COMBINED MANAGEMENT PLANS FOR THE SUTHERLAND WIND ENERGY FACILITY (WEF) AND ASSOCIATED GRID CONNECTION

1. Open Space Management Plan
2. Invasive Species Management Plan
3. Plant Search and Rescue Plan
4. Rehabilitation Management Plan

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1. INTRODUCTION

1.1 Background

1.1.1 Open Space Management Plan

This document presents the **Open Space Management Plan** for the proposed construction of the Sutherland WEF and Grid Project near Sutherland in the Northern and Western Cape Provinces.

As part of the authorisation process, an Open Space Management Plan is required to be formulated. This is to ensure that an acceptable plan is in place before construction activities take place on site, and to ensure that the remaining natural and/or open space areas are ecologically managed during the operation of the WEF and Grid project.

An infrastructure footprint was provided for the purposes of compiling the Open Space Management Plan and is provided in Figure 1.1. Recommendations will be given to be included in the overall management plans (i.e., EMPrs).

The purpose of the management plan is to ensure that effective strategies are implemented in any areas of open space and with a framework for the management of natural and semi-natural areas within and adjacent to the proposed development site during the project's construction and operational phases.

The approved project includes a number of wind turbines, connecting roads, pylons, laydown areas and overhead powerline and buried cables to the project substation. After the construction phase has been completed, it will inform the additional rehabilitation (separate component of this report) for the project area (not excluding the surrounding undisturbed areas).

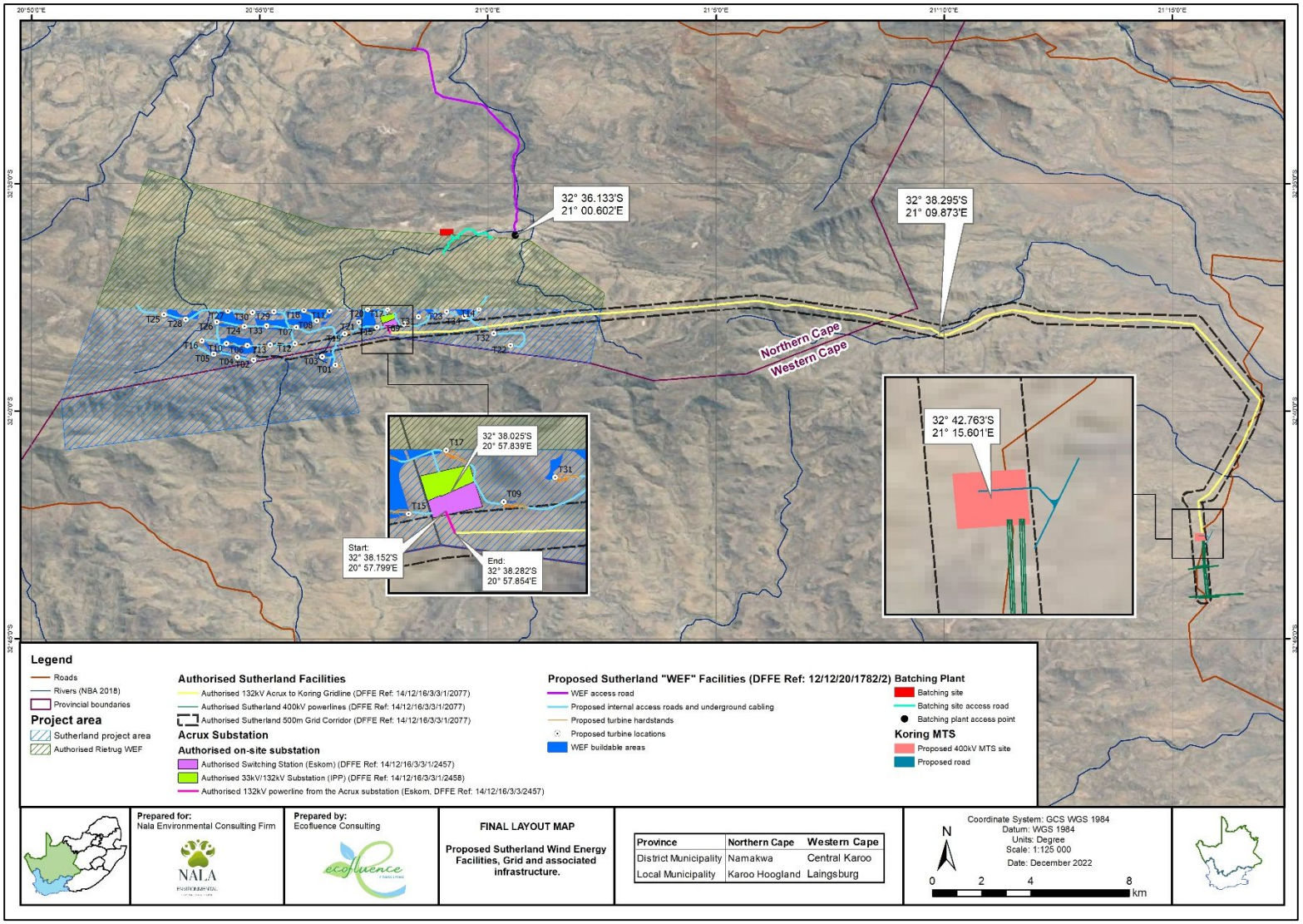

Figure 1.1. Authorised 140MW Sutherland Wind Energy Facility (WEF) and Grid Connection Infrastructure Layout

1.1.2 Invasive Species Plan

The **Invasive Species Plan** has been compiled according to the requirements of the Alien and Invasive Species Regulations, 2014, of the National Environmental Management: Biodiversity Act (Act 10 of 2004).

The format of this report is based on the document: "*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*". This document gives guidance on how the legal requirements must be applied and a template or standard format for reporting.

The **Regulations** on the management of listed alien and invasive species under the National Environmental Management: Biodiversity Act 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. In addition, the listed invasive species were published on 1 August 2014, as Government Notice No. 599 National Environmental Management: Biodiversity Act (10/2004): "*Alien and Invasive Species List, 2014*" and 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. These lists came into effect on 1 October 2014.

According to Section 75 of NEMBA, "*Control and eradication of listed invasive species*":

- 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.
- 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.
- The methods employed to control and eradicate a listed invasive species must 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.

According to NEMBA and the regulations published in Government Notices R506, R507, R508 and R509 of 2013, 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 Cat 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 Cat 3 plants to exist in riparian zones.

1.1.3 Plant Search and Rescue Plan

This document provides a management plan for the rescue of listed plants for the project area under the control of the project (Figure 1.1). This site-specific management plan address the requirement to rescue any plants that could reasonably be expected to survive transplanting from the area of the proposed construction. Currently, the site is in a mostly natural state, but this will be altered during the course of the development of the project, at which time various locations will be cleared of natural habitat in preparation for construction of components of the authorised project (WEF & Grid). Where possible, it is desirable to undertake rescue of suitable plant material. This will be determined after the final assessment (during spring) that will inform the permit applications. This survey will then determine the plants to be rescued and replanted near its current position.

The purpose of the Plant Rescue Plan is:

- To provide practical guidance on search and rescue of threatened or protected plant species (TOPS), as well as any other plants that can be used in the rehabilitation process.

The objective is to identify, remove and, where possible, rescue or relocate species of concern and other species, as discussed. The area to which this plan refers is the footprint areas of the project within the study area (Figure 1.1).

The question that arises is if there are any ecological principles for plant rescue in the natural environment? Many specialists consider this action as a last resort to conserve individual plants once authorisation for a project was granted and the development has been obtained and construction is about to take place. In the area earmarked for the WEF project area and grid corridor, it is clear that the vegetation within these project areas will be modified.

The question must be asked, will this significantly result in a loss of vegetation, habitat and plant species diversity, genetic variation and ecological interrelationships? (Conant, 1988; Griffith et al., 1989; Cook, 2020). According to the authors, one must then determine if the activity will rescue all plants of concern and the answer will be negative. The proposed rescue activity will only identify a small portion of the species of concern and this is related to two factors, firstly, different species appear at different times after rain events and some species will almost certainly be dormant at the time of the “Search and Rescue” and secondly, there may be practical limitations of how much plant material can be salvaged (Conant, 1988; Cook 2020).

It has been acknowledged by experts around the world that the selection of plants to rescue is based on criteria that may have little to do with conservation, for example, ease of access, horticultural value and probability of survival (Cook, 2020). **For this project, one must consider the environment where the plants occur and what the possible survival rate will be if they are removed and replanted on or near the site.**

Many specialists are of the opinion, and it is an accepted fact, that many of the rescued plants may not thrive or survive when moved out of its specific habitat. It must be noted that very little (if any) research or experimentation was done with very rare plants to determine under what conditions removal and replanting will ensure high survival, especially in artificial conditions (e.g. in a garden, hot house or other facility). If plants are removed and replanted near the place of origin, one must ask

what the survival rate will be? In the specific habitat of this project, removal will lead to damage to the plants embedded in the rocky substrate. After replanting, the dry conditions will further impact on the stressed plants and this may result in very low success rate of survival.

Various agencies globally (e.g. IUCN) (IUCN, 2000) and nationally (e.g. SANBI) have expressed concern regarding the concept of plant rescue. The concern is that the implementation of a plant search and rescue activity can weaken support for habitat conservation by fostering the perception that rescuing selected plants can compensate for destruction of an entire habitat, or that landscape plantings can substitute for natural areas (Cook, 2020). The proposed project area was modified over decades of intensive grazing that has impacted on the species diversity of the natural vegetation. In addition, the recent long drought will further impact on the natural vegetation's recovery ability.

With this in mind, it is clear that a plant rescue programme can divert time, energy, resources and leadership from tasks that may be more effective in protecting natural habitats. **Where applicable, it is possible to use plants for rehabilitation of affected areas, thereby restoring something resembling the natural vegetation. This will be achieved when large numbers of plants can be effectively, and with a high survival guaranteed, translocated. The rescued plants can then be used for landscaping or rehabilitating areas adjacent to modified areas (Cook, 2020).**

1.1.4 Rehabilitation Plan

The **Rehabilitation Plan** for the proposed project (Figure 1.1) will form part of the EMPr. This is to ensure that an acceptable plan is in place before construction activities take place on site and to ensure that affected areas are adequately rehabilitated in accordance with the sustainability principles of Integrated Environmental Management, promoted by the National Environmental Management Act (Act No. 107 of 1998) (NEMA). **This report associated with the vegetation of the area must be read with the aquatic rehabilitation plan (close interaction in the components).**

Recommendations relating to rehabilitation will be provided with regards to the final design of the WEF and the associated infrastructure (including grid connection infrastructure).

The site contains natural vegetation with moderate to high biodiversity value and is currently used for live-stock grazing purposes. The **purpose of the vegetation rehabilitation plan is to ensure that any areas that will be cleared of vegetation or that will be impacted in some way by construction activities on site are rehabilitated in such a way as to achieve the following:**

- **Return disturbed areas to an acceptable state.**
- **Re-establish vegetation cover with suitable plant species so that remaining biodiversity features and prior land-use options are not compromised.**
- **Reduce the risk of soil erosion in order to achieve long-term stability of the landscape.**
- **Prevent alien plant invasion on site.**
- **Restore ecosystem function to areas that are rehabilitated.**
- **Ensure that all areas are free-draining and non-polluting.**

1.2 Proposed activities on site

This section provides an outline of the proposed activities on site, in terms of the likely impacts expected from different project components. The purpose is to provide an indication of the type of rehabilitation activities that will be required.

1.2.1 Project components

The main infrastructure components to be constructed are as follows:

- Wind Energy Facility (WEF) with associated wind turbines and hardstands
- On-site substations with its associated overhead power lines and subterranean cables
- Koring Main Transmission Substation (MTS)
- Operation and Maintenance (O&M) buildings for use during the operational phase
- Temporary infrastructure – e.g. storage
- Access road – link from the R354
- Fencing and lighting for safety

1.2.2 Activities during pre-construction and construction phases

Various activities that may have an effect on the environment expected to be undertaken during the pre-construction and construction phases of the project, are as follows:

- Delineation of servitudes, roads, turbine footprints and laydown areas, including individual infrastructure components.
- Establishment of contractor camps, site offices, change-rooms, workshops, vehicle parking, ablutions, material storage areas, waste storage areas, etc. (if on the property in question).
- Establishment of security measures for construction activities, including fencing and lighting for contractor's operational areas.
- Transportation of equipment and machinery to the construction site locations.
- Limited removal of surface vegetation at the sites of proposed infrastructure components.
    - Recommend no removal of the basal layer – refer to 2.1.1.3.
- Stripping and stockpiling of topsoil and subsoil to a stockpile for later use for rehabilitation and landscaping.
- Grading and earthworks along the access road construction footprint.
- Sourcing of construction material.
- Construction and commissioning of the WEF according to the agreed programme.
- Development of construction environmental procedures.
- Erosion control and pollution control.
- Site rehabilitation following construction, of areas that have been disturbed and are not part of the ongoing operational phase of the proposed WEF; and
- Monitoring and maintenance of rehabilitated areas.

1.3 Current status of habitat on site

This section provides an outline of the existing status of the site (WEF and associated grid connection) with respect to natural vegetation. The purpose is to provide a context for the rehabilitation plan. The full discussion can be read in the full "Biological Assessment Report".

1.3.1 Ecosystem context

The study area falls within the **Roggeveld Shale Renosterveld** (FRs 3), with the **Roggeveld Karoo** (SKt 3) to the north and the **Central Mountain Shale Renosterveld** (FRs 5) on the escarp to the south (Figure 3.1) (Mucina and Rutherford, 2006).

According to Mucina and Rutherford (2006), the Roggeveld Shale Renosterveld (FRs 3) comprises of an undulating, slightly sloping plateau landscape, with low hills and broad shallow valleys (sandy soils).

The natural vegetation is characterised by the moderately tall shrublands which is dominated by *Elytropappus rhinocerotis* and the moister and rocky habitats, support a rich geophytic flora.

The vegetation unit is considered as Least Threatened with a conservation target of 27%, but no portions are conserved in statutory or private conservation areas. Only a small part has been transformed (1%), but local overgrazing presents a high risk. When looking at the broad climatic patterns, it is noted that the rainfall is evenly distributed throughout the year, with a slight peak in March (varying between 180 mm and 430 mm). The mean daily maximum and minimum temperatures ranges between 29.3°C and 0.2°C for January and July with a high frost incidence of 30 to 70 days per year (Mucina and Rutherford, 2006) with snow a regular feature.

2. MANAGEMENT PLANS

2.1 Open Space Management

2.1.1 Relationship to other management plans

The goal of the **Open Space Management Plan** is to ensure biodiversity compatible management of the site is achieved. Therefore, this plan can't be considered independently of the other environmental management plans and should be aligned with the Storm Water Management Plan (which specifies erosion management), the Rehabilitation Management Plan and the Alien Invasive Management Plan.

2.1.1.1 Access control

- Access to the facility should be strictly controlled and all visitors and contractors should be required to sign in before entering the premises.
- Signage should be placed at the entrance of the project site to indicate that disturbance of the fauna and flora species is strictly prohibited.
- No hunting, collection or disturbance of the fauna and the floral species are allowed, unless required for safe operation of the facility.
    - The exception is for the rescue of protected plants, and therefore the appropriate permits are needed.
- No driving off the demarcated roads or footprint areas for the turbines, its laydown areas and substations are permitted – no exceptions can be permitted.
- Restricted areas are off-limits, except for specific management purposes.
- Driving during wet conditions should be limited and only light vehicles should be allowed under these conditions, until the area has dried sufficiently to limit damage to the environment.

2.1.1.2 Fire management

Fires are not a regular occurrence in the area and therefore, no fires are permitted on the construction sites. However, fires may occasionally occur under certain circumstances. Ignition risk sources in the immediate area include:

- Lightning strikes
- Personnel within the facility
- Infrastructure, such as transmission lines

The following fire-management activities should take place:

- The contactor must ensure that the appropriate equipment and trained personnel are available to combat fires.
    - The Contractor shall ensure that the employees are aware of the procedure to follow in the event of a fire.
- Extensive firebreaks are not recommended as a fire management strategy.
    - The service roads within and around the facility will serve to break up the connectivity of the vegetation and serve as the firebreak which would retard the spread of fire around the site.
- The reduction of the biomass within the facility would be through the use of the livestock grazing - the continued use of the land by the owner for his agri-business.
    - The inputs on a seasonal basis from the landowner must be done, as his inputs into the grazing rotational system will be important.
- Additional fire management should be according to national legislation related to fire protection and Fire Management Agencies and in co-operation with measures in place by the landowner and Eskom (transmission powerlines), for example required fire-breaks.

2.1.1.3 Ecological process areas

To ensure the protection of ecological process areas, the following mitigation measures are recommended:

- All work undertaken during the construction and operational phases of the project shall be within the boundaries/footprints of the different areas (e.g. turbine positions, roads and substations).
- A "no-go" area shall extend outside the defined footprint areas.
- **It is recommended that clearing of vegetation should be limited to trees only that interfere within the approved footprints of all activities.**
- **By maintaining the basal layer, it will lower the risk of erosion, lower the exposed areas being infested by alien invasive plants and potentially result in a quicker recovery after construction.**
- Travel must be limited at all times – unnecessary travelling must be avoided.
    - It is recommended that a single entry/exit road must be used at all times.
    - Access roads approved for the final layout must be the only roads used during the construction phase, including the preparation for the construction of the turbines.
- No equipment associated with earthworks shall be allowed outside of the working area and defined access and construction roads or within "no-go" areas, unless expressly permitted by the Environmental Control Officer (ECO)/Engineer (only under very extreme conditions).
    - Immediate rehabilitation and remediation must take place in these exceptional cases.

2.1.1.4 Prohibited activities

The following activities should not be permitted by anyone expect the landowner or his representatives:

- No fires are to be allowed on the property
- No hunting, collecting or disturbance of fauna and flora.
- No domestic pets or livestock of contractors are permitted on site.
- No driving off any demarcated roads (i.e. poles to demarcated roads).
- No interfering with livestock.

- No use (e.g. swimming or washing of clothes or machinery) of any natural water resources
- No marking, painting or other forms of damage to any natural features (e.g. rock formations).

2.1.1.5 Monitoring programme

Throughout the lifecycle of the development, regular monitoring and adaptive management must be in place to detect any new degradation of the open/rehabilitated areas. During the construction phase, the ECO and contractor will be responsible for initiating and maintaining a suitable monitoring system. Once the development is operational, the project company will need to identify a suitable entity that will be able to take over and maintain the monitoring cycle and initiate adaptive management as soon as it is required. Monitoring personnel must be adequately trained.

Note: **Monitoring requirements of the Alien Invasive Management Plan and Rehabilitation Management Plan are also applicable, but are not repeated here.**

2.1.1.6 Concluding remarks

The information in this document is intended to provide various options that can be adapted for specific situations on the ground. The exact approach adopted for management is dependent on local conditions and situations, and is not meant to adhere strictly to a formula. The experience of the ECO and the construction crew are important for ensuring that a successful open space management programme is implemented. It is recommended that **bi-annual audits are conducted by the specialists** to assist with the programmes.

2.2 Alien Invasive Management Plan - conceptual guidelines for determining priority species and areas for control

In order to accurately identify and prioritise alien vegetation species for removal and control and to delineate subsequent management units, the invasiveness of a plant species must be assessed.

2.2.1 Factors that affect the risk of a species becoming invasive

There are a number of factors to take into account when evaluating the potential risk of an invasive species:

- The impact on ecosystem processes and system-wide parameters,
- The impact on community structure,
- The impact on community composition,
- The impact on individual native species,
- The conservation value and/or significance of ecological communities and native species threatened by the invasive species,
- The current range size of the invasive species,
- The proportion of the current range where the invasive species is negatively impacting biodiversity,
- The proportion of a region's biogeographical units that are invaded by the species,
- The diversity of habitats or ecological systems invaded by the invasive species,
- The current trend in total range of the invasive species (expanding, contracting or stable),
- The proportion of the current range currently occupied,
- The long-distance dispersal potential of the invasive species,
- The local range expansion or change in abundance,
- Inherent ability to invade native habitat,
- Similar habitats invaded elsewhere,
- Reproductive characteristics of invasive species,
- General difficulty in managing the species,

- Minimum time commitment for management of the species,
- Impacts of the management programme on native species and habitats and
- Accessibility of invaded areas.

These factors, taken in combination, provide some indication of the current and future potential invasiveness of a species, and thus the extent to which individual invasive species should be prioritized for management.

2.2.2 Conceptual phases in the invasion of a weed

The biological characteristics of an invasive species and its ability to spread are determined by population processes that may occur over extended periods of time and which may not be immediately evident at any single point in time. These relate to the ability of a species to become established and then to become increasingly invasive. Plants may follow a number of patterns in time and space, depending on such factors as its means of dispersal, life cycle, longevity, size, fecundity, and so on. Many follow a simplified 'S' shaped pattern (Figure 1.2, solid line) that can be illustrated graphically as the proportion of all potential habitat occupied by the pest at any point in time.

The essential features are a long tail at the beginning of a species spread as it crosses the first series of barriers, a steep rise as it breaks through these barriers and finds suitable habitats, and then a flattening off as these habitats are saturated. As the plant spreads, the proportion of the un-infested habitat declines at a rate defined by a 'reverse S' (Figure 1.3, dotted line). The process of spread may be continuous, but points are still recognisable (usually only with hindsight) where the rate of change alters markedly from the preceding period. For management purposes, the 'S' shape can be idealised as stages based on the extent and rate of spread. This concept can be applied at any geographic scale, from a field to a continent.

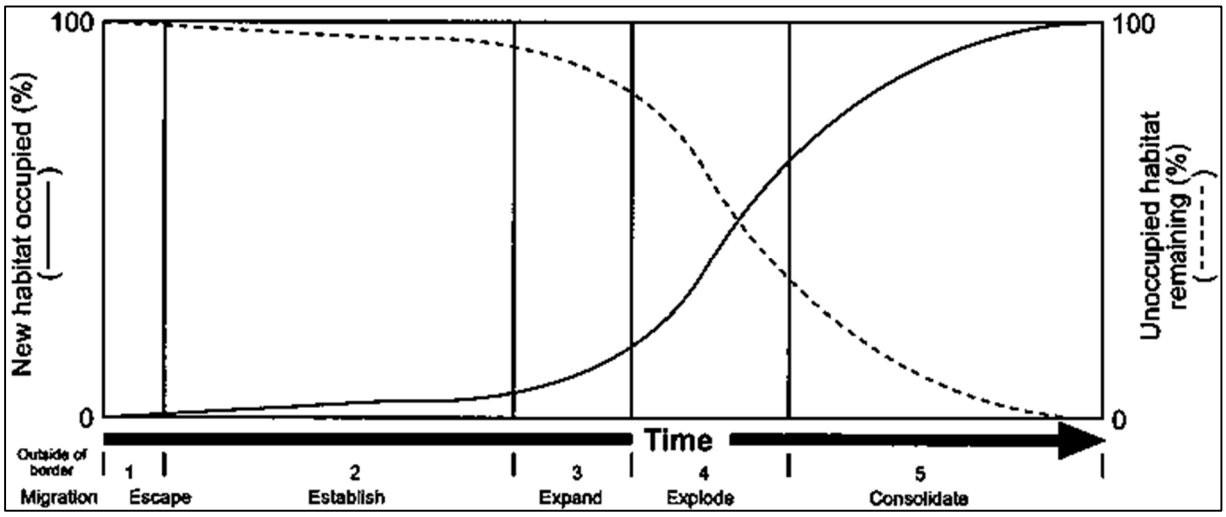

Figure 1.2: Conceptual phases in the invasion of a weed through time, and the way these relate to the percentage of occupied and unoccupied land (from Williams, 1997).

2.2.2.1 Migration phase

The species must first reach the border of the area. Once it has arrived it may, or may not, enter, depending on a variety of factors. Where there are efficient quarantine protocols and risk management procedures it will be detected and, it is hoped, eliminated before it becomes problematic to control.

2.2.2.2 Escape phase

Once inside the area it may escape only occasionally, or finally become fully naturalised. The locations of these naturalisation points are likely to be associated with the pathway of introduction, e.g. in fields planted with contaminated corn, or adjacent to erosion-control plantings. They have been referred to as “sentinel sites”.

2.2.2.3 Establishment phase

During this phase, the plant is able to reproduce in the new environment and population numbers slowly build up. Virtually all potential habitat is still uninfected.

2.2.2.4 Expansion phase

Eventually, the number of sites infected expands beyond the initial loci. Expansion is fastest where there are multiple loci. The causes of this expansion differ among species and are not well documented. Factors are diverse, including particularly favourable growing seasons, the arrival of new pollinators or dispersers and the species becoming adapted to its new environment by the formation of new genotypes. New habitats may be created, e.g. by changes in land use. Some local areas of habitat are noticeably infested, but most potential habitat is un-infested. It is often only at this stage that the plant begins to be perceived as a pest.

2.2.2.5 Explosion phase

The period where the pest expands rapidly and often where it begins to attract official concern. Many potential habitats are infested during this phase.

2.2.2.6 Entrenchment phase

The pest slowly spreads to the last remaining habitats over its full range within the area. This does not mean that it occurs on all suitable land at any one time, but that it has a high chance of occurring there. Further spread can occur only if more suitable habitat is created, e.g. by fire. Importantly, the pest may be present only in a dormant stage of its life cycle.

2.2.3 Implications for management of invasive species

These potential changes in the spread of a pest have implications for weed-risk assessment imperatives:

- The most cost-effective means of avoiding pest impacts is to prevent their introduction or establishment in an area. Failing that, the greatest return for expenditure of money and effort comes from controlling a pest before it has spread.
- Once it has established and begun to spread, the ongoing effort required to eliminate it increases dramatically.
- During the earliest spread phases, when the required funds to extirpate a pest are low, these may be effectively obtained as an adjunct to other pest control programmes. Once the pests begin to spread rapidly, the effort required to obtain the funds may be orders of magnitude greater.
- Effective weed-risk assessment systems must be appropriate to:
    - Whether or not a pest has established and spread;
    - The pest’s biology and ecology;
    - The values being threatened;
    - The extent to which it has have or has not established in an area; and
    - The technologies and resources available.

2.2.4 Procedure for removal of invasive species

There are four steps in developing a procedure to remove alien plants from a site, as follows:

- Determine which species occur on site, map their occurrence and density;
- Decide on priority species and areas to control and determine costs associated with this control;

- Undertake clearing; and
- Follow-up with ongoing clearing of re-emergence and monitor success.

2.2.5 General guidelines

There are various overall strategies to be taken into consideration in compiling an eradication programme. These include the following:

- Controlling alien invasive species, although a legal requirement, is usually a means to achieving a higher goal, such as protecting biodiversity, rehabilitating disturbed areas, restoring ecological functionality, preventing economic loss, protection of human health, etc. Alien invasive clearing should therefore be aligned with the broader biodiversity targets and strategy for the project.
- Different species require different control methods.
- It is important to break the reproductive cycle of a species.
- There should always be follow-up of clearing to prevent invasive species from becoming re-established in areas that were previously cleared.
- The size of the area being cleared should always be manageable.
- In principle, start in the least-invaded areas and work towards the heavier infestations. This will make it possible to safeguard relatively large areas of natural habitat.
- Clearing should always start at the highest point in the landscape and work downwards.
- Cover any exposed soil with plant material, but ensure that this is free of seeds of the invasive species or other propagules.
- If possible, try to clear plants before they produce seeds by cutting them back before they flower.
- Do not transport seeds, fruits, bulbs, tubers or stems that root easily from one site to another. It is best to burn material where it is cleared, if possible.
- Follow-up is essential. This is linked to ongoing monitoring to detect alien seedlings and remove them while they are easy to manage and also to progressively deplete the soil seed-bank.
- Rehabilitation or restoration of cleared areas is necessary to restore ecological functionality and to create conditions that are less favourable for invasive species.
- As alien invasive species impact on the condition of habitats and populations of species, their control or eradication, as appropriate, should be undertaken to increase the overall positive biodiversity footprint of the project, in line with an overall biodiversity strategy.

2.3 Ecological principles for plant rescue

Plant rescue is considered to be a last resort to conserve individual plants, when authorization for development has been obtained and construction is imminent. The ecosystem within the footprint of the development, with all its species diversity, genetic variation and ecological interrelationships will be lost and the objective is to salvage something prior to the destruction. Some considerations are as follows:

- Plant rescue can usually only salvage a small proportion of the plants on site. This is due to two main factors, firstly, the fact that different species appear at different times and some species will almost certainly be dormant at the time that the Search and Rescue is undertaken, and secondly, there may be practical limitations in terms of how much plant material can be salvaged.
- Globally, it has been recognised that the selection of plants to rescue is based on criteria that may have little to do with conservation, for example, ease of access, horticultural value and probability of survival.

- Plants chosen for rescue may not thrive or even survive. It is highly unlikely that all rescued plants will survive. This is based on the fact that it is virtually impossible to predict without experimentation and research exactly what artificial conditions will be required for the management of each species in order to ensure survival.
- Various agencies globally (e.g. IUCN) and nationally (e.g. SANBI) have expressed concern regarding the concept of plant rescue. The concern is that the implementation of a plant Search and Rescue can weaken support for habitat conservation by fostering the perception that rescuing selected plants can compensate for destruction of an entire habitat, or that landscape plantings can substitute for natural areas.
- Plant rescue can divert time, energy, resources and leadership from tasks that may be more effective in protecting natural habitats.
- Plants can be used for rehabilitation of affected areas, thereby restoring something resembling the natural vegetation.
- It can also make a long-term contribution to public education by providing native plants for public gardens and nature centres.

2.3.1 Principles

In situ conservation is preferable to *ex situ* conservation. Removing a population from its natural habitat and placing it under artificial conditions results in the erosion of the inherent genetic diversity and characteristics of that species. This principle is very strongly emphasized on the SANBI websites "Guidelines for Environmental Impact Assessments" (www.redlist.sanbi.org/eiaguidelines.php) where the following is stated:

- "*In situ conservation is vital and should be recommended as the only option for conserving species of conservation concern. Ex situ conservation, i.e. the removal of a subpopulation from its natural habitat to an artificial environment, a practice often termed 'search and rescue', will result in the erosion of the inherent genetic diversity and characteristics of that species and increase its extinction risk in the wild. Similarly, translocation of subpopulations is an unacceptable conservation measure.*"

In order to ensure the persistence of a population, it is imperative that the ecological processes maintaining that population persist. This requires that natural habitats are maintained in an ecologically functional condition.

Translocation of Red List species is an unacceptable conservation measure, since the translocated species may have undesirable ecological effects, as follows:

- Alterations to habitat by translocated species may be harmful to other species.
- Translocations may lead to transmission of pathogens or parasites (Hodder & Bullock, 1997).
- Translocation may result in rapid changes in the species itself (Conant, 1988).
- Translocations are expensive and rarely successful (Griffith et al., 1989).
- Success entails not only survival of the translocated individuals but also establishment of a self-sustaining, viable population able to reproduce and adapt to changing environmental conditions (Milton et al., 1999).
- Relocation of rescued plants to undisturbed habitats falsifies the local history of natural dispersal and alters the natural species composition of the target site.
- Once again, this has been emphasized on the SANBI websites "Guidelines for Environmental Impact Assessments" (www.redlist.sanbi.org/eiaguidelines.php) where the following is stated:
    - *"Translocations are expensive and rarely successful. Even if they are successful, translocated individuals may harm other species within the receiving environment, the*

translocated individuals may transmit pathogens and/or parasites, and translocation may result in rapid changes in the species itself."

- "Search and Rescue" as a conservation ideal therefore contradicts principles espoused by the South African National Biodiversity Institute (SANBI) and IUCN.

The implications of these principles are as follows:

- It is highly preferable not to replant rescued plants into other natural habitats. Based on scientific evidence and concerns expressed by SANBI, translocation to an existing conservation area cannot be supported as a management measure.
- Rescued plants, if re-planted back in the wild, should be placed as close as possible to where they were originally removed. However, as stated in the previous paragraph, re-planting into natural areas is not supported as a management measure.
- Re-planting into the wild must cause as little disturbance and harm as possible to existing natural ecosystems. As stated in the previous paragraph, re-planting into natural areas is not supported as a management measure.
- **Rescue must be limited to only those areas where plants will be destroyed by the development. No plants should be removed from areas that will otherwise not be disturbed.**
- **Rescue should not be undertaken from any site where there is a significant risk that well-established invasive alien plants or other pests will be spread by the relocation of native plants.**
- **The solution would be for rescued plants to only be replanted into disturbed areas after construction for rehabilitation purposes.**

2.3.2 Planning considerations

The following factors affect planning of plant rescue:

- Adequate time must be allowed to obtain the necessary information about the site and its flora. This is usually achieved during the EIA stage and follow-up surveys. A detailed walk-through survey has already been undertaken for the current project. A reliable inventory of the plants found on a site is a key factor in determining whether a rescue is appropriate and, if it is, how the plants will be used. In general, **a rescue should not be undertaken if an appropriate use of the rescued plants is not ready at hand or easily found**. Where invasive alien species are present, which is not the case here, the numbers and concentrations must be known. If there are large concentrations of alien invasive species, this may rule out any rescue and limits the choice of relocation sites or eventual use of the rescued plants.
- There must be adequately qualified and equipped personnel to undertake a plant rescue. Personnel undertaking the rescue should have the knowledge and skills to ensure that the rescue operation is a success. A trained and qualified botanist is required to identify the species to be rescued, but horticultural skills are required for nursery establishment and for the actual planning and management of a nursery.
- In principle, rescued plants should be utilized for public benefit, not private gain. Acceptable uses are therefore replanting in rehabilitated areas, providing stock for propagation and providing plant material for a scientific project. Problematic uses are selling rescued plants to the public and providing plants for private gardens. This is because additional permits would be required for transport and trade of protected species. An incentive is also created to remove plants from the wild, which is not supported.
- Rescuing plants that are listed as protected under National or Provincial legislation is subject to requirements that cover the collection and use of whole plants, their progeny and plant parts, including seeds. A permit is required to possess, transport or propagate such species.

The general permit for removal of TOPS will cover these components. Any trader would be required to get their own permits.

- A priority for replanting is to maintain the ecological integrity of the target habitat. Appropriate target sites include a managed wildflower garden, such as a botanical garden, and an interpretative nature trail. Botanical gardens offer programs to help visitors identify and learn about native plants and can make it clear that plants have been rescued, not wild collected, especially for those species that are not commercially available. Inappropriate target sites are natural habitats in which ecological integrity is currently uncompromised.

2.3.3 Species of Conservation Concern (SCC) that occur on site

This section provides an outline of the existing status of the study area with respect to the occurrence of any Species of Conservation Concern (SCC) or any other plant species that are deemed worthy of rescue prior to construction. The purpose is to provide an indication of the identity of such species.

Although no SCC were observed by Botha (2021) or during the recent survey undertaken in 2022, the area has a rich variety of sensitive and protected species (33 species has been recorded previously) (refer to the Biodiversity Assessment report for more detail).

2.3.3.1 Protected plants (National Environmental Management: Biodiversity Act)

No plant species were found on site that are protected according to the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004).

2.3.3.2 Protected plants (Northern Cape Nature Conservation Act No. 9 of 2009)

Plant species protected under the Cape Nature and Environmental Conservation Ordinance 19 of 1974 are listed in Appendix 2.

The following protected genera and species were listed (Botha, 2021):

- All species of the Genus *Pelargonium (*Family*:* Geranaceae):
  - *Pelargonium abrotanifolium*
- All species of the family Mesembryanthemaceae:
  - *Stomatium suaveolens, S. difforme, Ruschia cradockensis, Mesembryanthemum nodiflorum, Antimima* spp. (prolongata?), *A. ivory, Drosanthemum hispidum* and *D. eburneum*
- All species of the genus *Colchicum* (Family: Colchicaceae):
  - *Colchicum eucomoides* and *Colchicum volutare*
- All species of the family Crassulaceae:
  - *Crassula columnaris, C. deltoidei* and *C. nudicaulis*
- All species of the family Iridaceae:
  - *Babiana cuneata*
- All species of the genus *Lachenalia* (no Hyacinthaceae):
  - *Lachenalia attenuata*
- All species of the Genus *Pectinaria* (Family: Apocynaceae):
  - *Pectinaria articulata*

The list of species recorded are listed in the Biodiversity assessment report.

2.3.3.3 Protected species not seen that may occur on site

The site is within an arid area with seasonal (summer) rainfall. There are a number of species, especially geophytes that are only visible under favourable environmental conditions and at particular times of the year. This is especially true of geophytes that often only emerge for a short period of time and are dormant for the remainder of the season, or even for extended periods of time. There are small herbaceous plants and that are locally rare, as well as being small and inconspicuous, that may occur at a site but are relatively invisible even to detailed searching in suitable habitats.

It is recommended that a full survey of the approved layout is conducted during the spring, when more of the species mentioned can be present. This survey must be undertaken prior to construction and/or site clearing related activities commencing. This survey of the approved layout with an additional risk assessment can then inform the necessary permit applications. These permits must be received before any construction can commence (including site clearing).

2.4 Proposed Rehabilitation Plan

The rehabilitation implementation strategy should form an integral part of site and construction activities. The ECO, who will be responsible for ensuring that the Rehabilitation Plan is implemented, must be appointed and on-site at project inception. This person should form an integral part of the project team. Regular consultation and audits from the specialists are recommended.

2.4.1 Potential constraints to successful rehabilitation

This section provides an outline of key risks and constraints to successful rehabilitation. These include the following:

- Scale of clearing;
- Climate seasonality;
- Weeds;
- Seed availability;
- Soil management;
- Landform stability;
- Ecosystem connectivity; and
- Ecosystem resilience.

2.4.2 Scale of clearing

The scale of clearing will be relatively extensive, but most of this will be within the proposed footprint areas, i.e. it will remain permanently cleared and will require rehabilitation prior to operation. The amount of rehabilitation that is required is relatively dispersed within this area and is associated with the laydown areas and temporary storage areas. The risks are therefore moderate due to the arid conditions on site.

- Surface plant material that is cleared during construction activities can be stockpiled and/or bagged to be used as mulch during rehabilitation. The main purpose of mulching is to protect and cover the soil surface and serve as a source of seed for re-vegetation purposes.
    - During local site clearing the standing vegetation should not be cleared and mixed with the soil, but should be cleared separately, either mechanically or by hand using a brush-cutter.
    - The cleared vegetation should be stockpiled and used whole or shredded to protect the soil in disturbed areas and promote the return of indigenous species.

        - It is reiterated that clearing of the basal layer must be limited to the minimum. Keeping the basal layer intact will contribute to the stability of soils and the regrowth of plants as part of the rehabilitation programme.
- Mulch is to be harvested from areas that are to be denuded of vegetation during construction activities (limited areas). No harvesting should take place outside the area to be disturbed by construction activities.
- Brush-cut mulch should be stored for as short a period as possible.
- Seed released from stockpiles should be collected for use in the rehabilitation process.

2.4.2.1 Climate seasonality

The project area is in an arid area but where rainfall is relatively predictable and strongly seasonal. However, as we have seen, the previous eight years was dominated by well below expected rainfall and can have significant constraints on successful rehabilitation. It is important to ensure that any seeding or planting that is required must be done at the onset of the rainy season and not in the dry summer period. As water is a scarce resource, irrigation during initial rehabilitation is not a viable option (extent of the area to be watered).

2.4.2.2 Weeds

The **area has very low incidence of weeds on site and none were observed during the survey in the footprint areas**. This does not exclude any species being present that may become evident during the wet seasons. The disturbed areas are most at risk for the weeds and invasive plants to establish as it provide the best conditions. The potential risks are considered to be low, but controllable with the rigorous implementation of an Alien Invasive Plant Management Plan.

2.4.2.3 Seed availability and collection

- Based on analysis of other nearby rehabilitated areas, it is recommended that some form of re-seeding is used to establish an initial vegetation cover. Indigenous seed is not commercially available for species on site.
- This mean that seed must be collected and prepared for germination. It is important to use material from the same area, as there may be some genetic differences in plants.
- The re-application of topsoil and cleared vegetation (as mulch) will be sufficient for rehabilitation at this site. However, the botanical specialist can collect indigenous seed to sow.
- Seed can be broadcast onto the soil but should preferably be applied in conjunction with measures to improve seedling survival, such as scarification of the soil surface, or simultaneous application of mulch. The following principles apply:
    - Indigenous seeds may be harvested for the purposes of re-vegetation in areas that are free of alien invasive plants, either at the site or prior to clearance of vegetation from suitable neighbouring sites.
    - Seed may be harvested by hand and dried or treated appropriately (specialist team to conduct the activities).

2.4.2.4 Soil management

Topsoil is arguably the single most important rehabilitation resource in the project area. Topsoil and subsoil that currently occurs in areas to be cleared must be recovered to be used in rehabilitation areas. Topsoil must be carefully managed and stockpiled to ensure that it does not become degraded. The success of this process is one of the biggest risks associated with successful rehabilitation of disturbed areas. It is important not to mix the topsoil with subsoil when stockpiling and soils must be spread within two to three months to ensure the seeds don't lose its viability. This imply that small

sections can be cleared and once construction is completed, the rehabilitation must commence immediately.

2.4.2.5 Landform stability

The existing slopes of the areas that will require rehabilitation varies from flat to gently and steep inclining. Particular attention will have to be paid to maintaining surface stability during the early stages of rehabilitation. Minimizing surface water runoff from any small catchment areas that currently exist or that will be created from construction activities will be an important strategy, especially when these occur at elevated points in the landscape. Possible strategies that can be employed include the following:

- Contouring topsoil to match the slope of the surrounding landscape.
- Spreading a thin layer of cleared vegetation debris from cleared areas over re-contoured topsoil; and
- Rapid re-instatement of soil into holes and trenches dug for infrastructure components.

2.4.2.6 Soil, wetland and vegetation management

The following soil, wetland and vegetation management measures are proposed to aid in limiting impacts, as well as to assist with successful rehabilitation:

- Soil must only be stripped from areas that are to be disturbed during construction or maintenance and not from any adjacent or other areas.
- Erosion control measures must be included in the design of infrastructure.
- Vehicles must be restricted to travelling only in designated roadways to limit the ecological footprint of the proposed development activities.
- All disturbed areas must be rehabilitated using stockpiled soils, as required.
- Ecologically sensitive areas must be rehabilitated where they have been damaged by construction activities.
- The extent of all local construction sites must be demarcated and no vegetation is to be removed outside of this zone.
- If vegetation is to be cleared on site, erosion control measures must be kept in place to ensure that excessive scarring of the landscape is limited.
- Adequate storm water management must be incorporated into the design of the project in order to prevent erosion.
- Stripping and clearing of vegetation must ideally be planned to be done during the dry season.
- Should any construction activities occur within a 1 in 100-year flood line or within 500 m of a watercourse, the relevant authorisation (either a General Authorisation or Water Use License) should be obtained according to the National Environmental Management Act (NEMA) (Act 107 of 1998) and Section 21 c and i of the National Water Act (Act 36 of 1998), respectively.
- No structures are to be constructed within the riparian areas or within the active stream channel as far as possible. If at all possible, all support structures should be developed above the 1:100-year flood line. Or, if that is not possible, above the 1:50 year flood line.
- Sensitive areas in the vicinity of construction works must be fenced for the duration of the construction phase and designated a ‘no-go’ area.

2.4.4.1 General considerations

- Progressive rehabilitation is an important element of the rehabilitation strategy and should be implemented where feasible. Rehabilitation of disturbed areas should therefore be carried out concurrently with construction, as far as possible. Current disturbed footprint areas must be kept to a minimum.

- Once re-vegetated, areas should be protected to prevent trampling and erosion.
- No construction equipment, vehicles or unauthorized persons should be allowed onto areas that have been re-vegetated.
- Any runnels, erosion channels or wash-aways developing after re-vegetation should be backfilled and consolidated to restore them back to a proper condition.
- Material removed from the excavation that is not suitable or not required for backfill may be spread evenly over the disturbed area. However, spreading of subsoil is not permitted.
- The local topography must be returned to as close to its original state as possible. If possible, sites should not be levelled.
- Where necessary, re-vegetation can take place using seed, rescued plant material, or mulching. Where the affected area is less than 1 m across, passive re-vegetation can be employed, where natural ecological processes are relied upon to promote vegetation growth, but it is preferable to actively restore vegetation cover, as this reduces the risk of erosion.
- Compacted ground must be rehabilitated by ripping to a minimum depth of 600 mm.
- Rock piles should be deployed in a heterogeneous way to mimic habitat variability on site.

3 MONITORING PROGRAMMES

3.1 Open Spaces Monitoring Programme

Throughout the lifecycle of the development, regular monitoring and adaptive management strategies must be in place to detect any new degradation of the open/rehabilitated areas (i.e. evaluation and auditing). During the construction phase, the ECO and contractor will be responsible for initiating and maintaining a suitable monitoring system. Once the development is operational, the project company will need to identify a suitable entity that will be able to take over and maintain the monitoring cycle and initiate adaptive management as soon as it is required. Monitoring personnel must be adequately trained.

It is recommended that the specialists are used for evaluation and auditing on a regular basis.

Note: **Monitoring requirements of the Alien Invasive Management Plan and Rehabilitation Management Plan are also applicable, but are not repeated here.**

3.1.1 Concluding remarks

The information in this document is intended to provide various options that can be adapted for specific situations on the ground. The exact approach adopted for management is dependent on local conditions and situations and is not meant to adhere strictly to a formula. The experience of the ECO and the construction crew are important for ensuring that a successful open space management programme is implemented.

3.2 Alien Plant Monitoring Programme

It is important to note that **there are currently no invasive plants present on the larger project site**. The exceptions are at the home steads, where alien plants (flowers, shrubs and trees) were planted over the years. To date, no escapees have been observed, but this does not mean that the *status quo* will be maintained.

With the expected increase of traffic into the natural areas on the properties, the opportunity for seeds being important from other areas are high. This will therefore require the implementation of a

monitoring programme to ensure that no alien species establish and invade the developed and natural habitat in the area.

Monitoring is a form of assessment that provides land managers with information essential to making well-informed management decisions. Monitoring should:

- Be conducted on a regular or systematic basis,
- Follow the trend over time of an indicator or variable of the resource compared to predetermined management objectives,
- Involve the collection of data by sampling the entire resource regularly.

Monitoring can play an essential role in managing invasive plants as it provides nonbiased information to make well-informed and timeously management decisions. Monitoring results can be used to demonstrate where management actions (e.g. control treatments) are effectively and successfully meeting invasive plant management objectives and to quickly detect and modify actions that are ineffective. Monitoring must be used to:

- Detect new populations of alien plants,
- Determine the status and temporal trends in population sizes and distributions over time (e.g. evaluate invasiveness),
- Determine effects of invasive plant species on biota and processes of the ecosystem,
- Measure success of restoration and revegetation projects,
- Measure success of best management practices that are meant to prevent the introduction and spread of invasive plants into and throughout a management area.

There are four types of invasive plant monitoring:

- Monitoring for early detection (primary activity for this project, as currently no alien plant species are present),
    - Early detection monitoring is implemented before unwanted species have arrived in an area.
    - It is the **most cost-effective monitoring** because when rapid eradication takes place, control efforts are minimal. The following factors are important:
        - It is aimed at finding species when they first appear in a management area.
        - It is performed on a systematic schedule; either a predetermined one (e.g., every two years) or one that is based on known events of vector transport of new species through pathways into new areas.
        - It is important to sample target areas using inventory/survey methods or using information from predictive models based on ecosystem attributes, species establishment characteristics, and vectors and pathways
        - It is important to record non-infested sites during each monitoring event.
        - Requires skilled field botanists to identify plant species.
        - It is recommended that specialists are used regularly to assist with surveys, assessments and auditing to ensure the *status quo* is maintained (i.e. no alien plants species in the area).
- Monitoring for the effect of management actions on target species of invasive plants,
- Monitoring for the effect of management actions on non-target species and the environment,
- Monitoring for the status and trends of target species populations.

If any species are found, the following will apply:

- **Immediate intervention from the specialists to evaluate the species of concern.**

- **The introduction of a plan to immediately attack the specific problem in order to stop the spread of the alien species.**
- **Regular follow-up assessments by the specialists.**

3.2.1 CONCLUSIONS

This Control Plan is an initial assessment and should be modified as control methods are activated and conditions related to new invasions change on site. This requires continuous input and monitoring, including periodic collection of field data in order to analyse the status of the site and the effectiveness of management interventions, notably in terms of improving habitat condition of priority management units. **This Control Plan should feed into the broader biodiversity strategy for the Sutherland WEF & Grid project.**

3.3 Plant Search and Rescue Plan

This section provides details on the actions that are required to rescue any TOPS and/or listed plant species from the footprint of the development and what (possible) steps to be taken to house the plants temporarily and then to plant it into suitable habitats.

In order to comply with legislation, a plant survey on the final approved layout of the proposed Sutherland WEF & Grid project must be conducted prior to construction and/or site clearing related activities commencing, to locate any red data or protected plants species within the final footprint (i.e. roads, turbine positions, laydown areas, substation and cable and power line corridors. **This must be done in the season when most of the plants will be active growing - i.e. spring**).

Once the extent of the species to be affected are known, a decision on rescue can be taken. If the species present are found to be “abundant” across the site, it can be recommended that it can be left intact in the development footprint.

This is linked to the recommendation to leave the basal layer of vegetation intact where possible, as this will maintain a seedbank and the subterranean geophytes to form a “seedbank” after construction is completed. This is also linked to the recommendation that all traffic must be limited during the construction phase and that single entry and exit routes must be strictly applied.

Most of the red data and protected species that may be present are unlikely to transplant easily and therefore rescue efforts are unlikely to be successful. **It is therefore recommended that a permit be obtained for their destruction prior to commencement of construction and no further steps taken to rescue any of these.**

3.3.1 Plant rescue activities recommended (if required)

Before construction commences at the site, the following actions must be taken:

Action	Responsible person
Collate information on potential species of concern Initial identification of all listed species that may occur within the project area (refer to 3.3)	Botanist
Mark footprint of proposed construction area The footprint of proposed development must be marked out prior to breaking ground. (It is assumed that this will follow a phased approach and that not all areas will be marked simultaneously. An example would be pegging out the route of a section of road to be	Contractor / Engineer / Developer

constructed prior to earth-moving equipment beginning work on construction but could also include provision of a GPS track or GIS polygon file that depicts the affected areas.)	
Species search and rescue Location and rescue of all plants to be rescued in the final approved footprint layout must be walked and marked (required species rescued).	Botanist
Plant marking and information requirements For all plants that are rescued, relevant information should be collected, as is determined by the horticulturalist as being adequate for reporting and monitoring. This information could include the number of individuals/clumps and date collected, as well as where they came from.	Qualified botanist / horticulturalist
Establishment of nurseries • Nursery facilities must be established within either the proposed site office area, or in a construction laydown area or in any other suitable site where additional natural habitat will not be affected and where there is access to water. • Permits to collect, relocate and propagate plant material and to collect seed or cuttings for the contract must be obtained from the relevant authorities. This should be a single permit application that covers all components of the project. • The landscaping contractor must provide a comprehensive method statement relating to the nursery locality, layout, structures, operations and security. The method statement must also cover all aspects of operation, including sources of water and growing medium and a description of the intended practices to be used. The intended use of all horticultural practices should be described, as well as the intended use of additives such as polymer gels and resins. The proposed practices must be suited to the list of rescued species and should take specialized growing requirements into consideration. • The nursery must include a storage area. The nursery and storage area must be of adequate capacity to provide an amount of material stored (of whatever sort required for the completion of the works) sufficient to ensure that no interruption to the progress of the work is occasioned by lack of seeds, plants and other materials. The facility must also be cool and dry and rodent free. • The horticulturist / landscaping contractor must inspect all plant materials weekly to locate any diseased or insect pest infestations or weeds. If any are identified, appropriate control measures must be applied.	Contractor / Engineer / Developer / Landscaping Contractor
Plant rescue • Appoint an experienced horticulturalist or landscaping contractor to undertake the rescue operation, manage the rescued plant material and operate the nursery. • From information gathered during the process of marking plants, establish the resource requirements for the plant rescue team workforce and the methodology to be employed to maximize the likelihood of success. • A multipronged approach to plant rescue should be followed to maximize the likelihood of success. This should take into account overall genetic variability and alternatives to preserving genetic variability. In addition to transplanting of whole plants, seed can be collected to sow in situ in suitable habitats. For plants that can be successfully grown in a nursery environment, seed and other propagules (cuttings, wildlings) must be propagated to supplement the plant rescue effort. • Habitats that are currently disturbed/transformed and that are outside the development footprint are possible sites for rehabilitation where a positive biodiversity outcome can be locally achieved. • Rescued plants must be planted into a container to be housed within a temporary nursery on site or immediately planted into the target habitat. If planted into natural habitat, it must be protected from construction activities and monitored to ensure survival.	Landscaping Contractor / Developer

• Where appropriate, it may be possible to directly transplant individuals from areas about to be cleared backwards to areas that are already undergoing rehabilitation.	
Control of impacts on adjacent areas • Any listed plants close to the development servitude that will remain in place may not be defaced, disturbed, destroyed or removed. They should be cordoned off with construction tape or similar barrier and marked as no-go areas. • The collecting of plants by unauthorized persons should be prevented. • ECO to monitor that vegetation clearing only happens once all search and rescue operations have been completed. • The ECO should monitor construction activities in sensitive habitats to ensure that impacts within these areas are kept to a minimum.	ECO / qualified botanist

3.3.2 Monitoring requirements

The following monitoring activities are recommended as part of the plant rescue plan:

- Post-relocation monitoring of plants relocated during search and rescue to evaluate whether the intervention was successful or not. This should be undertaken on an annual basis over a period of three years in order to evaluate the success thereof.
- Provision of a detailed record, including photographs, that indicates the success of the plant rescue operation.

3.3.3 Indicators and Targets

Indicator	Target
Written and photographic records from all search and rescue operations.	All species of conservation concern identified or removed prior to clearing.
Survival rate of translocated plants	50-80% (based on probable survival rate of grassland species)

3.3.4 Conclusions

As noted, the final walk through recommended that the compilation of the list of red data and protected species must be done in spring, following the approval of the layout and prior to construction and/or site clearing activities commencing. It will determine if permits for destruction and/or rescue must be acquired. As mentioned, if the species present are abundant of the larger area, it will be recommended that destruction is done, as it will not viable to move the large numbers of plants. In addition, there is currently no indication of the success rate of replanting any of the species potentially present.

3.4 Rehabilitation Plan

In order to measure the impact of rehabilitation activities, monitoring must be undertaken. This section provides a description of a possible monitoring programme that will provide an assessment of the success of the rehabilitation activities.

The objective of monitoring is to ensure that the agreed rehabilitation process is successful and that the prescribed rehabilitation objectives are met. There is therefore a need to monitor the progress of the physical aspects of rehabilitation during the construction, operational and closure phases and to ensure that the desired final land use is successfully achieved. Maintenance of rehabilitated sites are often the difference between the ultimate successes or failures of rehabilitation. Monitoring will

determine whether rehabilitation objectives and requirements have been achieved with no residual impacts observed.

During the construction phase, the ECO will be responsible for monitoring and inspecting the contractor's written records to illustrate compliance with the EMPr(s). The aim of compliance monitoring is to verify that the responsible parties are adhering to the procedures, management conditions and specifications contained in the EMPr(s), and the conditions set out in the EA. Monitoring by the ECO will also include regular monitoring of:

- Control of alien vegetation associated with the infrastructure; and
- Rehabilitation of construction sites after construction.

In addition, regular external audits by the specialists are recommend to augment the effectivity of the process.

Note: **Monitoring requirements of the Alien Invasive Management Programme are also applicable, but are not repeated here.**

3.4.1 Rehabilitated vegetation monitoring

One of the prominent indicators of successful rehabilitation is the status of the vegetation that emerges in rehabilitated areas, both in terms of cover and biomass and species composition. A possible method of monitoring vegetation requires annual collection of species compositional and dominance measures of plant growth within both rehabilitated areas and in nearby benchmark areas (in which natural vegetation still occurs). A possible approach in which data can be analysed using standard ecological statistical methods is as follows:

- Establish monitoring points in key locations spread across the range of rehabilitated areas, as well as in nearby undisturbed natural vegetation.
- The number and location of these can be determined using random, stratified random or subjective methods, but the number of sites should comply with basic statistic power requirements.
- Plant species compositional data must be collected in each rehab monitoring site as well as in a reference site adjacent to the rehabilitated area that have similar ecological characteristics.

There are a number of important characteristics of the data collection strategy:

- In comparison to collecting data on only key species or dominant species, total floristic composition data provides relatively complete ecological information on the vegetation that is being assessed. A total list of species is also required in order to generate diversity indices (richness, evenness and functionality).
- Analysis of floristic trends over time provides a valuable tool for determining whether successional changes in the rehabilitated site are converging on a natural state over time, i.e. whether a desired ecological state is being achieved, or whether there is divergence towards an alternative ecological state.
- Comparison with a reference site provides scientific control that offsets external effects on floristic data due to factors such as rainfall and grazing effects.
- A species list must be compiled of all species occurring within the rehabilitated site, treating the site as a vegetation sample plot. For each species, an estimate must be made of the aerial cover, using the Braun-Blanquet cover-abundance scale or similar method.
- A useful approach is to also collect photographic records of all plant species for reference purposes.

3.4.1.1 Pre-construction and construction phase monitoring

The following monitoring is required during the construction phase of the project:

Monitoring action	*Indicator*	*Timeframe*
Photographs of area prior to construction	Baseline condition / pre-construction state	Pre-construction

3.4.1.2 Operational phase monitoring

The following monitoring is optional during the operational phase of the project:

Monitoring action	*Indicator*	*Timeframe*
Document rehabilitation measures implemented, and success achieved in problem areas	Decline in vulnerable bare areas over time	Annually
Vegetation monitoring (as described in the text above)	Species compositional change over time	Annually

3.4.2 Concluding remarks

The information in this document is intended to provide various options that can be adapted for specific situations on the ground. The exact approach adopted for rehabilitation is dependent on local conditions and situations and is not meant to adhere strictly to a formula.

The experience of the ECO and the construction crew are important for ensuring that a successful rehabilitation programme is implemented.

In addition, regular detailed surveys and audits must be conducted by the specialists.