A REHABILITATION AND REVEGETATION PLAN FOR THE PROPOSED RENEWABLE ENERGY GENERATION PROJECT ON THE FARM RHODES 269, NORTHERN CAPE PROVINCE

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ECOLOGICAL REPORT

April 2016

Conducted on behalf of:
Miko Energy (Pty) Ltd

Compiled by:

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Reviewed by:

Ms. E. Grobler (EAP.)

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Ms. E. Grobler	AGES Limpopo

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April 2016	2.0	Final
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1 ASSIGNMENT

Exigo3 was appointed by AGES Limpopo to compile a rehabilitation and re-vegetation plan for the proposed establishment of a solar energy generation facility on the farm Rhodes 269, Joe Morolong Local Municipality, John Taolo Gaetsewe District Municipality, Northern Cape Province.

The assignment is interpreted as follows: Compile a management plan to be implemented by the Environmental Control Officer (ECO) for the rehabilitation and revegetation of the proposed development site. The study will be done according to guidelines stipulated by the Department of Environmental Affairs (DEA).

1.1 INFORMATION SOURCES

The following information sources were obtained:

1. All relevant maps through Geographical Information Systems (GIS) mapping, and information (previous studies and environmental databases) on the rehabilitation and revegetation of the site concerned;
2. Requirements regarding the management plan as requested by DEAT;
3. Information on the micro-habitat level was obtained through obtaining a first-hand perspective from the ecological study compiled by Hoare (2012) was also utilized for this study.

1.2 REGULATIONS GOVERNING THIS REPORT

1.2.1 National Environmental Management Act Regulation 543 Section 32

This report has been prepared in terms of Regulation 32 of the National Environmental Management Act (No. 107 of 1998) Regulations GN 33306 GNR 543 for environmental impact assessment. Regulation 33 states that a specialist report must contain:

1. An application or the EAP managing an application may appoint a person to carry out a specialist study or specialized process.
2. The person referred to in sub-regulation 1 must comply with the requirements of regulation 17 (General requirements for EAPs or a person compiling a specialist report or undertaking a specialized process).
3. A specialist report or a report on a specialized process prepared in terms of these regulations must contain:

a. Details of

   i. The person who prepared the report; and Letter of Appointment

   ii. The expertise of that person to carry out the specialist study or specialized process.

b. A declaration that the person is independent in a form as may be specified by the competent authority;

c. An indication of the scope of, and purpose for which, the report was prepared;

d. A description of the methodology adopted in preparing the report or carrying out the specialized process;

e. A description of any assumptions made and any uncertainties or gaps in knowledge;

f. A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment;

g. Recommendations in respect of any mitigation measures that should be considered by the applicant and competent authority;

h. A description of any consultation process that was undertaken during the course of carrying out the study;

i. A summary and copies of any comments that were received during any consultation process;

j. Any other information requested by the competent authority.

1.3 TERMS OF REFERENCE

1.3.1 Objectives

a. The main aim of the plan is to provide guidelines to be implemented after the construction phase of the development to ensure that previous impacts are rectified by rehabilitating or restoring the affected environment. This will include attempts at habitat re-creation, to restore the original land uses and biodiversity values;

b. Provide management and rehabilitation guidelines to ensure that the biodiversity will form part of a sustainable environment after rehabilitation;

c. Make recommendations in terms of revegetation ecological management and rehabilitation procedures for the general environment of the site and surrounding areas;

1.3.2 Limitations and assumptions

- In order to obtain a comprehensive understanding of the dynamics of rehabilitation and revegetation plan, monitoring should ideally be replicated over several seasons and over a number of years. However, due to project time constraints such long-term studies are not feasible;
- The large study area did not allow for the finer level of assessment that can be obtained in smaller study areas. Therefore, data collection in this study relied heavily on data from representative sections, as well as general observations, generic data and a desktop analysis;

2 INTRODUCTION

Rehabilitation can be defined as the return of disturbed areas to a safe, stable, productive and self-sustaining condition that promotes bio diverse land use. Land rehabilitation techniques can be used to speed up the time required to restore the impacted area back to its original, or better, state. To re-create and maintain a sustainable environment it is important to plan how the areas to be impacted by the construction of the Rhodes 2 Solar Park will be rehabilitated and revegetated.

A central purpose in rehabilitation planning should be to promote the ecological integrity of each site and surrounding landscapes. The application of ecological restoration principles requires that plans are developed consistent with regional or landscape level ecological objectives. At the local scale, this involves an examination of surrounding landscapes, in combination with determining predicted successional trends of vegetation communities appropriate to enhance local and regional ecosystems.

At the site level, emphasis is placed on rehabilitation techniques such as land-form replication and planting species that will promote site stability and sustainability. Re-vegetation should use indigenous species that contribute most to the compatibility of the local ecology and increase biodiversity.

The final goal of the rehabilitation planning process is a practical, achievable and adequately resourced rehabilitation programme. Rehabilitation of the disturbed areas should be done in such a way to ensure that the rehabilitation and revegetation on the site for the Rhodes 2 Solar Park will be sustainable in the long term.

3 STUDY AREA

3.1 LOCATION AND DESCRIPTION OF ACTIVITY

The project entails the development of a Photovoltaic (PV) Power Plant and is located on the farm Rhodes 269, Kuruman RD, Joe Morolong Local Municipality, John Taolo Gaetsewe District Municipality, Northern Cape Province (Figure 1).

The proposed project is situated directly north of the town of Hotazel and 50 kilometers to the North of the town of Kathu, with the footprint planned to the east and west of Eskom's "Hotazel - Heuningvlei" 132 kV power line.

The solar project is called RHODES 2 SOLAR PARK and it envisages the establishment of a Photovoltaic (PV) Power Plant having a maximum generating capacity up to 120 MW.

The PV power plant will have a footprint (fenced area) up to 250 ha, within a study area of 1380 ha in extent.

The Rhodes 2 Solar Park will deliver the electrical energy to the "Hotazel - Heuningvlei" 132 kV power line (preferred connection solution). The Eskom's power line will loop in and out of the 132 kV busbar of the new on-site substation, via two new sections of 132 kV.

Access to the Rhodes 2 Solar Park will be from a local upgraded farm road diverted of the regional road R31, which runs parallel to the eastern boundary of the property.

The chosen site is suitable for the installation of a photovoltaic (PV) power plant. It is appropriate morphologically (flat terrain) and regarding the favourable radiation conditions. The available radiation allows a high rate of electric energy production, as a combination of latitude-longitude and climatic conditions.

The aerial image of the site is indicated in figure 3. The footprint of the PV plant layout is planned in the central section of the site.

Rhodes 2 Solar Park Rehabilitation & Revegetation Plan

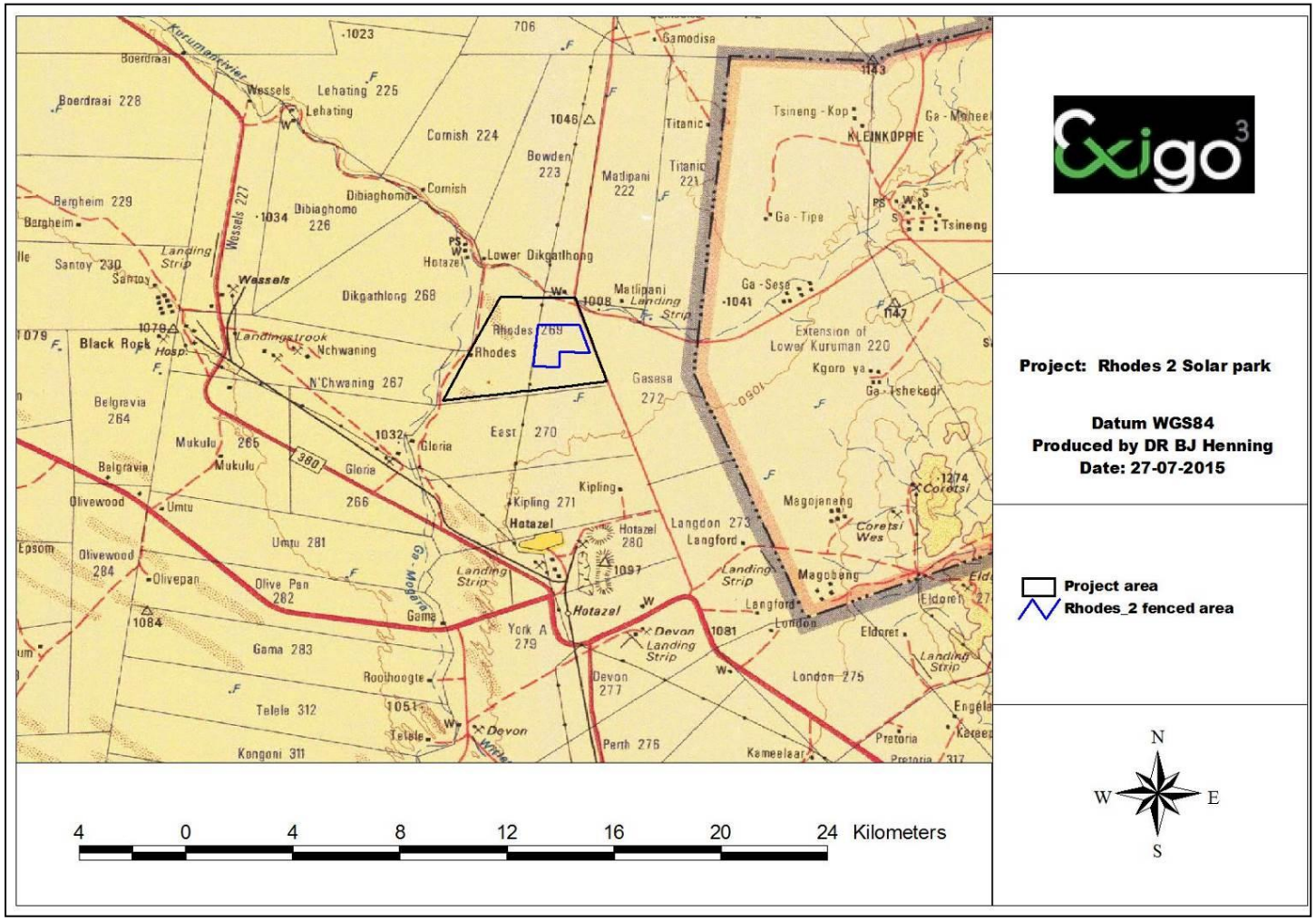

Figure 1. Regional Location Map

Rhodes 2 Solar Park Rehabilitation & Revegetation Plan

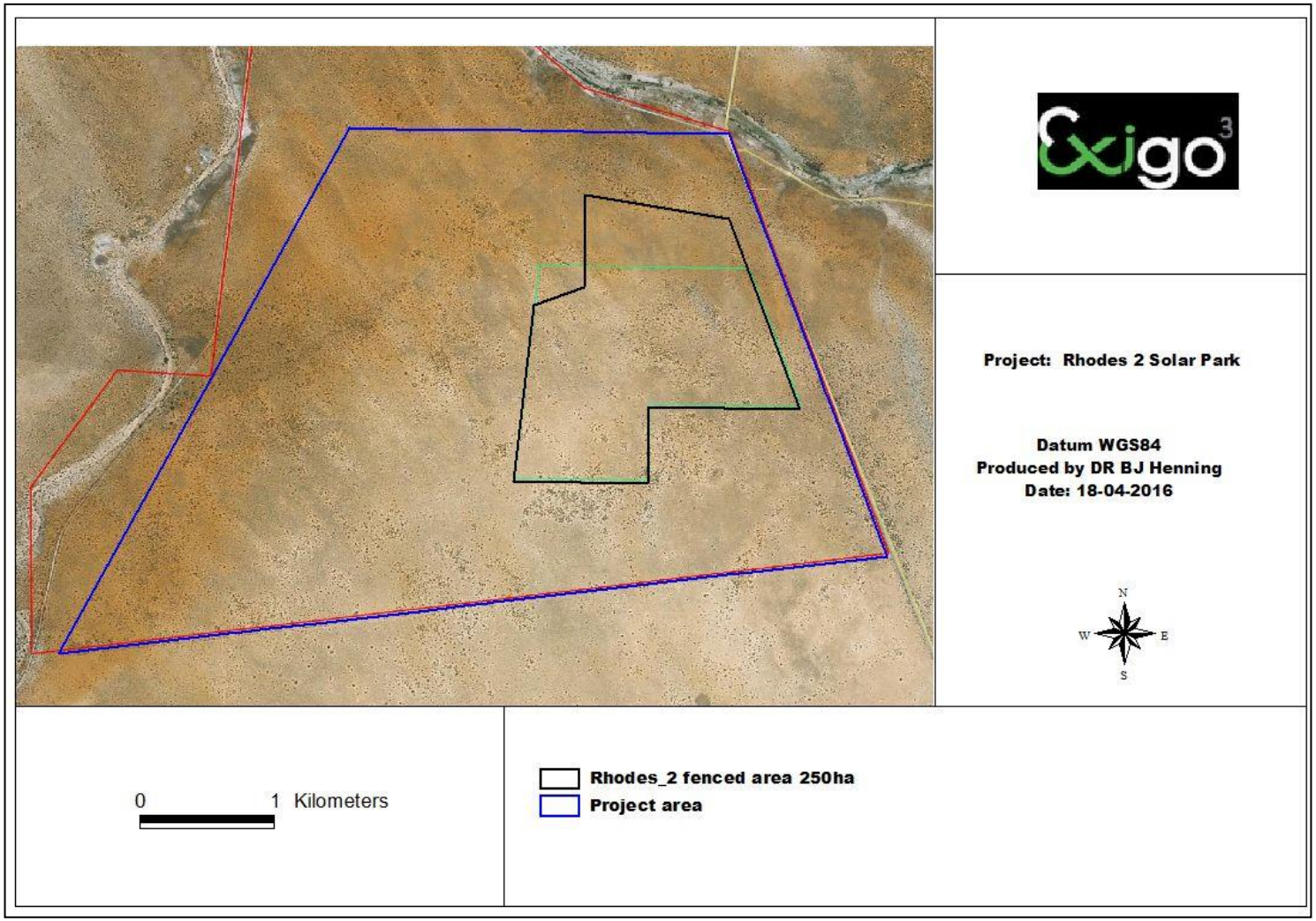

Figure 2. Satelite image showing the power line route (Google Pro, 2010)

Rhodes 2 Solar Park Rehabilitation & Revegetation Plan

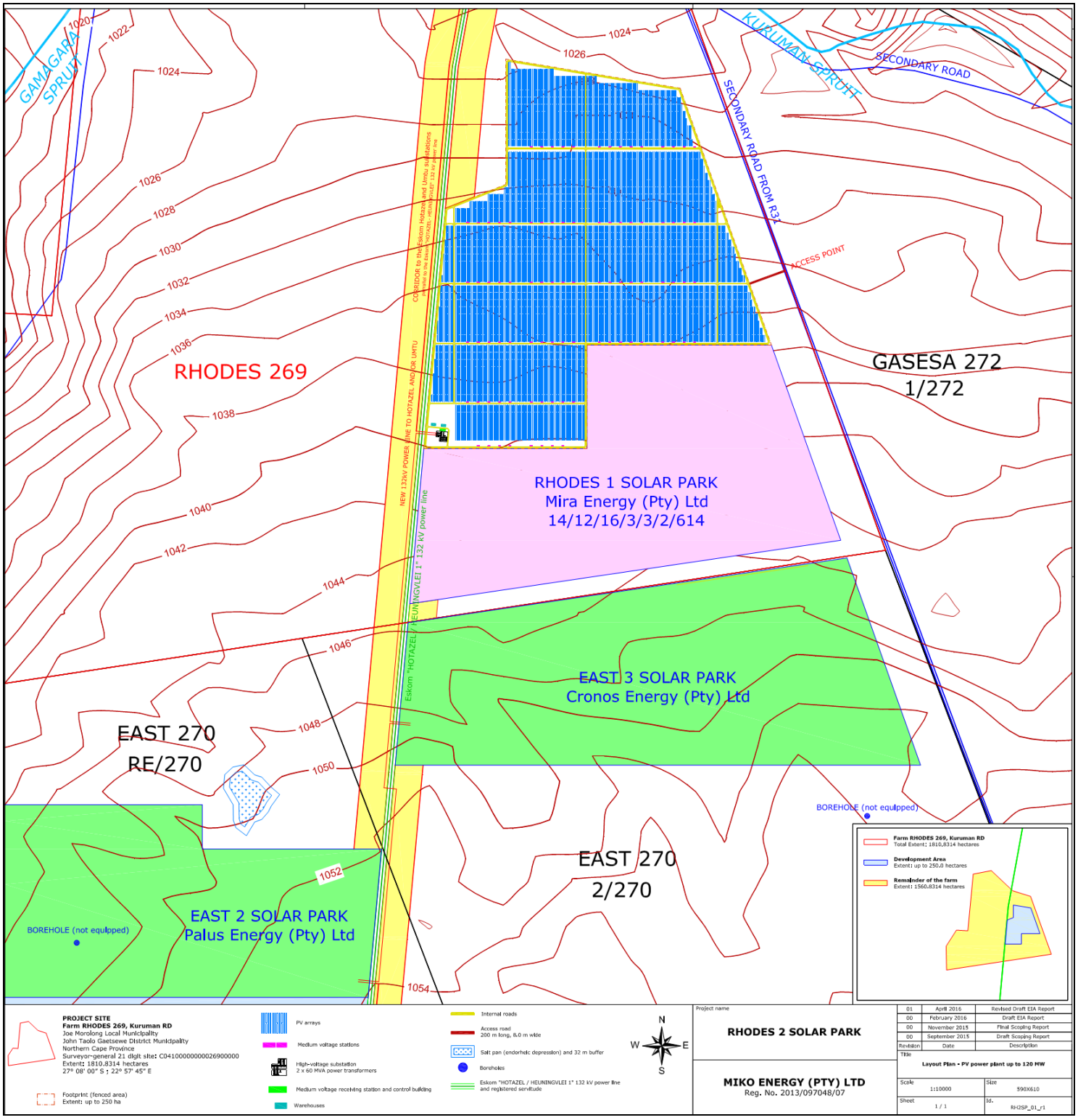

Figure 3. Layout Map Alternative 1

4 PRINCIPLES OF ENVIRONMENTAL REHABILITATION

4.1 BEST PRACTICES IN REHABILITATION PLANNING AND MANAGEMENT

Use of rehabilitation planning and environmental management that aims for sustainability is encouraged in all aspects of reclamation planning, design and implementation. Environmental Guidelines by the Department of Water Affairs and Forestry (DWAF), 2005 aims to guide environmental management during all phases of a project lifecycle.

These Environmental Best Practice Guidelines for; Planning; Construction, Operation and Decommissioning Planning provide scientific-based, comprehensive and integrated strategies to perform rehabilitation for developments and therefore mitigate against safety hazards and environmental degradation.

4.2 APPLIED PRINCIPLES OF ECOLOGICAL RESTORATION

A central purpose in rehabilitation planning should be to promote the ecological integrity of each site and surrounding landscapes. The application of ecological restoration principles requires that plans are developed consistent with regional or landscape level ecological objectives. At the local scale, this involves an examination of surrounding landscapes, in combination with determining predicted successional trends of vegetation communities appropriate to enhance local and regional ecosystems.

At the site level, emphasis is placed on rehabilitation techniques such as land-form replication and planting species that will promote site stability and sustainability. Re-vegetation should use indigenous species that contribute most to the compatibility of the local ecology and increase biodiversity.

Ecological restoration with biodiversity benefits in mind must involve an orderly set of considerations that promote successful procedures and practices. Often these practices, although based on similar general considerations, will need to be innovative because of the unique set of circumstances that each area and ecosystem to be restored represents. The restoration objectives must be formulated from a detailed knowledge of the basic structural and functional characteristics of natural ecosystems.

The development of measurable criteria for judging restoration success has proved difficult but they are usually derived from the particular community and ecosystem characteristics desired as restoration objectives (Johnson and Putwain 1981; Hobbs and Norton 1996). Cairns (1993) provides three general success guidelines that the restored ecosystem should attain: (i) self-regulation for some set period of time, where self-regulation means the structural and functional attributes persist in the absence of whatever “subsidies” (fertilizer, seeding etc.) may have been necessary during the initial phases of implementation; (ii) the design criteria (restoration goal and objectives) established before restoration was undertaken; (iii) no observable adverse effects in the larger ecological landscape.

From these criteria, it can be seen that it is absolutely necessary to have restoration objectives that have unambiguous operational definitions (technically feasible), which are ecologically sound (scientifically valid) and socially relevant, and that are receptive to measurement and prediction (Cairns 2000). The ecosystem characteristics measured are usually those related to the composition, structure, and pattern of the vegetation as a key component of the biodiversity pool (Allen 1992). It is notable that some important structural measurements of biodiversity are usually omitted (Chambers et al. 1994). In particular, measurements concerning the soil biotic community and animal species numbers are not usually made, even though they can often provide important indications of long-term productivity and successional pathways (Chambers and Wade 1992).

Ecosystem characteristics for consideration as ecological restoration objectives (adapted from Hobbs (1999) are:

- Composition: species presence and their relative abundance;
- Structure: vertical arrangement of vegetation and soil components;
- Pattern: horizontal arrangement of system components;
- Heterogeneity: a variable composing of characteristics 1–3;
- Function: performance of basic ecosystem processes (energy capture, water retention, nutrient cycling);
- Species Interactions, e.g., pollination, seed dispersal etc.;
- Dynamics and resilience: succession and state-transition processes, ability to recover from normal episodic disturbance events (e.g., floods, drought, fire).

In the restoration of sites where the topsoil has been lost, the major ecological challenges are still concerned with plant species–substrate interactions, i.e., revegetation. Restoration practice where topsoil has been retained focuses less on vegetation establishment and more on the spatial and temporal factors affecting species colonization and establishment, the criteria for monitoring and assessing success, particularly in the longer term, and the restoration of natural indigenous ecosystems and biodiversity values.

4.3 COMPATIBILITY IN LAND USE, LAND COVER AND LANDSCAPE DESIGN

Final rehabilitation plans and designs should ensure that the natural ecological land use system of the site is restored and maintained through a sustainable development solution. Landscape design and development plans should be incorporated into the rehabilitation planning process; including landforms, structures, planting pallet development and surrounding developments interface with the site and natural drainage system.

5 THE REHABILITATION WORKS/METHODS

The Environmental Rehabilitation process at the site should form an integral part of site development, operation and closure activities. A Rehabilitation Specialist and/or Environmental Control Officer (ECO) should therefore be appointed, and be available on-site as part of the rehabilitation management / construction team. The ECO should form an integral part of the management team, attending regular site meetings, receiving Project Meeting Minutes and being kept fully updated regarding the closure plan and site rehabilitation process. This information is vital in ensuring that the necessary preventative measures and Search and Rescue activities are affected timeously.

5.1 IDENTIFICATION AND PROTECTION OF ENVIRONMENTALLY SENSITIVE AREAS

The on-site Environmental Control Officer and/or Rehabilitation Specialist should be fully aware of the scale and extent of the rehabilitation operations. No further vegetation clearing, levelling, excavation, topsoil removal or plant material removal is to be permitted without prior consent from the ECO and Rehabilitation Specialist based on the rehabilitation plan for the site unless instructed by them. Care must be taken during rehabilitation to avoid the natural drainage areas occurring on the property. No vegetation clearance, topsoil collection or movement of machinery and vehicles should be allowed here as to keep the ecological integrity of the drainage areas intact.

5.2 COMPREHENSIVE PHOTOGRAPHIC RECORD

In order for practical and attainable rehabilitation goals to be defined, it is recommended that a comprehensive photographic record of the entire property be created. Video footage may also be useful in compiling such a record. A photographic record of the entire property should be kept as it could become a very valuable tool for the Rehabilitation Works in future. It would serve as the basis for rehabilitation requirements, informing decisions on drainage, soil shaping, levels, plant choices and rehabilitation in general. It can also serve as a verification report to authorities and land administrators regarding the legislative processes, sustainable approach and progressive improvement.

5.3 SEARCH AND RESCUE ACTIVITIES

Search and Rescue activities could be initiated as part of the Rehabilitation process. Where rehabilitation actions will commence, viable, transplantable plant species could be identified by the ECO / Rehabilitation Specialist, removed and stored in a potential ‘on-site’, self sustaining nursery, to be re-used in rehabilitation activities in future.

Plant material that is to be “rescued” must be potted up into bags utilising local soil obtained from the previously stored topsoil heap. Adequate root systems per plant material type must be carefully excavated and retained in order for plant material to remain viable. Search and Rescue activities would include the removal of grass clumps, smaller transplantable shrubs and trees and endangered species such as geophytes and succulents should be placed into bags using local soil.

Animals like small mammals, reptiles and birds encountered during rehabilitation operations should be captured or moved by a specialist and released in a safe area. No animals may be poached at the property or adjacent areas. Many animals are protected by law and poaching or other interference could result in a fine or jail term.

5.4 CLEARED INDIGENOUS PLANT MATERIAL

Where construction or rehabilitation activities are to commence in a specific area, certain indigenous plant material from the construction footprint area could be collected and bagged to be used in re-vegetation or as mulch during rehabilitation. The Sickle bush (*Dichrostachys cinerea*) occurs widespread on the farm. To protect drainage areas and small streams as well as erosion prone areas, Sickle bush could be cut and used to *"brush pack"* these problem areas to protect it. This will also restrict movement of animals and humans over sensitive erosion probe areas until pioneer vegetation has established.

5.5 TOPSOIL, STOCKPILES AND BACKFILLING

The manner in which topsoil and stockpiles are created and maintained is important with regards to the implementation of a successful rehabilitation process. Soil management practices must be adhered to in order to reduce soil loss and to encourage rehabilitation post-construction. The two most important aspects to consider when removing topsoil are the depth of soil to be removed and the conditions of storage.

The topsoil layer (0-25 cm) is important as it contains nutrients, organic material, seed, and communities of micro-organisms, fungi and soil fauna. The biologically active upper layer of soil is fundamental in the development of soils and the sustainability of the entire ecosystem. The correct handling of topsoil is vital in conserving the seed bank and nutrients which occur within this layer thereby ensuring successful rehabilitation.

- Topsoil must only be used for rehabilitation purposes and not for any other use example i.e. construction of roads.
- Previously excavated areas on the site should be backfilled with suitable topsoil, levelled to resemble the surrounding topography and slopes and scarified for re-vegetation/re-seeding.
- On steeper slopes rehabilitation measures may include systems such as soil terracing, berm creation, grass blocks, fascine work, gabion basket work, reno mattresses, retaining block mechanisms, sand bags, boulder and rock placement, stone pitching, and grading.
- Erosion control netting or matting (GeoJute or Bio-Jute) may be utilised on steep slopes to assist with soil retention, weed control and vegetation establishment. The netting material helps protect the soil from wind and water erosion, and the required rehabilitation plant material can be installed by making small incisions for planting. The netting is biodegradable and will eventually break down and form a mulch layer.

5.6 COMPACTION REHABILITATION MEASURES

Soil compaction is often an effect of high traffic areas on development sites. It can become a major problem and can be recognized by:

- Excess surface moisture and slow drying soils due to deeper compaction preventing the percolation of water through the soil profile;
- Water runoff due to surface compaction preventing penetration and absorption (ponding of water), especially on banks and sloping surfaces.
- Large clear or sparsely covered areas devoid of a good vegetative cover due to hardened topsoil layers

Rip and/or scarify all disturbed areas, including roads that are no longer in use (preferably before the rainy season). Do not rip and/or scarify areas under wet conditions, as the soil will not loosen. Compacted soil can also be decompacted by “Rotary Decompactors” to effectively aerate soils for vegetation establishment.

5.7 EROSION REHABILITATION MEASURES

Water has the gift to sustain life, but also the potential to maim, damage and destroy if not managed correctly. Remedial actions must be established to ensure that potential erosion is addressed with an erosion control strategy towards long-term rehabilitation. It is important to take note of the following generic points regarding erosion risks in the study area:

- Soil loss will be greater during wetter periods. However, the provision of erosion control measures for the through the drier months of the year is equally as important;
- Soil loss from the site is proportionally related to the time the soils are exposed, prior to rehabilitation. The time from commencement of rehabilitation activities to finalization thereof should be limited. Rehabilitation efforts should commence as soon as practical;

- Construction staging and progressive/concurrent rehabilitation is important; and
- The extent of the disturbance that will take place will influence the risk and consequences of erosion on the site.
- Avoid over-wetting, saturation and unnecessary run-off during dust control activities and irrigation.
- Retain natural indigenous grass and shrubs and re-vegetate bare areas as soon as possible.

5.8 RE-VEGETATION

Plant species that have been rescued or removed and relocated to the temporary nursery could be used in replanting rehabilitation areas. Additional plant material (indigenous trees) as required should be sourced from local indigenous nurseries and specifications regarding plant sizes, heights and the installation process of these plants should be developed by the On Site ECO and Rehabilitation Specialist. Standard horticultural best practice would apply, with specific reference to the fact that the plant material would have to be in good condition, free from pests and diseases (any such plant would have to be removed from the site), well formed and well rooted, potting materials are weed free and with sufficient root cover. Groundcovers and sedges are often supplied in trays, and the same standards would apply.

- A grass seed specification for reseeding the rehabilitated areas is included below. Re-grassing should be undertaken (as far as possible) during the summer months, as germination and establishment is best at this time of year. Spring rains are also conducive to good germination results, and as such rehabilitation programmes should take these factors into consideration.
- There are two methods for seeding, hand broadcasting and hydro-seeding. The methods utilised will be site specific and the On Site ECO and Rehabilitation Specialist will determine them.
- In certain areas grass runners may be required, and grass sods where instant cover is necessary.
- A typical grass seed mixture (hand sowing) that could be implemented for rehabilitation activities will include: (specification 4-5kg/ha)
    - *Eragrostis tef* (Tef)
    - *Eragrostis curvula* (Weeping Love Grass)
    - *Digitaria eriantha* (Smutsvinger)
    - *Cynodon* spp. (Bermuda kweek)
    - *Panicum maximum* (Witbuffel)
    - *Chloris gayana* (Rhodes grass)
    - *Paspalum notatum* (Bahia Grass)

5.9 INVASIVE PLANT SPECIES

The Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) holds landowners legally responsible for the control of invasive alien plants on their properties.

Control involves killing the plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion. Weeds and invader plants will be controlled in the manner prescribed for that category by the Conservation of Agricultural Resources Act or in terms of Working for Water guidelines.

Scientists and field workers use a range of methods to control invasive alien plants. These include:

- Mechanical methods - felling, removing or burning invading alien plants.
- Chemical methods - using environmentally safe herbicides.
- Biological control - using species-specific insects and diseases from the alien plant's country of origin. To date 76 bio-control agents have been released in South Africa against 40 weed species.
- Integrated control - combinations of the above three approaches. Often an integrated approach is required in order to prevent enormous impacts.
- The Contractor is responsible for the control of weeds and invader plants within the construction site for the duration of the construction phase. Alien invasive tree species such as black wattle and blue gum should be eradicated.
- Control involves killing the plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion. Weeds and invader plants will be controlled in the manner prescribed for that category by the Conservation of Agricultural Resources Act or in terms of Working for Water guidelines.
- Institute an eradication/control programme for early intervention if invasive species are detected, so that their spread to surrounding natural ecosystems can be prevented.
- Rehabilitate disturbed areas as quickly as possible to reduce the area where invasive species would be at a strong advantage and most easily able to establish.
- Institute a monitoring programme to detect alien invasive species early, before they become established and, in the case of weeds, before the release of seeds.
- During site visits in August 2012 no serious problem areas in terms of invasive plants were noticed apart from a few solitary species like the Prickly Pear (*Opuntia spp*.) Invasive plants should be monitored and eradicated as soon as they appear on the property.

5.10 FIRE HAZARD

Wildfires can be started both by people and by acts of nature. They are often associated with slash and burn activities, which in times of drought, can pose greater hazards. Negligence of people often plays a major role in such a hazard. Factors affecting the impact of vegetation fire hazards are:

  - Vegetation dryness (moisture content and amount of living vegetation);
  - Changes in weather variables that influence the spread and intensity of fires;
  - Availability of combustibles; and
  - Long term drought in the dry season.

- The grass cover along the boundary fences of the adjacent properties should be kept short (30 cm) in order to minimise the fire hazards;
- Adequate precautions have to be taken to ensure that fires are not started on site;
- Do not permit any fires or open flames anywhere on the site, except at designated areas;
- Cleared vegetation must not be burned on the site.

5.11 FAUNA

- Rehabilitation should be done to ensure that fauna which occurred in the area of the solar farm return to the area. The reduction of construction activities and vehicles on the site should allow faunal populations to utilise the rehabilitated area once again;
- If pesticides or herbicides are used, the products should be chosen responsibly to act in accordance with the sensitive environment and associated ecology. Storage, administering and disposal must be done according to the prescribed methods. Care should be taken to prevent any of the pollution from ending up in the drainage channels;
- The restoration or rehabilitation actions will need the implementation of a faunal monitoring program as a barometer for the management to recognise positive changes and trends in the biodiversity of the development area during and after closure. The objectives of such a programme may include:
  - Assessment of future improvement/deterioration of the faunal biodiversity of the area (thus a measure of success of environmental management);
  - Increase the accuracy of present status determination (actual species present vs. expected species) of the area with every survey;
  - Determination of both temporal and spatial trends in faunal biodiversity on the area;
  - Assist in future management of the area by providing recommendations and guidelines regarding future activities and rehabilitation;
- Biodiversity management actions during closure should include controlling and monitoring of numbers of alien invasive fauna numbers by eradication, habitat modification, resource limitation and public education.

- Young nutrient rich growth may entice herbivores to rehabilitated areas. The increased grazing pressure may decrease the rate of rehabilitation. Herbivore-proof fencing or brush packing may be required around the rehabilitation zones in the early stages to protect seedlings from grazers if grazing pressure is found to significantly affect growth;
- Revegetation programs will include consideration of the possibility of reconstructing fauna habitats. Old salvage logs from cleared areas will be replaced after construction where possible, to provide habitat for fauna;
    - Key fauna species will be identified and targeted for re-colonisation where appropriate. Edible seed bearing plants, perennial grasses and sedges may be seeded or planted to encourage re-colonisation by native fauna.

6 REHABILITATION AND REVEGETATION OF THE SITE

The following methods and principles apply for rehabilitation purposes:

- All areas where material will be removed for backfill and rehabilitation construction purposes should be graded and shaped in such a way as to resemble the natural surrounding landscape;
- All bare areas should be ripped/scarified;
- A grass seed specification for re-seeding the rehabilitated areas is provided below. Re-grassing should be undertaken (as far as possible) during the summer months, as germination and establishment is best at this time of year. Spring rains are also conducive to good germination results, and as such rehabilitation programmes should take these factors into consideration.
    - There are two methods for seeding, hand broadcasting and hydroseeding. The methods utilised will be site specific and the on Site ECO and Rehabilitation Specialist will determine them.
    - In certain areas grass runners may be required, and grass sods where instant cover is necessary.
    - A typical grass seed mixture (hand sowing) that could be implemented for rehabilitation activities will include: (specification 4-5kg/ha)
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        - *Cynodon spp.* (Bermuda kweek)
        - *Panicum maximum* (Witbuffel)
        - *Chloris gayana* (Rhodes grass)
        - *Paspalum notatum (Bahia Grass)*

7 MAINTENANCE AND MONITORING

Several methods exist to monitor rehabilitated areas to scientifically prove that a self-sustainable ecosystem has developed or show a positive trend towards successful rehabilitation. This will prove that environmental degradation and biological diversity have been mitigated and restored where it has been negatively impacted upon. The important aspect to keep in mind is that it is not only a visual inspection, but measurable information gathering e.g. water samples, soil samples, vegetation diversity, biomass, basal cover, species composition etc. The monitoring data must be of such a standard that meaningful conclusions can be made and a trend indicated. Good record keeping is essential. All illegal invader plants and weeds shall be eradicated as required in terms of Sections 119 to 126 of The National Environmental Management Act.

Monitoring should take place on regular time intervals to establish if the revegetation strategy was successful. The site must be monitored for at least two years in order to observe any possible invasion by alien species and, if they appear, they must be controlled as is appropriate. Also to monitor and correct possible erosion, storm water and siltation problems. Soil sampling and analysis should be done every two years to monitor the development of the soil and need for supplementary fertilization.

8 REFERENCES

GERMISHUIZEN, G., MEYER, N.L., STEENKAMP, Y and KEITH, M. (eds.) (2006). A checklist of South African plants. Southern African Botanical Diversity Network Report No. 41, SABONET, Pretoria.

Henning B. 2014. Specialist ecological study for the proposed Rhodes 2 Solar Park. Exigo Sustainability (Pty) Ltd.

IUCN (2001). IUCN Red Data List categories and criteria: Version 3.1. IUCN Species Survival Commission: Gland, Switzerland.

MUCINA, L., RUTHERFORD, M.C., PALMER, A.R., MILTON, S.J., SCOTT, L., VAN DER MERWE, B., HOARE, D.B., BEZUIDENHOUT, H., VLOK, J.H.J., EUSTON-BROWN, D.I.W., POWRIE, L.W. & DOLD, A.P. 2006. Dwaalboom Thornveld. In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

MUELLER-DOMBOIS, D. AND ELLENBERG, H. 1974. Aims and methods of vegetation ecology. Wiley, New York.

RUTHERFORD, M.C. & WESTFALL, R.H. (1994). Biomes of southern Africa: an objective categorization. Memoirs of the Botanical Survey of South Africa No. 63.

9 APPENDIX A. PLANT SPECIES LISTS FOR SITE

Tree & shrub species	Grass species	Dwarf shrubs, Forbs, succulents & geophytes
Acacia erioloba	*Aristida congesta*	*Acanthosicyos naudinianus*
Acacia haematoxylon	*Aristida meridionalis*	*Argemone ochroleuca*
Acacia hebeclada	*Digitaria eriantha*	*Bulbostylis hispidula*
Acacia mellifera	*Enneapogon cenchroides*	*Chrysocoma obtusata*
Gewia bicolor	*Enneapogon desvauxii*	*Citrullis lanatus*
Terminalia sericea	*Eragrostis echinocloidea*	*Cleome angustifolia*
Ziziphus mucronata	*Eragrostis pallens*	*Convolvulus sagittatus*
Grewia flava	*Melinis repens*	*Crotalaria orientalis*
	Panicum coloratum	*Cucumis zeyheri*
	Schmidtia kalaharense	*Cyperus obtusiflorus*
	Stipagrostis amabilis	*Dicerocarium eriocarpum*
	Stipagrostis hirtigluma	*Elephanthorhiza elephanthina*
	Stipagrostis obtusa	*Giseckia africana*
	Tragus racemosus	*Heliotropium ciliatum*
		Hermbstaedtia fleckii
		Hirpicium echninus
		Indigofera alternans
		Indigofera charlieriana
		Ipomoea magnusiana
		Kedrostis africana
		Kohautia caespitosa
		Limeum argute-carinatum
		Limeum viscosum
		Momordica balsamina
		Monechma genistifolium
		Oxygonum delagoense
		Pavonia burchelli
		Pergularia daemia
		Polygala spp.
		Pupalia lapaceae
		Senecio eenii
		Senna italic
		Sesamum triphyllum
		Sida cordifolia
		Tribulis terrestris
		Verbesina encelioides
		Walafrida saxatalis
		Xenostegia tridentate