed project. All relevant listing notices for the project (GN R327, GN R325 and GN R324) will be applied for</p>	<p>DFFE – Competent Authority</p> <p>Eastern Cape – DEDEAST – Commenting Authority</p>	The listed activities triggered by the proposed project have been identified and are being assessed as of the previous processes conducted for the project.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Environmental Management Act (No 107 of 1998) (NEMA)	<p>In terms of the "Duty of Care and Remediation of Environmental Damage" provision in Section 28(1) of NEMA every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.</p> <p>In terms of NEMA, it is the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.</p>	<p>DFFE</p> <p>Eastern Cape DEDEA&amp;T</p>	<p>While no permitting or licensing requirements arise directly by virtue of the proposed project, this section finds application through the consideration of potential cumulative, direct, and indirect impacts. It will continue to apply throughout the life cycle of the project.</p>
Environment Conservation Act (No. 73 of 1989) (ECA)	<p>The Noise Control Regulations in terms of Section 25 of the ECA contain regulations applicable for the control of noise in the Provinces of Limpopo, North West, Mpumalanga, Northern Cape, Eastern Cape, and KwaZulu-Natal Provinces.</p> <p>The Noise Control Regulations cover the powers of a local authority, general prohibitions, prohibitions of disturbing noise, prohibitions of noise nuisance, use of measuring instruments, exemptions, attachments, and penalties.</p> <p>In terms of the Noise Control Regulations, no person shall make, produce or cause a disturbing noise, or allow it to be made, produced or caused by any person, machine, device or apparatus or any combination thereof (Regulation 04).</p>	<p>DFFE</p> <p>Eastern Cape DEDEA&amp;T</p> <p>Blue Crane Route Local Municipality</p>	<p>Noise impacts are expected to be associated with the construction phase of the project. As the site is located a great distance from noise sensitive receptors and communities, construction noise is unlikely to present a significant intrusion to the local community. There is therefore no requirement for a noise permit in terms of the legislation.</p>
National Water Act (No. 36 of 1998) (NWA)	<p>A water use listed under Section 21 of the NWA must be licensed with the Regional DWS, unless it is listed in Schedule 1 of the NWA (i.e. is an existing lawful use), is permissible under a GA, or if a responsible authority waives the need for a licence.</p> <p>Water use is defined broadly, and includes consumptive and non-consumptive water uses, taking and storing water, activities which reduce stream</p>	<p>Regional Department of Human Settlements, Water and Sanitation</p>	<p>Ephemeral watercourses are present within the project development footprint as identified within the Aquatic Pre-construction Walkthrough report (<b>Appendix A1</b>).</p> <p>Where development activities impede or divert the flow of water in a watercourse, or alter the bed, banks,</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering a watercourse, removing water found underground for certain purposes, and recreation.</p> <p>Consumptive water uses may include taking water from a water resource (Section 21(a)), and storing water (Section 21(b)).</p> <p>Non-consumptive water uses may include impeding or diverting of flow in a water course (Section 21(c)), and altering of bed, banks or characteristics of a watercourse (Section 21(i)).</p>		<p>course or characteristics of watercourse, Section 21(c) and 21 (i) of the NWA would be triggered, and the project proponent would need to apply for a WUL or register a GA with the DWS.</p>
<p>Minerals and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA)</p>	<p>In accordance with the provisions of the MPRDA a mining permit is required in accordance with Section 27(6) of the Act where a mineral in question is to be mined, including the mining of materials from a borrow pit.</p> <p>Section 53 of the MPRDA states that any person who intends to use the surface of any land in any way which may be contrary to any object of the Act, or which is likely to impede any such object must apply to the Minister for approval in the prescribed manner.</p>	<p>Department of Mineral Resources and Energy</p>	<p>Any person who wishes to apply for a mining permit in accordance with Section 27(6) must simultaneously apply for an Environmental Authorisation in terms of NEMA. No borrow pits are expected to be required for the construction of the project, and as a result a mining permit or EA is not required to be obtained.</p> <p>In terms of Section 53 of the MPRDA approval is required from the Minister of Mineral Resources to ensure that the proposed development does not sterilise a mineral resource that might occur on site.</p>
<p>National Environmental Management: Air Quality Act (No. 39 of 2004) (NEM:AQA)</p>	<p>The National Dust Control Regulations (GNR 827) published under Section 32 of NEM:AQA prescribe the general measures for the control of dust in all areas, and provide a standard for acceptable dustfall rates for residential and non-residential areas.</p> <p>In accordance with the Regulations (GNR 827) any person who conducts any activity in such a way as to give rise to dust in quantities and concentrations that may exceed the dustfall standard set out in Regulation</p>	<p>Eastern Cape DEDEAST / Sarah Baartman District Municipality</p>	<p>In the event that the project results in the generation of excessive levels of dust the possibility could exist that a dustfall monitoring programme would be required for the project, in which case dustfall monitoring results from the dustfall monitoring programme would need to be included in a dust monitoring report, and a dust management plan would need to be developed. However, with mitigation</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>03 must, upon receipt of a notice from the air quality officer, implement a dustfall monitoring programme.</p> <p>Any person who has exceeded the dustfall standard set out in Regulation 03 must, within three months after submission of the dustfall monitoring report, develop and submit a dust management plan to the air quality officer for approval.</p>		<p>measures implemented, the proposed project is not anticipated to result in significant dust generation.</p>
<p>National Heritage Resources Act (No. 25 of 1999) (NHRA)</p>	<p>Section 07 of the NHRA stipulates assessment criteria and categories of heritage resources according to their significance.</p> <p>Section 35 of the NHRA provides for the protection of all archaeological and palaeontological sites, and meteorites.</p> <p>Section 36 of the NHRA provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority.</p> <p>Section 38 of the NHRA lists activities which require developers or any person who intends to undertake a listed activity to notify the responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development.</p> <p>Section 44 of the NHRA requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of archaeological sites as part of tourism attraction.</p>	<p>South African Heritage Resources Agency</p> <p>Eastern Cape Province Heritage Resources Authority (ECPHRA)</p>	<p>The proposed reticulation alignment and a proposed road run over a feature identified by Halkett (2010). This feature is reflected by Sites 36106, 36097 and 36107 which reflect an historic dry stone wall that does not correspond with current cadastral boundaries. As per the description of Halkett (2010), the dry stone walling degenerates into a line of intermittent aloes in places. This wall/line of aloes is visible as an ephemeral feature on satellite imagery and has been mapped in Figures 9.2 and 9.3. Although the heritage significance of this feature is unknown, it is recommended that where the dry stone walling is still visible, that impact to this feature be avoided. As such, a no-impact buffer of 10m is recommended around the mapped feature. There is no objection to the road passing through this feature on condition that the road is limited to aspects of the wall that are marked only by the line of aloes. A 30m no-development buffer is recommended around instances where the dry stone walling is visible. The known instances of dry stone walling from Halkett (2010) are mapped with their recommended no-development buffer</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
			<p>of 30m indicated in Figure 9.3. The proposed reticulation system can pass over the feature, but should not impact it at all (Appendix E1).</p> <p>Should a heritage resource be impacted upon, a permit may be required from SAHRA in accordance with of Section 48 of the NHRA, and the SAHRA Permit Regulations (GNR 668). This will be determined once the final location of the development footprint and its associated infrastructure within the development area has been determined.</p>
<p>National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA)</p>	<p>Section 53 of NEM:BA provides for the MEC / Minister to identify any process or activity in such a listed ecosystem as a threatening process.</p> <p>Three government notices have been published in terms of Section 56(l) of NEM:BA as follows:</p> <ul style="list-style-type: none"> <li>» Commencement of TOPS Regulations, 2007 (GNR 150).</li> <li>» Lists of critically endangered, vulnerable and protected species (GNR 151).</li> <li>» TOPS Regulations (GNR 152).</li> </ul> <p>It provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), and vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (NEM:BA: National list of ecosystems that are threatened and in need of protection, (Government Gazette 37596, GNR 324), 29 April 2014).</p>	<p>DFFE Eastern Cape DEDEA&amp;T</p>	<p>Under NEM:BA, a permit would be required for any activity which is of a nature that may negatively impact on the survival of a listed protected species.</p> <p>Several individuals of twenty three protected plant species that are protected by the Eastern Cape Nature Conservation Ordinance No. 19 of 1974 were observed in various parts of the project area (Refer to Table 2.2 of the Terrestrial Pre-construction walkthrough report- Appendix A1).. <i>Euphorbia globosa</i> (EN) and <i>Euphorbia meloformis</i> (NT) were also observed in the project area.</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA)	<p>Chapter 5 of NEM:BA pertains to alien and invasive species, and states that a person may not carry out a restricted activity involving a specimen of an alien species without a permit issued in terms of Chapter 7 of NEM:BA, and that a permit may only be issued after a prescribed assessment of risks and potential impacts on biodiversity is carried out.</p> <p>Applicable, and exempted alien and invasive species are contained within the Alien and Invasive Species List (GNR 864).</p>	<p>DFFE</p> <p>Eastern Cape DED&amp;EAT</p>	<p>Restricted Activities and the respective requirements applicable to persons in control of different categories of listed invasive species are contained within the Alien and Invasive Species Regulations (GNR 598) published under NEM:BA, together with the requirements of the Risk Assessment to be undertaken.</p>
National Environmental Management: Protected Areas Act (Act 57 of 2003)	<p>The Act provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes. The categories consist of the following:</p> <ul style="list-style-type: none"> <li>- Special nature reserves,</li> <li>- National parks, nature reserves (including wilderness areas) and protected environments,</li> <li>- World heritage sites;</li> <li>- Specially protected forest areas, forest nature reserves and forest wilderness areas and</li> </ul> <p>Mountain catchment areas</p>	DFFE	<p>Restrict all activities relating to the wind farm to the authorised properties and as per the final approved layout as no NEMPAA related areas have been identified within the authorised WEF site.</p>
Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA)	<p>Section 05 of CARA provides for the prohibition of the spreading of weeds.</p> <p>Regulation 15 of GNR 1048 published under CARA provides for the classification of categories of weeds and invader plants, and restrictions in terms of where these species may occur.</p> <p>Regulation 15E of GNR 1048 published under CARA provides requirement and methods to implement control measures for different categories of alien and invasive plant species.</p>	<p>Department of Agriculture, Forestry and Fisheries (DAFF)</p>	<p>In terms of Regulation 15E (GNR 1048) where Category 1, 2 or 3 plants occur a land user is required to control such plants by means of one or more of the following methods:</p> <ul style="list-style-type: none"> <li>» Uprooting, felling, cutting or burning.</li> <li>» Treatment with a weed killer that is registered for use in connection with such plants in accordance with the directions for the use of such a weed killer.</li> <li>» Biological control carried out in accordance with the stipulations of the Agricultural Pests Act (No.</li> </ul>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
			<p>36 of 1983), the ECA and any other applicable legislation.</p> <ul style="list-style-type: none"> <li>» Any other method of treatment recognised by the executive officer that has as its object the control of plants concerned, subject to the provisions of sub-regulation (4).</li> <li>» A combination of one or more of the methods prescribed, save that biological control reserves and areas where biological control agents are effective shall not be disturbed by other control methods to the extent that the agents are destroyed or become ineffective.</li> </ul>
National Forests Act (No. 84 of 1998) (NFA)	<p>According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. Notice of the List of Protected Tree Species under the National Forests Act (No. 84 of 1998) was published in GNR 734.</p> <p>The prohibitions provide that “no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister”.</p>	DAFF	<p>A licence is required for the removal of protected trees. It is therefore necessary to conduct a survey that will determine the number and relevant details pertaining to protected tree species present in the development area for the submission of relevant permits to authorities prior to the disturbance of these individuals.</p> <p>According to the Terrestrial Pre-construction walkthrough report approximately 8 Protected tree species are expected to occur within the project areas, with <i>Sideroxylon inerme</i> confirmed during the walkthrough and recommendation to avoid the clearing bushclumps during site clearing activities.</p>
National Veld and Forest Fire Act (No. 101 of 1998) (NVFFA)	Chapter 4 of the NVFFA places a duty on owners to prepare and maintain firebreaks, the procedure in this regard, and the role of adjoining owners and the fire protection association. Provision is also made for the making of firebreaks on the international boundary of the Republic of South Africa. The	DAFF	While no permitting or licensing requirements arise from this legislation, this Act will be applicable during the construction and operation of the proposed infrastructure establishment, in terms of the



Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>applicant must ensure that firebreaks are wide and long enough to have a reasonable chance of preventing a veldfire from spreading to or from neighbouring land, it does not cause soil erosion, and it is reasonably free of inflammable material capable of carrying a veldfire across it.</p> <p>Chapter 5 of the Act places a duty on all owners to acquire equipment and have available personnel to fight fires. Every owner on whose land a veldfire may start or burn or from whose land it may spread must have such equipment, protective clothing and trained personnel for extinguishing fires, and ensure that in his or her absence responsible persons are present on or near his or her land who, in the event of fire, will extinguish the fire or assist in doing so, and take all reasonable steps to alert the owners of adjoining land and the relevant fire protection association, if any.</p>		<p>preparation and maintenance of firebreaks, and the need to provide appropriate equipment and personnel for firefighting purposes.</p>
<p>Hazardous Substances Act (No. 15 of 1973) (HAS)</p>	<p>This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger, to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products.</p> <ul style="list-style-type: none"> <li>» Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc., nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared as Group I or Group II substance</li> <li>» Group IV: any electronic product, and</li> <li>» Group V: any radioactive material.</li> </ul> <p>The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.</p>	<p>Department of Health (DoH)</p>	<p>It is necessary to identify and list all Group I, II, III, and IV hazardous substances that may be on site and in what operational context they are used, stored or handled. If applicable, a license would be required to be obtained from the Department of Health (DoH).</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
<p>National Environmental Management: Waste Act (No. 59 of 2008) (NEM:WA)</p>	<p>The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment.</p> <p>The Minister may amend the list by –</p> <ul style="list-style-type: none"> <li>» Adding other waste management activities to the list.</li> <li>» Removing waste management activities from the list.</li> <li>» Making other changes to the particulars on the list.</li> </ul> <p>In terms of the Regulations published in terms of NEM:WA (GNR 912), a BA or EIA is required to be undertaken for identified listed activities.</p> <p>Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that:</p> <ul style="list-style-type: none"> <li>» The containers in which any waste is stored, are intact and not corroded or in</li> <li>» Any other way rendered unfit for the safe storage of waste.</li> <li>» Adequate measures are taken to prevent accidental spillage or leaking.</li> <li>» The waste cannot be blown away.</li> <li>» Nuisances such as odour, visual impacts and breeding of vectors do not arise, and</li> <li>» Pollution of the environment and harm to health are prevented.</li> </ul>	<p>DFFE – hazardous waste</p> <p>Eastern Cape DEDEAST – general waste</p>	<p>No listed activities are triggered by the proposed infrastructure establishment at the Msenge WEF and therefore no Waste Management License is required to be obtained. General and hazardous waste handling, storage and disposal will be required during construction and operation. The National Norms and Standards for the Storage of Waste (GNR 926) published under Section 7(1)(c) of NEM:WA will need to be considered in this regard.</p>
<p>National Road Traffic Act (No. 93 of 1996) (NRTA)</p>	<p>The technical recommendations for highways (TRH II): “Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads” outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed.</p>	<p>SANRAL – national roads</p> <p>Eastern Cape DoT</p>	<p>An abnormal load / vehicle permit may be required to transport the various components to site for construction. These include route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. Transport vehicles exceeding the dimensional limitations (length) of 22m. Depending on the trailer</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts.</p> <p>The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.</p>		<p>configuration and height when loaded, some of the on-site substation components may not meet specified dimensional limitations (height and width).</p>
<p>Electronic Communications Act (Section 29) No 36, 29 of 2005</p>	<p>The Act serves to promote convergence in the broadcasting, broadcasting signal distribution and telecommunications sectors and to provide the legal framework for convergence of these sectors; to make new provision for the regulation of electronic communications services, electronic communications network services and broadcasting services; to provide for the granting of new licences and new social obligations; to provide for the control of the radio frequency spectrum.</p>	<p>Independent Communications Authority of South Africa</p>	
<p>Civil Aviation Act (No.13 of 2009) &amp; Aviation Act (Act No 74 of 1962) 13<sup>th</sup> amendment of the Civil Aviation Regulations (CARS) 1992</p>	<p>This Act provides for the establishment of a stand-alone authority mandated with controlling, promoting, regulating, supporting, developing, enforcing and continuously improving levels of safety and security throughout the civil aviation industry. The SA CAA achieves the objectives set out in the Act by complying with the Standards and Recommended Practices (SARPs) of the International Civil Aviation Organisation (ICAO), while considering the local context when issuing the South African Civil Aviation Regulations (SA CARs). All proposed developments or activities in South Africa that potentially could affect civil aviation must thus be assessed by SACAA in terms of the SA CARs and South African Civil Aviation Technical Standards (SA CATS) in order to ensure aviation safety. Air Traffic and Navigation Services (ATNS) has been appointed as the</p>	<p>South African Civil Aviation Authority</p>	<p>This Act will find application during the operation phase of the Msenge Emoyeni Wind Energy Facility. Appropriate marking on the project infrastructure is required to meet the specifications as detailed in CAR Part 139.01.33. An obstacle approval for the Msenge Emoyeni Wind Energy Facility is required to be obtained from CAA.</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>Obstacle application Service Provider for Windfarms on 1 May 2021.</p> <p>Any structures exceeding 45m above ground level or structures where the top of the structures exceeds 150m above the mean ground level, the mean ground level considered to the lowest point in a 3km radius around such structure.</p> <p>Structures lower than 45m, which are considered as a danger to aviation shall be marked as such when specified.</p> <p>Overhead wires, cables etc, crossing a river, valley or major roads shall be marked and in addition their supporting towers marked and lit if an aeronautical study indicates it could constitute a hazard to an aircraft.</p> <p>Section 14 of Obstacle limitations and marking outside aerodrome or heliport – CAR Part 139.01.22 related specifically to appropriate marking of wind energy facilities.</p>		
<b><i>Provincial Policies / Legislation</i></b>			
Ciskei Nature Conservation Act of 1987	<p>This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations.</p> <p>The Act provides lists of protected species for the Province.</p>	Eastern Cape DEDEAST	<p>A collection/destruction permit must be obtained from Eastern Cape DEDEAST for the removal of any protected plant or animal species found on site.</p> <p>Refer to Table 2.2 and Table 2.3 of the Terrestrial Walkthrough report (Appendix A1).</p>

(Adopted from the HWC Chance Fossils Finds Procedure: June 2016)

### **Introduction**

This document is aimed to inform workmen and foremen working on a construction and/or mining site. It describes the procedure to follow in instances of accidental discovery of palaeontological material (please see attached poster with descriptions of palaeontological material) during construction/mining activities. This protocol does not apply to resources already identified under an assessment undertaken under s. 38 of the National Heritage Resources Act (no 25 of 1999).

Fossils are rare and irreplaceable. Fossils tell us about the environmental conditions that existed in a specific geographical area millions of years ago. As heritage resources that inform us of the history of a place, fossils are public property that the State is required to manage and conserve on behalf of all the citizens of South Africa. Fossils are therefore protected by the National Heritage Resources Act and are the property of the State. Ideally, a qualified person should be responsible for the recovery of fossils noticed during construction/mining to ensure that all relevant contextual information is recorded.

Heritage Authorities often rely on workmen and foremen to report finds, and thereby contribute to our knowledge of South Africa's past and contribute to its conservation for future generations.

### **Training**

Workmen and foremen need to be trained in the procedure to follow in instances of accidental discovery of fossil material, in a similar way to the Health and Safety protocol. A brief introduction to the process to follow in the event of possible accidental discovery of fossils should be conducted by the designated Environmental Control Officer (ECO) for the project, or the foreman or site agent in the absence of the ECO. It is recommended that copies of the attached poster and procedure are printed out and displayed at the site office so that workmen may familiarise themselves with them and are thereby prepared in the event that accidental discovery of fossil material takes place.

### **Actions to be taken**

One person in the staff must be identified and appointed as responsible for the implementation of the attached protocol in instances of accidental fossil discovery and must report to the ECO or site agent. If the ECO or site agent is not present on site, then the responsible person on site should follow the protocol correctly in order to not jeopardize the conservation and well-being of the fossil material.

Once a workman notices possible fossil material, he/she should report this to the ECO or site agent. Procedure to follow if it is likely that the material identified is a fossil:

- The ECO or site agent must ensure that all work ceases immediately in the vicinity of the area where the fossil or fossils have been found;
- The ECO or site agent must inform SAHRA of the find immediately. This information must include photographs of the findings and GPS co-ordinates;
- The ECO or site agent must compile a Preliminary Report and fill in the attached Fossil Discoveries: Preliminary Record Form within 24 hours without removing the fossil from its original position. The Preliminary Report records basic information about the find including:
  - The date
  - A description of the discovery
  - A description of the fossil and its context (e.g. position and depth of find)
  - Where and how the find has been stored
  - Photographs to accompany the preliminary report (the more the better):

- A scale must be used
  - » Photos of location from several angles
  - » Photos of vertical section should be provided
  - » Digital images of hole showing vertical section (side);
  - » Digital images of fossil or fossils.

Upon receipt of this Preliminary Report, SAHRA will inform the ECO or site agent whether or not a rescue excavation or rescue collection by a palaeontologist is necessary.

- Exposed finds must be stabilised where they are unstable and the site capped, e.g. with a plastic sheet or sand bags. This protection should allow for the later excavation of the finds with due scientific care and diligence. SAHRA can advise on the most appropriate method for stabilisation.
- If the find cannot be stabilised, the fossil may be collect with extreme care by the ECO or the site agent and put aside and protected until SAHRA advises on further action. Finds collected in this way must be safely and securely stored in tissue paper and an appropriate box. Care must be taken to remove the all fossil material and any breakage of fossil material must be avoided at all costs.

No work may continue in the vicinity of the find until SAHRA has indicated, in writing, that it is appropriate to proceed.

<b>FOSSIL DISCOVERIES: PRELIMINARY RECORDING FORM</b>		
Name of project		
Name of fossil location:		
Date of discovery:		
Description of situation in which the fossil was found:		
Description of context in which the fossil was found:		
Description and condition of fossil identified:		
GPS coordinates:	Lat:	Long:
If no co-ordinates available then please describe the location:		
Time of discovery:		
Depth of find in hole		
Photographs (tick as appropriate and indicate number of the photograph)	Digital image of vertical section (side)	
	Fossil from different angles	
	Wider context of the find	
Temporary storage (where it is located and how it is conserved)		
Person identifying the fossil Name:		
Contact:		

Recorder Name:		
Contact:		
Photographer Name:		
Contact:		

## Appendix N: Traffic Management Plan

### 1. OBJECTIVE

The objective of the traffic management plan is the prevention of incidents from the use of vehicles and disturbance of local traffic on public roads during the construction, operation, rehabilitation and decommissioning phases of the proposed projects. This Plan has been prepared to enable the Contractor and developer to identify and implement all legal and best practice requirements in respect of the management of traffic associated with the project. The purpose of the Plan is to ensure that traffic management (and management of vehicles and equipment in respect of the Project) is undertaken in a safe and efficient manner. As such, the management of traffic in terms of this plan is intended to avoid and minimise traffic risks to (and impacts on) the health and safety of the local community and any personnel on site during the Project, under both routine and non-routine circumstances. The requirements of this Plan shall apply to all construction personnel including any Sub-contractor appointed to provide vehicles, machinery or drivers for the Project.

### 2. TARGETS:

To ensure compliance with the national traffic laws, local authority by laws and any other statutory requirements relating to traffic management.

### 3. TRAFFIC MANAGEMENT PLAN IMPLEMENTATION

#### 3.1 Traffic Volumes

- a) Traffic volumes are most likely to increase during the construction phase. However, due to the remote location of the site, and the low volume of traffic on public roads in the area the impact is expected to be low.
- b) Avoid construction vehicles movement on public roads during peak traffic times (06:00 – 09:00 and 16:00 – 19:00).
- c) Limit use of private cars by arranging mini bus transport service for workers;

#### 3.2 Licensing, roads and Maintenance

The Contractor must ensure that

- a) All Project vehicles comply with relevant traffic and transport licencing requirements (such as with regard to licencing requirements relating to the transportation of over-sized loads or hazardous materials, including hazardous waste).
- b) All drivers of vehicles used during the Project shall have the requisite licences to operate any vehicle (or machinery) operated by them on Site or on any public roads.
- c) All Project vehicles shall have valid roadworthy certificates and licences
- d) Existing road infrastructure must be used, wherever possible for providing access to the wind energy facility
- e) In so far as new roads are required to be constructed near water resources (including drainage lines), the following requirements are applicable:
  - Provision must be made for fauna (such as toads) to pass under roads (for example, through the use of culverts);
  - Bridge design must be such that it minimises impacts on riparian areas and must be permeable;
  - Culverts must be designed so as to allow free flow of water and must be maintained in good working order.
  - Hard road surfaces must be kept as narrow as possible.
- f) All vehicles and machinery used during the Project shall be regularly maintained and repaired where necessary. In this regard, all construction and passenger vehicles used during the Project shall be inspected by an appropriately qualified mechanic regularly as required following the commencement of the Project. The Project Managers shall ensure that regular inspections are undertaken of construction and passenger vehicles



to ensure that they are in good working order and are not overloaded. Site-specific traffic plan to be developed and implemented during the detailed design phase prior to construction.

- g) Limit dust generation by applying dust suppressants (eg spraying with water) and postponing dust generating activities during period of strong winds and enforcing a strict speed limit of 40 km/h on unpaved roads.
- h) Maintain the pre-construction condition of public roads being utilised by construction vehicles. Preconstruction condition of roads should be supported by photographic evidence for record-keeping.
- i) In the event that the condition of public roads being used by construction vehicles are significantly degraded due to use, the developer should restore road condition to its pre-construction condition
- j) Use only well trained, suitably qualified and experienced drivers in possession of an appropriate and valid driver's license;

### 3.3 Traffic routing, speed limits and signage

- a) The movement of all vehicles to and from Site shall be along designated public roads and site access roads. The most appropriate route for large Project vehicles (such as trucks and buses) transporting equipment, materials and employees (along public roads) to and from the Site must be determined in consultation with the local Municipality, local road traffic authorities and the local community. A copy of the approved routes must be maintained on Site together with this Plan
- b) Strictly regulate speed limit of construction vehicles in all construction areas.
- c) Implement clear and visible signalling to indicate the movement of vehicles and when turning onto or off access roads to ensure safe access to and from the site. Clear and visible signage must be placed on and around site, clearly demarcating safe entry and exit points;
- d) Demarcate and strictly control parking areas so that vehicles are limited to specific areas only;

### 3.4 Authorisation relating to the transportation of abnormal loads

- a) The NRTA and associated regulations prescribe the permissible vehicle dimensions and masses of vehicles travelling on public roads. Where vehicles will exceed these requirements and where the load cannot be dismantled without significant cost / effort, it must be classified as an abnormal load and an exemption must be obtained in terms of section 81 of the NRTA.
- e) According to the EPC Heads of Terms all transport permits will be obtained by the Contractor. This must be clearly indicated in the Contract.
- f) Obtain permits from relevant administrative authority in the event of abnormal load transportation to and from site.
- g) Monitor for overloading of vehicles;
- h) Require all drivers to abide by standard road and safety procedures on site;
- i) When travelling on public roads all speed limits and rules of the road must be adhered to; and

### 3.5 Monitoring actions to be conducted by the ECO

- a) Maintain incidents / complaints register for community complaints;
- b) Monitor dust generation and implementation of management actions detailed above.
- c) A copy of this Plan must be maintained on site by the ECO and all employees working at the site. Sub-contractors must be trained to ensure compliance with this Plan.

## 3.6 Pedestrian And Passenger Safety

### 3.6.1 Employees

All contractor and developer personnel transported to and from the Site shall be safely accommodated in appropriate passenger vehicles. No employee shall be transported on the back of open trucks. The Construction Safety Officer must ensure that this requirement is adhered to at all times.

All vehicles transporting employees must be appropriately maintained and not carry more passengers than the number of persons for whom seating accommodation is provided.

Assembly points for passengers embarking passenger vehicles must be located a safe distance from areas/routes of high vehicle traffic. Roads and areas used by construction vehicles shall, as far as possible be avoided by all personnel. Designated pedestrian routes shall be demarcated where appropriate.

Vehicle and pedestrian safety shall be emphasised in the Safety Induction Training required to be provided by the Contractor. All employees and construction personnel shall be trained and informed as to the dangers and risks posed by construction and other traffic, such training shall also include appropriate precautionary measures required to be undertaken to facilitate safe and efficient traffic management (e.g. checking for traffic before crossing roadways and utilising designated pedestrian routes). Drivers shall be adequately trained in the recognition and avoidance of road hazards, vehicle maintenance and safety

### 3.6.2 Stakeholder Engagement

The traffic safety procedures, transport routes and construction schedules intended to be applied during the construction phase shall be finalised in consultation with members of the local community, the local authority and affected landowners prior to the commencement of construction activities. The scope of such engagement should include the designation of routes for construction vehicles, procedures for complaints and emergency procedures shall be concluded in consultation with local community members, affected land owners and local emergency and traffic authorities.

In this regard, appropriate measures shall be taken to ensure that:

- The routes used by construction vehicles (as far as possible) avoid areas of high pedestrian traffic;
- adequate signage is used to warn local community members of hazards (e.g. site access, construction vehicles turning);
- information dissemination and awareness is conducted to inform community members of increased traffic risks and appropriate precautionary measures; and
- community members are aware of the Contractors' construction (and delivery) schedules.

## 3.7 Emergency Responses And Reporting Of Hazards

Prior to the commencement of the Project, local emergency services (ambulance and medical services, police and fire and rescue) must be consulted by the contractor in relation to the availability of emergency services to attend to road accidents associated with the Project. In the event that any traffic hazard is identified on Site by any person or Project personnel, such hazard shall be immediately reported to the Site Manager who shall take the appropriate measures to avoid an incident or accident being caused.

Drivers of project vehicles will be required to undertake first aid training and all project vehicles shall carry first aid supplies which should be adequate to cater for the number of passengers carried on the vehicle in question. In the event that an accident occurs on-site or off-site, the on-site emergency procedure must be followed. In the event that an accident occurs off-site, it shall immediately be reported to the relevant emergency service providers by the driver, and in the event that the driver is incapacitated, by any other passenger on such vehicle.

### 3.8 Review of This Management Plan

This Plan shall be reviewed periodically during the life time of the Project to facilitate on going and effective management of traffic.

## APPENDIX D: BAT MANAGEMENT PLAN

The first two years of a WEFs operation are the most important period in which to collect post-construction information because this is when any change in bat activity is likely to occur. Two years will also allow for interannual variation in activity and fatality to be captured, contributing to a greater understanding of impact and risk. A minimum of two years' operational monitoring must be undertaken but impacts should continue to be monitored and assessed throughout the lifespan of the facility in consultation with a suitably qualified bat specialist.

Fatality monitoring results should allow comparisons with other WEFs and provide a basis for determining if operational changes or other mitigation measures at the WEF are appropriate. Therefore, search protocols should be standardised to the greatest extent practicable and they should include methods for adequately accounting for sampling biases (e.g. searcher efficiency, scavenger removal of carcasses, density-weighted proportion of searchable area). Operational monitoring is divided into two parallel phases described below: 1) Acoustic Monitoring and 2) Carcass Searches.

### **APPENDIX 1 – MINIMUM REQUIREMENTS FOR OPERATION BAT MONITORING SUMMARY** (as per the South African Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy Facilities, 2<sup>nd</sup> Editions, June 2020).

- A minimum of two years of operational monitoring is required (acoustic monitoring and carcass searches).
- Monitoring must be conducted again in year five, and every five years thereafter.
- Acoustic monitoring as per the pre-construction monitoring programme if acceptable or according to MacEwan et al. (2020b, or subsequent editions). At least one ultrasonic microphone should be installed within rotor sweep height.
- The search interval must be twice a week initially to be updated using carcass removal rates by scavengers for the specific study area.
- All turbines must be searched according to the search interval for the first year. This can be reduced or adjusted in subsequent years based on the findings of the first year.
- The search plot must cover a radius around the turbine of at least half the distance from the maximum blade tip height to the ground. For example, if turbines blades extend 120 m from the tip to the ground (i.e. the top of the rotor swept zone), the search plot should extend 60 m in all directions.
- Transects within each plot should be spaced a maximum of 6 m apart yielding a search width of 3 m on either side of the transect line. This should be decreased in areas with low visibility.
- Field bias assessments should be conducted as often as possible, but a minimum of once per season is required, including at the start of the monitoring programme to set baselines.
- A minimum of 10 carcasses per visibility (and size) class should be used per season for each searcher or search team for the searcher efficiency trials.
- For each carcass removal trial, a minimum of 10 carcasses, evenly distributed across the visibility (and size) classes, should be used. No more than three carcasses should be placed at any particular search plot at any given time. The trial carcasses should be monitored every day until they have been completely removed or decomposed.
- GenEst (Simonis et al. 2018) or subsequent versions must be used to estimate bat fatality.
- If fatality minimisation strategies are implemented, the effectiveness of the strategies must be thoroughly tested by extending the initial monitoring period by an additional two years. Records of bat fatality and fatality estimates must be kept in a central database that can be accessed by various stakeholders to facilitate greater understanding of batwind energy impacts including cumulative impacts.
- One or more fatalities during a 12 month period of any frugivorous bats, conservation important or rare/ range-restricted bats listed in Table 3 should trigger mitigation."

To all insectivorous bat species not included in Table 3 below. The threshold applies to individual species killed annually per 10 ha and is based on values adjusted for biases such as searcher efficiency and carcass

persistence. One or more fatalities during a 12 month period of any frugivorous bats, conservation important or rare/ range restricted bats as listed In Table 3 should trigger mitigation.

Table 3: List of Bats where 1 Fatality per Annum should Trigger Mitigation (South African Bat Fatality Threshold Guidelines, Edition 2. October 2018)

Species Name	Common Name
<i>Cistugo lesueuri</i>	Lesueur's Hairy Bat
<i>Cistugo seabrae</i>	Angolan Hairy Bat
<i>Glaeotis percivali</i>	Short-eared Trident Bat
<i>Eidolon helvum</i>	African Straw-colored Fruit Bat
<i>Epomophorus wahlbergi</i>	Wahlberg's Epauletted Fruit Bat
<i>Kerivoula argentata</i>	Damara Woolly Bat
<i>Laephotis namibensis</i>	Namib Long-eared Bat
<i>Laephotis wintoni</i>	De Winton's Long-eared Bat
<i>Miniopterus fraterculus</i>	Lesser Long-fingered Bat
<i>Miniopterus inflatus</i>	Greater long-fingered bat
<i>Neoromicia rendalli</i>	Rendall's serotine
<i>Nycteris woodi</i>	Wood's Slit-faced Bat
<i>Otomops martiensseni</i>	Large-eared free-tailed Bat
<i>Rhinolophus blasii</i>	Peak-saddle Horseshoe Bat
<i>Rhinolophus capensis</i>	Cape Horseshoe Bat
<i>Rhinolophus cohenae</i>	Cohen's Horseshoe Bat
<i>Rhinolophus denti</i>	Dent's Horseshoe Bat
<i>Rhinolophus smithersi</i>	Smither's Horseshoe Bat
<i>Rhinolophus swinnyi</i>	Swinny's Horseshoe Bat
<i>Rousettus aegyptiacus</i>	Egyptian Fruit Bat
<i>Scotoecus albobfuscus</i>	Thomas' House Bat
<i>Scotophilus nigrata</i>	Giant Yellow House Bat
<i>Tadarida ventralis</i>	Giant Free-tailed Bat
<i>Taphozous perforatus</i>	Egyptian Tomb Bat

**EXAMPLE DATA SHEETS**

Information for each Search Plot

Site: \_\_\_\_\_

Date: \_\_\_\_\_

Searcher(s): \_\_\_\_\_

Turbine No.	Search Start Time	Search End Time	Start Point/Direction	No. of Bat Carcasses Found	Notes (weather, turbine maintenance etc.)

**Fatality Report Sheet**

Site Name:		Photo Number:	
Carcass ID No:		Searcher(s):	
Recovery Date:		Time Found:	
Turbine No:		Co-ordinates:	

**HABITAT INFORMATION (within a 3m radius around carcass)**Dominant Habitat                      Rocks  Bare Ground  Vegetation  Other: \_\_\_\_\_Visibility Class                      Easy  Moderate  Difficult  Very Difficult Slope                                      <25°  50°  >75° 

Distance from turbine base \_\_\_\_\_

Other Notes \_\_\_\_\_

**CARCASS INFORMATION**Live  Dead If Live                                      Euthanised  Released  Taken to Rehab Centre If Dead                                      Used for Field Bias Trials  Taken as Voucher 

Field Species ID \_\_\_\_\_

Sex    Male  Female  Unknown 

Describe obvious injuries \_\_\_\_\_

Evidence of Scavenging    Yes  No  Possible Scavengers \_\_\_\_\_Carcass Condition                      Fresh  Decomposing - early  Decomposing - late  Desiccated Infestation                                  None  Flies  Maggots  Ants  Beetles  Other:Estimated Time of Death    Previous Night  2-3 Days  4-7 Days  1-2 weeks  >2 weeks Eyes    Round/fluid filled  Dehydrated  Sunken  Empty 

Notes

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## **Procedure for Dealing with Live and Injured Bats**

The level of treatment and care offered to injured bats depends on the training, skill and motivation of the personnel involved. Training in all the techniques discussed below can be obtained from an experienced wildlife veterinarian or from specialist bat rehabilitators. Handling injured bats should not be attempted by untrained personnel. If there is no training offered, and little motivation to care, injured bats are best humanely euthanised and the bodies lodged with a museum so that the injuries and death may be recorded. However bats are intelligent and can learn: grounded bats treated and returned to the wild may learn to avoid turbines and thus safeguard future generations. Bats (live or dead) may not be handled except with the correct permits from the responsible provincial authorities. Live bats should be handled with soft, close-fitting, bite-proof gloves (gardening or pigskin gloves) and with a soft flannel or fleece cloth. All personnel handling live or dead bats should be fully inoculated against rabies. Although canine rabies has never been found in a bat in Africa, African bats may carry one of two Lyssaviruses which might infect humans. Accidental bites and scratches should be washed well with soap and water and treated with an iodine-based ointment. A medical professional should be consulted as soon as possible after such injury. Live bats should not be handled by inexperienced or untrained people.

**IT SHOULD BE IMPRESSED UPON ALL HANDLERS THAT BATS ARE INTELLIGENT AND SENTIENT MAMMALS AND HANDLING SHOULD BE ACCORDINGLY**

### **Assessment of Injuries**

#### **Rehydration**

Bats are best rehydrated with a subcutaneous injection of Lactated Ringer's solution. Many of the bats at highest risk of harm from wind turbines (e.g. Molossidae and Miniopteridae) do not drink free water and cannot be effectively rehydrated orally.

#### **Shock**

Shock can be treated with oral Rescue Remedy drops (available from chemists and supermarkets) or with Metacam® (Meloxicam) which is more effective but only available from veterinary professionals.

#### **Feeding**

Insect-eating bats can be fed mealworms (the best food for insect-eating bats but difficult to keep in field conditions), Whiskas® cat food (not a balanced diet and thus for short-term use only), and Nutrostim® (a high-calorie food supplement useful for Pipistrelles and Serotines). Fruit bats can be fed any soft, non-citrus fruit or Purity® Pear baby food.

#### **Euthanasia**

There is no simple way to euthanise bats in a field situation and the method used depends on the experience of the handler.

1. Halothane or Isoflurane are anaesthetics which are the method of choice for bat euthanasia. The bat is placed in a small container with the halothane and left until heartbeat has ceased. However halothane is a Schedule 5 drug, can only be obtained from a veterinarian, and evaporates unless correctly stored.
2. Cervical dislocation, stunning and decapitation should only be used by experienced handlers and as a last resort. Brain activity may persist for 13 seconds or more after decapitation and the skull may be damaged too badly for correct identification.



## Classification and Assessment of Injuries with Recommended Option for Providing Care to Bats

Level of injury	Descriptions	Care Needed
Level 1	No obvious injuries, no blood or broken bones visible. Dehydration, shock. Bruises where bat can fold and move wings. Holes in wing membranes where trailing edge is intact.	Field care. Treat for dehydration and shock. Release same day
Level 2	No broken long bones (might be small breaks in phalanges) or blood visible. Bruises where bat cannot fold or move wings. Bat unwilling to fly.	Field care. Treat for dehydration and shock
Level 3	Broken long bones, tears through trailing edge of wings. Concussion	Specialist care. Treat for dehydration and shock
Level 4	Broken skull or jaw, spinal injuries where bat cannot move hind legs. Blood in mouth and nose indicating barotrauma injury.	Euthanise

**Procedure for Dealing with Dead Bats**

Dead bats which are not needed for field bias trials should always be lodged with a museum which can provide accurate species identification, cause of death, and long-term storage. Dead bats should be preserved with alcohol as formalin-preserved animals are harder to manipulate to determine the cause of death, and alcohol preservation is needed for genetic sampling. Dead bats can be frozen temporarily but need to be preserved in alcohol for transport and identification. Bats should be identified, measured, and weighed before being preserved. An identification label should be tied firmly to a leg. The following information must accompany all specimens:

- Date and time when carcass was located/found
- Collectors name and surname
- Locality in the following format: Province, District/Municipality, Town/Suburb, etc. (e.g. KwaZulu-Natal: uMkhanyakude District, Mtubatuba, Nkosi Mtuba Road)
- GPS locality<sup>3</sup>
- State of body (e.g. fresh, poor, badly decomposed)
- Any evidence of scavenging of the body (this may be important for noting bodily damage during autopsies)

The abdomen should be injected with 90 % ethanol to ensure that the internal organs are adequately preserved and can be sampled for genetic material at a later stage. The bat should then be placed in 70 % ethanol for at least three days to allow the tissues to be preserved. To prevent deterioration of the bodies during preservation the volume of alcohol should be more than three times the volume of the bodies.

Once preserved, the specimens can be drained of excess alcohol, wrapped in muslin cloth, and placed in appropriate packaging for transport. Carcasses should be packaged in strict accordance to UN3373 category B packing instructions - this includes leak-proof packaging,

and triplicate layering. Packages should be clearly marked "UN3373 category B – biological material for research purposes". Transportation of carcass material should follow International Air Transport Association (IATA) packing instruction 650 (for UN3373 material), on passenger and cargo aircraft and Cargo Aircraft only. The above also applies to consignments shipped via road freight. For further information on the packing requirements for UN3373 category B, please visit <https://apps.who.int/iris/bitstream/handle/10665/325884/WHO-WHE-CPI-2019.20-eng.pdf?ua=1>.

These requirements are subject to change. Please visit the World Health Organisation website to ensure compliance with the most recent guidelines. A declaration needs to be fixed to the outside of the package stating that IATA regulations have been followed prior to shipping the package. In accordance with the Convention of Biological Diversity – Nagoya Protocol, copies of all permits (scientific/collecting, export, import) must accompany the package or be provided in electronic format to the relevant receiving organisation. Packages can be couriered to either:

Dr L. Richards  
Durban Natural Science Museum (Research Section)  
151 K.E.Masinga Rd (corner Wyatt Rd)  
Durban, 4001

Dr T. Kearney  
Ditsong National Museum of Natural History  
432 Paul Kruger Street  
Pretoria, 0002