

RE-VEGETATION AND HABITAT REHABILITATION PLAN

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Project Title:

The proposed development of a 225MW solar photovoltaic (PV) facility on several portions of farms in the Hanover district, Emthanjeni local municipality, Pixley Ka Seme district municipality; Northern Cape province.

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DEFINITIONS & ACRONYMS

- **Acceptable cover:** means that the planted area sown, hydro-seeded or planted shall be covered with live plants, mimicking species composition and abundance of undisturbed surrounding vegetation, to allow for seasonal and climatic variability (which would not be factored in when comparing to baseline values). The Applicant, including his agents, shall determine the areas or portions of land that shall be assessed for acceptable cover, and these shall then remain fixed for the purposes of maintenance and final hand over. Acceptable cover shall be measured using the same procedure/s utilised during the baseline studies, to ensure all results are comparable. In areas where surface rocky outcrops, naturally degraded areas occur due to inappropriate land-use practices, duplex soils, faulty road alignment, design and drainage that concentrated runoff resulting in canyonized gullies these areas shall be acceptable if all the requirements of this Section have been executed and a stable surface area, not prone to erosion, is left.
- **Ameliorants:** Is a substance that aids plant growth primarily by improving the physical condition of the soil.
- **Biosome:** A unique range of products / indigenous seed mixtures to certain areas in South Africa.
- **Chemical Fertiliser:** Soil amendments applied to promote plant growth and contain main nutrients normally of Nitrogen, Phosphorous and Potassium.
- **Hydro-seeding:** means mixing the specified seed mix into a slurry with water and other materials, such as anti-erosion compound, mulch and fertiliser and applying this mixture by means of a spraying device onto the prepared ground areas to be seeded.
- **Maintenance period:** means the period after the establishment period during which the Contractor shall be responsible for maintaining the grass cover to the standard of acceptable cover. This maintenance period shall not be less than one year, shall include one growing season and may extend, as may be appropriate, beyond the expiry of the Defects Notification Period for the other Sections of the Works.
- **Organic material:** Is the organic matter component of soil. Can be divided into 3 pools; living biomass of micro-organisms, fresh and partially decomposed residues and humus; the well decomposed organic matter and highly stable organic matter.
- **Prehistoric compost:** Prehistoric compost is a product mined in areas where natural pressure on areas has not completed the cycle to form coal, creating a product rich in carbon on which micro-organisms feed, this product developed for the agricultural market enables agronomists to boost micro- organism numbers in soil ensuring longevity by making food available to micro-organisms. With the right amount of carbon [food] and the right balance of micro-organisms, a sustainable product can be made.
- **Preparing topsoil for seeding:** means doing the final preparation of the seed bed for seeding – includes loosening topsoil or growing medium, tilling to form horizontal drills approximately 150mm apart and deep, parallel to the contours.
- **Ripping:** means loosening the in-situ and backfilled soil by means of a mechanical ripper, in areas to be rehabilitated to a depth of at least 300 mm. Ripping is done to mitigate compaction resulting from construction activities, leaving no section of soil undisturbed, and is done prior to placing topsoil.
- **Scarifying:** means loosening the soil in areas which have become hard and compacted after ripping was done, and which need to be loosened in order to facilitate re-vegetation. Scarifying is done to a depth of at least 150 mm. Scarifying may also be required on topsoil that has form a crust in order to create a seedbed suitable for seeding. Scarifying

can be achieved with the use of several possible implements, depending on the in situ soil conditions, including disc ploughs & rotavators.

- **Sensitive area:** means any area that is denoted as sensitive in any maps or Specialist Reports due to its particular attributes, which could include the presence of rare or endangered vegetation, the presence of heritage resources (e.g. archaeological artefact or graves), the presence of a unique natural feature and the presence of a watercourse or water body etc.
- **Shaping:** means finishing all slopes which do not form part of the Permanent Works so that they blend with the existing adjacent landforms and such that resultant slopes do not exceed a maximum gradient of 1:5 (V:H), unless otherwise directed by the Engineer. Traverse of steep land requires a high standard of grass establishment and maintenance to protect the soil cover. Experience is that at steeper than 1:5 there is a high risk that topsoil with fertilizer and grass seed or establishing seedlings will be washed off before sufficient cover develops to protect the slope.
- **Topsoil:** means topsoil from stockpile previously stripped by the Contractor from the areas of the Works.
- **Trimming:** means bringing the existing or previously shaped ground to a smoothly flowing surface with the final levels generally following the original topography, and to blend in with the landform around permanent structures.

INTRODUCTION

The purpose of this method statement is to define the protocols relating to landscaping and rehabilitation to achieve acceptable re vegetation / acceptable cover, the roles and responsibilities of all parties involved in the project.

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1. SCOPE OF WORK

The Scope of Works requires rehabilitation to restore areas to pre-construction land capability.

2. MATERIALS AND EQUIPMENT LIKELY TO BE USED

Equipment and material to be used:

- TLB;
- Tiller;
- Agrivator;
- Disc Implement / Plough;
- Mechanical Spreader;
- Hydro-Seeder;
- Water Truck;
- Agricultural Planter;
- Rotavator;
- Organic Fertiliser;
- Treated Grass Seed;
- Rescued Plants;
- Fibre Mulch;
- Hand Tools;
- Back Packs;
- Bakkie.

The equipment to be used will depend on site specifics including access and availability of supplies; find the following descriptions:

- **RIPPER / TRACTOR:** Prior to topsoil replacement ripping will be completed to uncompact the soil which will aid infiltration of ameliorants and improve effective root depth for recruiting plants. Trimming and shaping will be applied to ensure that the construction area blends- and ties-in with the existing soil profile.
- **TRACTOR/ TILLER / AGRIVATOR/DISC:** Prior to seeding the soil needs to be prepared by scarifying the topsoil by means of a tractor combination with tiller and agrivator / disc.
- **TRACTOR/ MECHANICAL SEEDER:** Seeding will be done with a tractor or mechanical seeder. This combination will only be used for slopes not steeper than 1:3-1:5.
- **TLB:** will be used especially for topsoiling of slopes in combination with a work team and hand tools (i.e. rakes).
- **MECHANICAL FERTILIZER SPREADER/TRACTOR COMBINATION:** will be used on slopes not steeper than 1:3 – 1:5.
- **HYDROSEEDING MACHINE:** to apply wet slurry with seed, soil binder and fertilizer mix on slopes of more than 1:5.

- **ROTARY BACK PACK SPREADER:** When seeding is to be done in areas where there is no access for machinery, a rotary rucksack spreader is to be used for spreading seed / mulch / fertilizer. Soil preparations in these areas are to be prepared with hand tools, picks, spades and wheelbarrows.
- **AGRICULTURAL PLANTER:** Agricultural land will be re-planted with an agricultural planter.
- **WATER TRUCK:** is to be used wherever flora has not re-established satisfactorily.

To ensure best landscaping and rehabilitation practices all raw materials used during this phase will be within the prescribed usage dates ensuring longevity of plants and maximum erosion protection.

2.1 Fertiliser (Application only after topsoil sampling)

Soil samples will be taken for analysis to determine the balance of elements.

2.1.1 Assessing the type and quantities of fertilisers:

2.1.1.1 To ensure that the correct type and quantities of fertiliser is applied during the rehabilitation process, soil samples will be taken at regular intervals and will be analysed by an independent laboratory.

2.1.1.2 Upon analysis a qualified agronomist is to prescribe the type and quantity of fertiliser to be used.

2.1.2 Grass seed mixtures

2.1.2.1 Type and quantity of grass seed:

2.1.2.2 Grass seed can be harvested from the surrounding veld following permission from the affected landowner/s. In absence of local harvested seed, commercial seed may be used. Grass seeds can further be harvested and stored during the pre-construction phase, prior to any impacts to in situ vegetation.

2.1.2.3 The recommended planting months are between October and December over the rainy season.

3. TIMEFRAMES OF EACH ASPECT OF REHABILITATION

3.1 Phasing of rehabilitation: This will depend on the contractor's production schedules and access to completed work areas as per the contractor's programme. Since vegetation is the most effective control against surface erosion, the landscaping and rehabilitation of disturbed areas shall occur as soon as practically possible following the completion of the work in a specific area. However, while preparatory work may continue outside of the growth season the planting of grass shall be carried out during periods most likely to produce beneficial growth results viz., during the period mid-October of any particular year to mid-January of the following year. The Contractor must programme his operations in such a manner to accommodate this requirement.

3.2 Composting/ organic material (fertilising): To improve water retention and the organic composition of the topsoil, the organic material removed during clear and grub will be reinstated with the topsoil as well as additional imported compost and / or kraal manure, as per an approved fertiliser design.

3.3 Sequence of rehabilitation methods: Shaping, ripping, scarifying, topsoil, preparing areas for seeding and seeding (application of fertiliser as required).

3.3.1 To ensure that grassing takes place during the months specified in the specification all soil preparation required up to and including the topsoil placement is to be completed once a specific area is handed over to the responsible Landscaper.

3.4 Grassing

3.4.1 Where areas are to be grassed as matter of urgency outside of the optimal growing season, such areas are to be monitored to ensure that dormant seeds germinate during favourable conditions. Grass sods will be considered preferentially in these cases. Should these areas not establish adequately, the area may need to be over-seeded or re-planted.

4. PREPARATION OF AREAS FOR REHABILITATION

4.1 Preparation of ground surfaces:

4.1.1 Prior to landscaping and rehabilitation of an area, everything not forming part of the Permanent Works, including but not limited to temporary services and facilities (including foundations), temporary fences (excluding the construction servitude fencing which will be removed after acceptable cover has been attained and the Defects Notification Period is complete), temporary access routes and all fill or wearing coarse material used for routes, watercourse diversions, protective works, dewatering systems and settlement ponds shall be demolished and removed from that area.

4.1.2 All material generated from the demolition and removal of structures from site shall be appropriately disposed of as per Waste Management Plan in the EMP.

4.1.3 In this regard building rubble may not be disposed of at borrow pits.

4.1.4 Excavated surfaces that will remain permanently exposed on completion of the Works shall be cleared of all loose material, pieces of rock, debris, rubbish and the like and left neat and tidy.

4.1.5 If required for subsequent grassing or for the establishment of natural vegetation, the final surface of excavations shall not be absolutely smooth, but shall have a slightly rough surface.

4.2 Shaping:

4.2.1 All slopes which do not form part of the Permanent Works shall be graded so that no slope exceeds a maximum gradient of 1:5.

4.2.2 Contour drains (swales) will be provided to control erosion and attenuate storm water runoff.

- 4.2.3 Excavation and fills for Temporary Works and spoil areas shall be formed in such a manner that the final profile shall appear as a natural extension to the adjacent, undisturbed ground profiles.
- 4.2.4 Where required appropriate level control measures will be implemented to ensure that final shaped profiles match the pre-construction landform as far as possible.

4.3 Ripping

- 4.3.1 To ensure sufficient water infiltration and ease of amelioration, all construction areas are to be ripped after completion of shaping activities.
- 4.3.2 All soil to be rehabilitated shall be ripped with a mechanical ripper to a depth of 300 mm.
- 4.3.3 No section of ground shall remain undisturbed after ripping.

4.4 Scarifying

- 4.4.1 Prior to the application of topsoil, the ground surface shall be scarified by hand or tiller to a depth of approximately 10-15cm to breakdown soil clods.
- 4.4.2 Where topsoil has been placed, and a crust has formed, scarifying shall be repeated to break the crust prior to establishing vegetation.

4.5 Replacement of topsoil and trimming

- 4.5.1 Topsoil will be reinstated after ripping and scarifying activities.
- 4.5.2 Trimming will consist of bringing the existing or previously shaped and ripped ground to a smoothly flowing surface with the final levels generally following the original surface after shaping.
- 4.5.3 Both mechanical and hand trimming could be undertaken.
- 4.5.4 Trimming shall be done in such a way that, after cultivation and application of topsoil, the finished surface of the area shall blend with the surrounding areas outside the servitude.
- 4.5.5 Top soiling cut, fills and spoil slopes.
 - 4.5.5.1 All cut, fill and spoil slopes, where rehabilitation is to be completed, topsoil replacement by applying the stored topsoil is to commence.
 - 4.5.5.2 The topsoil is to be placed and spread using appropriate mechanical equipment. The placed soil is to be raked by hand or mechanically to ensure a smooth finish.
 - 4.5.5.3 In order to ensure the correct depth of topsoil is returned, a pegging system will be used to maintain the levels during placement.
- 4.5.6 Top soiling in horizontal layers
 - 4.5.6.1 On gentle slopes and flat areas topsoil is to be spread by pushing the stored topsoil stockpiles over the prepared areas using appropriate mechanical equipment. The topsoil is to be spread to the thickness at which it has been stripped.



Figure 1: Example of land scarification.

4.6 Removal of rock, stones and roots

4.6.1 All rocks and stones larger than 100 mm maximum dimension, roots and other material with maximum dimension of 300 mm brought to the surface by shaping, ripping, trimming or scarifying, shall be removed prior to placing of topsoil and disposed of.

4.7 Fertilising

4.7.1 After placement of topsoil all areas to be grassed are to be fertilised by spreading the fertilisers either by hand, manure spreader or hydro-seeders at the recommended rate.

4.7.2 Liquid fertiliser is to be mixed in the hydro-seeding slurry as recommended.

4.7.3 **Sampling:** The rate of application is to be determined by the soil analyses and stipulated in the approved fertiliser designs.

4.8 Preparing topsoil for seeding

4.8.1 To ensure maximum moisture retention and minimum erosion all areas to be seeded will be prepared by scarification to prepare soil and to create optimal conditions for seed germination.

4.8.2 Scarifying:

4.8.2.1 The most commonly used method is to pull an agricultural implement such as a tiller or scarifier horizontally along all slopes with tractors in order to create "V" shaped furrows not spaced wider than 250mm-300mm and 25mm-30mm deep.

4.8.2.2 Seed is deposited from mechanical seeders onto the soil surface maximizing seed to soil contact; natural conditions will create accumulation of nutrients and moisture in the lowest point of the "V" shaped furrows.

4.8.2.3 The preferred method to be used will be dependent on availability and access.

5. RE-VEGETATION

5.1 Hand seeding:

- 5.1.1 If hand seeding is the preferred method of grass establishment, the specified seed mixture is to be mixed as per specification.
- 5.1.2 The area seeded will be rolled where possible with the land imprinter ensuring adequate seed to soil contact.

5.2 Hydro-seeding:

- 5.2.1 All seeding to be done after scarifying, with a hydro-seeder capable of keeping a slurry of seed, mulch and fertilizer (if applicable).
- 5.2.2 Anti-erosion compounds can consist of an organic or inorganic material to bind soil in such way as to suppress dust and form encrustation.
- 5.2.3 Application will depend on manufacture's specification, fibre mulch is a light fibre substance that is mixed with hydro-seed slurry to apply wet or when applied dry with a fertilizer spreader.



Figure 2. An example of hydro-seeding application.

- 5.2.4 Encrustation should not affect germination negatively.
- 5.2.5 During search and rescue, harvested seed of shrubs, Aloes and trees will form part of the slurry mix and apply sporadically to blend in with existing flora and the local environment.

5.3 Seed mixture:

- 5.3.1 In essence the target is to establish a vegetation cover which consists of not only palatable grasses but grasses which occur naturally in the region / biome.
- 5.3.2 For seed application, the baseline vegetation study & surrounding vegetation conditions will be considered in the selecting of seeds.

- 5.3.3 The following methods of access control may be considered and implemented by the contractor:
 - 5.3.3.1 Fencing of sensitive areas;
 - 5.3.3.2 Agreements with the landowners by appointing herd boys to control the livestock within the solar PV area;
 - 5.3.3.3 Providing feed in a designated area to lure the livestock away from sensitive areas;

6. ESTABLISHMENT AND MAINTENANCE OF RE-VEGETATED AREAS

6.1 Responsibility for establishing an acceptable cover:

- 6.1.1 The establishment of an acceptable cover, as defined previously, shall include maintaining the surface to the required slopes and levels without erosion or sedimentation, weeding, fertilising, and any other procedure consistent with good horticultural practice necessary to ensure normal, vigorous and healthy growth of the plant material on site.

6.2 Maintenance of vegetation

- 6.2.1 Maintenance of the vegetation will commence when an acceptable cover as defined above has been established, and these shall then remain intact for the period of maintenance (not less than one year) and final hand over.
- 6.2.2 During this period, the rehabilitated areas will be maintained through weeding, fertilising, disease and insect pest control, mowing or slashing and any other procedure consistent with good horticultural practice necessary to ensure normal, vigorous and healthy growth of the plant material.
- 6.2.3 In all cases the cover at the end of the Maintenance Period shall not be less than acceptable cover.

6.3 Weeding of re-vegetated areas

- 6.3.1 The re-vegetated areas shall be kept free of weeds and invasive vegetation.
- 6.3.2 Weeds shall be predominantly controlled by means of pulling.
- 6.3.3 Where chemical control of weeds is implemented, the work is to be carried out by personnel suitably qualified to do this type of work in terms of the relevant legal requirements.
- 6.3.4 Only when chemical control of weeds will be considered, a register of identified chemicals for this purpose will be provided with its MSDS.
- 6.3.5 Environmentally friendly, selective herbicides will be applied.

6.4 Traffic on re-vegetated areas

- 6.4.1 Re-vegetation of areas requiring permanent cover, will not commence until all operations that may require construction equipment to pass over those areas, has been completed.
- 6.4.2 All re-vegetated areas shall be regarded as “no go” areas, and no construction equipment, trucks or water carts (other than those used for watering of established vegetation) will be allowed on these areas and only equipment required for the preparation of areas, application of fertilizer,

spreading of topsoil, and watering will be allowed to operate on re-vegetated areas.

- 6.4.3 In all cases traffic should use the defined maintenance tracks, which will be rehabilitated at the end of the period for which access is required.

7. EROSION CONTROL AND SENSITIVE AREAS

7.1 Erosion Control

- 7.1.1 During construction, the Contractor will protect all areas susceptible to erosion by installing all necessary temporary and permanent drainage works as soon as possible.
- 7.1.2 Other measures such as the construction of gently sloping mounds approximately 200 mm in height as may be necessary to prevent the concentration of surface water and scouring of slopes, banks and other areas. This will apply to all shoulders of slopes where erosion control measures will be implemented.
- 7.1.3 Any runnels or erosion channels developing during the re-vegetation period or during the period within the project footprint, will be backfilled and consolidated and the areas restored to a stable & functional state, in all cases the cause of the erosion problem/s will be identified and rectified.
- 7.1.4 It will not be permitted to allow soil erosion to develop before affecting repairs, and all erosion damage will be repaired as soon as possible.
- 7.1.5 All topsoil or other material accumulated in side drains shall be removed and reinstated onto the rehabilitated surface.
- 7.1.6 Topsoil washed away shall be replaced.
- 7.1.7 Erosion of rehabilitated areas must not be allowed due to pedestrian access, or domestic animal tracks.

7.2 Gully erosion control (dongas)

- 7.2.1 In areas where “naturally” degraded areas are present, which resulted due to inappropriate land-use practices (subjected to annual cropping or over-grazing, or because of faulty road alignment, design and drainage) and / or duplex soils, that require a perennial grass cover for maintenance and have been exposed to concentrated runoff resulting in gullies (dongas) that grow ever deeper, wider and longer, special attention will be required.
- 7.2.2 There will be a need to identify and classify all gullies within the project area and suggest appropriate measures to control gully erosion. These site-specific methods will be attached as an addendum to this method statement identifying all areas; these could include:
- 7.2.2.1 Gully reshaping and filling
- 7.2.2.1.1 The practicability of shaping will depend on the size and the amount of fill required to restore the gully to its desired shape.
- 7.2.2.1.2 Steep gully sides must be reshaped.
- 7.2.2.2 Controlling gully heads
- 7.2.2.2.1 Options for controlling gully head erosion include:
- 7.2.2.2.1.1 Diversion banks to divert run-off from the gully head to a stable outlet.

- 7.2.2.2.1.2 Forming chutes through battering gully heads to an acceptable slope. The objective is to convey run-off safely to a lower level. These chutes should be lined with erosion-resistant materials such as erosion control mats, rock, rock mattresses, concrete, etc.
 - 7.2.2.2.1.3 Use of drop structures to allow run-off to drop vertically to a lower level, where the energy is dissipated before flowing down the watercourse. These could be constructed from concrete, concrete blocks, gabions, timber or steel plate. Gabions and rock mattresses have an advantage of being flexible and permeable.
 - 7.2.2.2.1.4 The construction of gully control dams situated in such a manner that they “drown” the gully head when the spillway is operating.
- 7.2.2.3 Gully floor stabilisation:
- 7.2.2.3.1.1 The objective to ensure long-term stabilisation depends on establishing a good vegetative cover on the gully floor to gradually silt up reducing the fall over the gully head.
 - 7.2.2.3.1.2 A series of small weirs made from wire netting or concrete can trap sediment which encourages vegetative growth.

8. QUALITY ASSURANCE

To ensure best horticultural practice during the landscaping and rehabilitation phase, the Landscaper/s will have a qualified manager on site at all times, the Landscaping manager will liaise with the main contractor or operator before completing any works. All work is to be started once an area is signed over to the landscaping contractor; records of measurements and quantities completed are to be kept and signed by the main contractor.

9. SECURITY

- All access gates must be closed and locked when crossing through private farm land as per each landowner’s requirements. No vehicular movement is allowed after dark and before sunrise.
- Speeding is not allowed, and all vehicles are to travel with caution when passing through farm land.
- No firearms are allowed on site unless permission has been granted by the landowners. Should a firearm be discharged, this fact must be reported to the local branch of the South African Police Service.

10. COMMUNICATION ROLES AND RESPONSIBILITIES

Awareness and induction training will be held to communicate the procedures and protocol of access as outlined above.

11. GENERAL

Modifications to this Construction Method Statement may be required from time to time, which will need to be approved by the holder of the Environmental Authorisation.