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ECOLOGY & BIODIVERSITY
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PLANT RESCUE AND PROTECTION PLAN

PROPOSED LICHTENBURG 1 100MW SOLAR PV FACILITY, LICHTENBURG, NORTH-WEST PROVINCE

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Prepared by:

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LIST OF ABBREVIATIONS

CARA: Conservation of Agricultural Resources Act 43 of 1983
DEA: Department of Environmental Affairs
EA: Environmental Authorisation
ECO: Environmental Control Officer
EMP: Environmental Management Plan
NEMA: National Environmental Management Act 107 of 1998
LFA: Landscape Functional Analysis (Tongway and Hindley 2004)
IP: Invasive Plant (indigenous or alien)

LIST OF DEFINITIONS:

Accelerated soil erosion: Soil erosion induced by human activities.

Acceptable cover: An acceptable cover shall mean that not less than 40% (in regions receiving less than 400 mm rain per annum), of the area rehabilitated and/or planted shall be covered with grass and other species and that there shall be no bare patches of more than 500 cm in maximum dimension.

Alien: originating from another country or continent and originally different environment, commonly used to describe plants that are not indigenous to South Africa and have become problematic (spreading rapidly, threatening existing biodiversity)

Allelopathic components: one or more biochemical compound produced by a plant and released through leaf litter or roots that suppresses the growth, survival, and reproduction of other surrounding vegetation

Bare soil: Un-vegetated soil surface, unaltered by humans

Bush encroachment: means stands of plants of the kinds specified in CARA Table 4, where individual plants are closer to each other than three times the mean crown diameter

Compacted soil surface: A soil surface that has been hardened by an outside source, causing the soil to be more compacted than the surrounding area.

Container plants: Container plants include all vegetation which are bought or supplied in acceptable containers from nurseries or vegetation lifted out of their natural position and placed in containers.

Desirable end state: the future condition or target on which the rehabilitation is designed and that will serve later as a basis for rehabilitation success evaluation. This can be based on a reference site or modelled according to available information on historic vegetation

Ecological rehabilitation: The process of assisting the recovery of a degraded or damaged ecosystem in a trajectory that renders the ecosystem fully

functional, stable, and able to develop further, but not necessarily returning to the original historic state.

Ecological restoration: The process of assisting the recovery of an ecosystem that has been degraded damaged or destroyed, in a trajectory that ultimately returns the ecosystem to its natural successional stage.

Ecosystem: The combination of biota within a given area, together with a suitable environment that sustains the biota and the interactions between biota. It can have a spatial unit of any size, but shows some degree homogeneity as far as structure, function and species composition is concerned. Small-scale ecosystems typically link up to larger scale ecosystems and all contribute to the ecosystem function and services at the landscape-scale.

Establishment of grass: All procedures necessary to produce an acceptable cover of grass on an area.

Establishment Period: The Establishment Period is defined as the period beginning from the actual planting or placing of vegetation until three months thereafter, unless otherwise specified or unless grass cover is unacceptable or unless plants have not taken.

Extinction debt: is a concept that describes the future extinction of species due to events in the past. Extinction debt occurs because of time delays between impacts on a species, such as destruction of habitat or reduction of population size, and the species' ultimate disappearance.

Geophytic: resprouting during the growing season from an underground storage organ such as bulbs, corms, tubers or rhizomes, and dying back completely during unfavourable seasons

Indigenous: refers to a plant or animal that occurs naturally in the place in which it is currently found

Invasive plant: a kind of plant which has under section 2 (3) of CARA been declared an invader plant, and includes the seed of such plant and any vegetative part of such plant which reproduces itself asexually

Landscape: Consists of a mosaic of two or more ecosystems that exchange organisms, energy, water, and nutrients.

Nursery conditions: These are the necessary conditions to maintain healthy growth of rescued and/or container plants. This includes protection of such plants against wind, frost, direct sunlight, pests, rodents, diseases, and drought. It also includes the provision of suitable water, fertilizer and any other measures required to maintain the container plants.

Period of Maintaining: The Period of Maintaining is defined as the period following directly after the Establishment Period until the end of the Period of Maintenance for the whole Contract as defined in the General Conditions of Contract, unless otherwise specified.

Revegetation: The process of establishing a vegetative cover on exposed soils, regardless of species composition or structure, as long as the species are

non-invasive and their presence will not impede the gradual process of ecological rehabilitation or –restoration.

Soil Erosion: is a natural process whereby the ground level is lowered by wind or water action and may occur as a result of inter alia chemical processes and or physical transport on the land surface**.**

Scarifying: To roughen the surface of soil as a preparation for seeding or topsoil addition.

Trimming: To neatly round off the levels of existing or previously shaped earthworks to blend in with the levels of other earthworks, constructed works, or natural landforms.

Transformation: The conversion of an ecosystem to a different ecosystem or land use type.

Topsoil: uppermost layer of soil, in natural vegetation maximally 30 cm, in cultivated landscapes the total depth of cultivation, containing the layer with humus, seeds and nutrients. Topsoils that are applied to landscapes to be rehabilitated must be free of refuse, large roots and branches, stones, alien weeds and/or any other agents that would adversely affect the topsoils suitability for re-vegetation.

Weed: a plant that grows where it is not wanted, and can therefore be an indigenous or alien species. An unwanted plant growing in a garden is just called a weed, but the 198 listed IPs are called "declared weeds and invaders".

(Coetzee 2005, Clewell et al. 2005, SER 2004)

LICHTENBURG 1 PV FACILITY, NEAR LICHTENBURG, NORTH WEST PROVINCE
PLANT RESCUE AND PROTECTION PLAN

1 PURPOSE

The purpose of the plant rescue and protection plan is to implement avoidance and mitigation measures to reduce the impact of the development of Lichtenburg 1 on listed and protected plant species and their habitats and to provide guidance on search and rescue of species of conservation concern.

2 SCOPE

This document is to be applied by all contractors on Lichtenburg 1.

This plan, as a requirement of the authorisation, is a legal document that must be implemented. However, the management plan is an evolving guideline that needs to be updated or adapted as progress is made with the management of species of conservation concern recorded on site.

The objective of rescuing animals and plants, rehabilitation and revegetation within the development footprint and immediate adjacent areas is:

- Preventing the loss of species either directly or through future extinction debts and minimising impacts of development on population dynamics of species of conservation concern
- Preserving the natural configuration of habitats as part of ecosystems, therefore ensuring a diverse but stable substrate and general environment for species to be able to become established and persist
- Where the natural configuration of habitats has been significantly altered but will not be permanently transformed, re-create as near-natural habitats as practical to re-establish ecosystem functionality to those habitats
- Preserving or re-creating the structural integrity of natural plant communities
- Actively aid the improvement of indigenous biodiversity according to a desirable end state according to a previously recorded reference state
    - This reference state, if healthy, will be dynamic and able to recover after occasional disturbances without returning to a degraded state
- Improving the ecosystem function of natural landscapes and their associated vegetation

3 LEGISLATION AND STANDARDS

Relevant legislation:

- Conservation of Agricultural Resources Act 43 of 1983
- Environmental Conservation Act 73 of 1989
- National Forestry Act 84 of 1998
- National Environmental Management Act 107 of 1998
- National Environmental Management Act: Biodiversity Act / NEMA:BA (Act No. 10 of 2004)
- The Transvaal Nature Conservation Ordinance (No. 12 of 1983)
- The Bophuthatswana Nature Conservation Act (Act 3 of 1973)

4 GENERAL SITE DESCRIPTION

The development footprint is located on Portion 6 of the Farm Zamenkomst 4, situated approximately 12 km to the north from the town of Lichtenburg. The proposed site falls under the jurisdiction of the Ditsobotla Local Municipality and within the greater Ngaka Modiri Molema District Municipality in the North West Province. The study site falls within the 2626AA quarter degree square (QDGS).

The site can be described as largely flat to slightly undulating with an average slope of 0.3% and a maximum slope of 1.4%. The typography of the project site itself can be described as follows;

- the northern portion of the project site is mostly flat which becomes slightly more undulating to the south.
- The project site generally has a slight south to south-western inclination.
- Micro-topographical variations are mostly due to chert outcroppings, small "sinkhole" structures within the dolomitic areas.

The open grassland and shrublands of the project site are mostly being used for livestock farming (cattle), with a low presence of game. Infrastructure and development are minimal within the project site and is limited to cattle kraals (pens), artificial watering points, cement dams, cattle feeding points and an overhead transmission line. Furthermore, numerous dirt roads (twin tracks) traverse the project site.

The project site is situated in the Grassland biome and Dry Highveld Grassland Bioregion. The vegetation in and surrounding the project site is Carletonville Dolomite Grassland (Gh 15). During the Ecological survey conducted by Botha (2018), only one vegetation association

was identified within the solar development footprint, whilst two vegetation associations were identified within the powerline corridor namely:

- Association 1: *Elionurus muticus – Helichrysum callicamum* Savanna Grassland (both the solar footprint and the powerline corridor). This savanna type comprises a dominant open grassland with some scattered shrubs and trees (mainly *Searsia pyroides, S. Lancea, Celtis africana, Gymnosporia buxifolia* and *Grewia flava*). Taller trees are relatively scarce and may be clumped together. Such clumps are scarce within the project site and typically comprise of *Searsia lanceae, S. pyroides, Ziziphus mucronata, Celtis africana, Gymnosporia buxifolia* and *Asparagus laricinus*. Species of conservation importance that was observed within the unit were occasional *Boophone disticha* plants. Other conservation important plants much less frequently observed include; *Ammocharis coranica, Orbea lutea* and *Aloe greatheadii* var*. davyana*.
- Association 2: *Hyparrhenia hirta – Elionurus muticus* Palaeo-drainage Grassland (only within the powerline corridor). These palaeo-channels are relicts of historically wetter periods and merely exhibit characteristics (edaphic) of wetter periods but have lost all of its hydrological functions. Although there are still very slight incisions of the channels, it is mostly filled with a moderately to thin layer of sand and/ or silt and clay covering bedrock and stones of dolomite and chert. These palaeo-drainage lines are characterised by a plant species composition different from the surrounding dryer areas and is almost entirely covered with graminoids with some forbs. Shrubs and trees are almost absent from this channel with only occasionally the presence of *Grewia flava* and *Searsia lancea*. The grass layer is moderately tall (1m – 1.7m) and overwhelmingly dominates this plant community, typically comprising of *Themeda triandra, Cymbopogon caesius, Hyparrhenia hirta, Aristida congesta, A. junciformis, Eragrostis rigidior, E. curvula, E. chloromelas, E. plana, Cynodon dactylon* and *Diheteropogon amplectens*. Trampled and severely overgrazed areas are typically covered by *Aristida congesta, Eragrostis plana, Gomphrena celosioides, Bidens pilosa, Seriphium plumosum, Argemone ochroleuca, Verbena bonariensis* as well as *Schkuria pinnata.* Regarding conservation important species, only one conservation important species was observed within this palaeo-drainage grassland namely *Ammocharis coranica* and was only observed occasionally and occurring as a singular species.

Conservation important species found during the ecological survey (accompanied with general information regarding search and rescue targets and methods) include:

- *Boophone disticha:*
  - Red Data: Declining
  - Deciduous bulbous plant with thick covering of dry scale above the ground
  - Dry grassland and on rocky slopes

- Can be relocated – may be difficult to locate once the species are in their dormant phase – look out for protruding bulb scales
- Protect from poaching (harvested and sold for medicinal purposes)
- Sap of leaves and especially sap of inside bulb extremely toxic
- Aim to rescue at least 80%, preferably 100%

» *Aloe greatheadii var. davyana*

- Protected within the relevant Provincial Conservation Acts as well as CITESII
- Stemless succulent growing either singularly or in groups of up to 15 plants
- Wide distribution within grassland and bushveld biomes
- Easy to relocate and replant,
- Aim to rescue at least 80%

» *Orbea lutea* subsp*. lutea*

- Protected within the relevant Provincial Conservation Acts as well as CITESII
- The yellow carrion flower is a succulent perennial without obvious leaves. Stems are usually crowded and 4-angled
- Wide distribution within grassland and scrub and savanna habitats
- Easy to relocate and replant,
- Aim to rescue at least 80%

» *Ammocharis coranica*

- Protected within the relevant Provincial Conservation Acts.
- Deciduous bulb covered in thinly layered tunics.
- Easy to relocate and replant, aim to rescue at least 80%, preferably 100%.

» *Pelargonium dolomiticum*

- Protected within the relevant Provincial Conservation Acts
- Straggly perennial shrublet sprouting from an underground shrublet.
- Rocky grassland.
- Easy to relocate and replant.
- Useful for rehabilitation.
- Aim to rescue at least 80%.

Species that were not found during the ecological survey but may likely occur (according to BODATSA) within the project site (species that might have been dormant during the time of the ecological survey) include the following:

Table 1: Species listed as conservation worthy within the South African Red List, National Forest Act (NFA), Transvaal Nature conservation Ordination (TNCO) and Bophuthatswana Nature Conservation Act (BNCA).

Species	Status
Gladiolus elliotii	TNCO & BNCA
Gladiolus permeabilis	TNCO & BNCA
Crinum graminicola	TNCO & BNCA
Brachystelma foetidum	TNCO & BNCA

Brachystelma incanum	TNCO, BNCA & Vulnerable
Pelargonium sidoides	TNCO & BNCA & Declining
Cleome conrathii	Near Threatened
Hypoxis hemerocallidea	TNCO, BNCA & Declining

A pre-construction walk-through of the final development footprint for species of conservation concern prior to the commencement of the construction phase was recommended within the Ecological Assessment Report and following such a survey this Plant Rescue and Protection Plan should be updated accordingly.

5 EFFECT OF REMOVING INDIVIDUALS OF SPECIES OF CONSERVATION CONCERN

Species of conservation concern are declining either due to overexploitation, their natural re-establishment rates after destruction are extremely low, or because their range of occupancy is limited and further infringed on by development. Most plant populations require a certain minimum number of individuals within a population or metapopulation to allow for sufficient genetic transfer between individuals. This prevents genetic erosion and hence weakening of the ability of individuals to persist in their environments. Similarly, where the distance between metapopulations is significantly increased due to fragmentation and the resultant loss of some populations, populations may suffer genetic decline due to restricted movement of pollen. Pollinators or other species that depend on a particular plant species for a specific microhabitat or food source may be equally affected because of the reduction of available resources. Therefore, the aim of plant rescue actions is always to maintain as many individuals of a plant population in as close proximity to the original habitat as possible to minimise loss of individuals and fragmentation of populations to prevent the creation of future extinction debts of the development.

6 ANIMAL SEARCH AND RESCUE

Several active animal burrows, as well as sightings of animals were made during the fieldwork undertaken for the Ecological Impact Assessment. Hares, most rodents and larger mammals will be able to move away rapidly from construction activities if vehicles adhere to speed limits set on access roads (60 km/h) and within the construction site (30 km/h). However, smaller burrowing animals and slower-moving reptiles such as tortoises will have to be moved outside of the construction area if and where necessary.

During induction, staff must be made aware of and requested to always be on the lookout for animals, active burrows, tortoises or nests, and report such sightings on the construction site immediately to the EO and ECO for action. The EO will also be responsible to inspect all surfaces just ahead of construction to detect active burrows and nests, for which professional

contractors will have to be brought in to extract the animals and release them outside of the footprint area.

Trenches, while open, must also be inspected on a daily basis, especially before being closed, for the presence of fauna that may have become trapped. Deep trenches (deeper than 1.5 meters) left open overnight should be visibly barricaded as an effort to prevent larger animals from falling into the trenches. Any animals found must be removed in a safe manner, unharmed, and placed in an area where the animal will be safe. If the ECO or contractor is unable to assist in the movement of a fauna species, ensure a member of the conservation authorities assists with the translocation.

No snake species found within trenches or the rest of the development footprint may be handled by the ECO, contractor or any other staff member. If noted, the conservation authorities should be contacted for assistance or must recommend a qualified snake handler. These drier habitats provide preferable habitat for poisonous species such as puff adder (*Bitis arietans*) and cape cobra (*Naja nivea*). Some non-poisonous species such as for example, mole snakes (*Pseydasous cana*) tend to have colour variations similar to that of poisonous snakes such as cape cobra and rinkhals (*Hemachatus haemachatus*), whilst the Rhombic Egg Eater (*Dasypeltis scabra*) can sometimes easily be mistaken for a Common Night Adder (*Causus rhombeatus*) or a juvenile puff adder. Therefore, accurate identification might be difficult and therefore the reason for recommending that only a qualified snake handler removes these species.

All mammal, large reptiles and avifauna species found injured during construction will be taken to a suitably qualified veterinarian or rehabilitation centre to either be put down in a humane manner or cared for until it can be released again.

7 PRINCIPLES OF SEARCH AND RESCUE

Successful plant rescue can only be achieved if:

- Species can be removed from their original habitat with minimal damage to the plant, especially the roots.
- All plants removed are safely stored and treated according to their specific requirements prior to being transplanted again.
- They are relocated into a suitable habitat and protected from further damage and all disturbances to aid their re-establishment.
- Timing of planting activities is planned with the onset of the growing season.
- Steps are taken where necessary to aid the initial establishment of vegetation, including occasional watering.

The following principles apply in terms of plant rescue and protection:

- Prior to construction, a walk-through of the final development footprint should be undertaken by a suitably qualified botanist/ecologist to locate and identify all listed and protected species which fall within the development footprint, as well as to identify species suitable for search and rescue.
- A permit (obtained from North West Department of Rural, Environment and Agricultural Development (READ)) is required to translocate or destroy any listed and protected species even the plants are not moved outside of the property boundaries. This permit should be obtained prior to any search and rescue operations being undertaken.
- Where suitable species are identified, a search and rescue operation of these species should be undertaken within the development footprint prior to the commencement of construction.
- As far as possible, timing of search and rescue activities should be planned with the onset of the growing season.
- Affected individuals should be translocated to a similar habitat outside of the development footprint and marked for monitoring purposes. For each individual plant that is rescued, the plant must be photographed before removal, tagged with a unique number or code and a latitude longitude position recorded using a hand-held GPS device.
- The EO must be informed and present where ground works are initiated on virgin soils and where large bulbs or plants with large tubers become exposed and uprooted during initial ground works, these species should be extracted from the topsoil and be stored as recommended on-site until they can be replanted.
- The rescued plants must be planted into a container to be housed within a temporary nursery on site or immediately planted into the target habitat.
- Rescued plants, if re-planted, should be placed as close as possible to where they were originally removed. Re-planting must cause as little disturbance as possible to existing natural ecosystems. The position of the rescued individual/s must be recorded to aid in future monitoring of that plant.
- During construction, the ECO must monitor vegetation clearing at the site. Any deviations from the plans that may be required should first be checked for listed species by the ECO or EO and any listed species present which are able to survive translocation should be translocated to a safe site.
- Any listed species suitable for translocation observed within the development footprint that were not previously observed must be translocated to a safe site.
- The collecting of plants or their parts should be strictly forbidden. Appropriate signage in this regard should be placed at the entrance gates to the site. Staff should be informed of the legal and conservation aspects of harvesting plants from the wild as part of the environmental induction training.

» Sensitive habitats and areas outside project development should be clearly demarcated as no go areas during the construction and operation phases to avoid accidental impacts.

8 REFERENCES

Clewell, A., Rieger, J. and Munro, J. (2005). Guidelines *for Developing and Managing Ecological Restoration Projects, 2 Edition*. www.ser.org and Tucson: Society for Ecological Restoration International.

Coetzee, K. (2005). *Caring for Natural Rangelands.* Scottsville: University of KwaZulu-Natal Press.

Dekker, S. C., M. Rietkerk, et al. 2007. Coupling microscale vegetation-soil water and macroscale vegetation-precipitation feedbacks in semiarid ecosystems. Global Change Biology 13: 671-678.

Department of Environmental Affairs,(1983). *Conservation of Agricultural Resources Act 43 of 1983.* Pretoria: Department of Environmental Affairs.

Esler, K.J., Milton, S.J., Dean, W.R.J. (eds). 2006. Karoo Veld Ecology and Management. Briza

Holmes, P.M. and Richardson, D.M. (1999). *Protocols for restoration based on recruitment dynamics, community structure, and ecosystem function: Perspectives from South African Fynbos.* Restoration Ecology 7(3): 215-230

Paton, I. (2011). *Geological Impact Assessment Report.* George: Outenique Geotechnical services Civil Laboratories.

Society for Ecological Restoration International Science & Policy Working Group. 2004. *The SER International Primer on Ecological Restoration*. www.ser.org & Tucson: Society for Ecological Restoration International.

Tongway, D.J. and Hindley, N.L. (2004) Landscape Function Analysis: Procedures for Monitoring and Assessing Landscapes, CSIRO Sustainable Ecosystems, CANBERRA, AUSTRALIA

Tongway, D.J., Freudenberger, D.O., Noble, J.C., and Hodgkinson, K.C. (Eds). (2003). Landscape Ecology, Function and Management. CSIRO Sustainable Ecosystems, CANBERRA, AUSTRALIA

9 APPENDIX: PHOTOGRAPHIC GUIDE TO PROTECTED SPECIES

PLANT SPECIES FOUND DURING WALK-THROUGH SURVEY

	***Boophone disticha*** Protected: Red Data List (Declining) o Deciduous bulbous plant with thick covering of dry scale above the ground o Dry grassland and on rocky slopes o Can be relocated – may be difficult to locate once died back (dormant phase) – look out for protruding bulb scales o Protect from poaching (harvested and sold for medicinal purposes) o Sap of leaves and especially sap of inside bulb extremely toxic o Aim to rescue at least 80%, preferably 100%
	***Aloe greatheadii var. davyana*** Protected: Relevant Provincial Conservation Act and CITES o Stemless succulent growing either singularly or in groups of up to 15 plants o Wide distribution within grassland and bushveld biomes o Easy to relocate and replant, o Aim to rescue at least 80%
	***Orbea lutea* supsp. *lutea*** Protected: Relevant Provincial Conservation Act and CITES o Stemless succulent growing either singularly or in groups of up to 15 plants o Wide distribution within grassland and bushveld biomes o Easy to relocate and replant, o Aim to rescue at least 80%

	***Ammocharis coranica*** Protected: Relevant Provincial Conservation Act o Deciduous bulb covered in thinly layered tunics o Dry grassland and on rocky slopes o Can be relocated – may be difficult to locate once died back (dormant phase) – look out for protruding bulb scales o Sap of leaves and especially sap of inside bulb extremely toxic o Aim to rescue at least 80%, preferably 100%
	***Pelargonium dolomiticum*** Protected: Relevant Provincial Conservation Act o Straggly perennial shrublet sprouting from an underground shrublet. o Rocky grassland. o Easy to relocate and replant. o Useful for rehabilitation. o Aim to rescue at least 80%.