


(v) The Impacts and Risks

DOCUMENT CONTROL

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“(v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts-
(aa) can be reversed;
(bb) may cause irreplaceable loss of resources; and
(cc) can be avoided, managed or mitigated;”

The general objective of integrated environmental management is, *inter alia*, to “*identify, predict and evaluate the potential and actual impact on the environment, socio-economic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities, with a view to minimising negative impacts, maximising benefits, and promoting compliance with the principles of environmental management*”. – (Section 23(2)(b) of NEMA 107 of 1998)

Ecoleges sets out to identify impacts and suggest mitigations by following the logical sequence of steps illustrated in **Figure 1**. A clearly defined scope is absolutely critical for creating the mould within which the EMPr shall be cast. Environmental impacts are defined as any change to the environment, whether adverse or beneficial, wholly or partially resulting from those elements of the proposed activities that can interact with the environment. Consequently, the

activities need to be identified (step 2) before their impacts (step 3) can be predicted. Step 4 is incorporated as a safety net to capture those elements that are not identified in the previous two steps. Finally, mitigations are sought and tailored to counteract the project-specific impacts and achieve particular goals and objectives in line with environmental best practices.

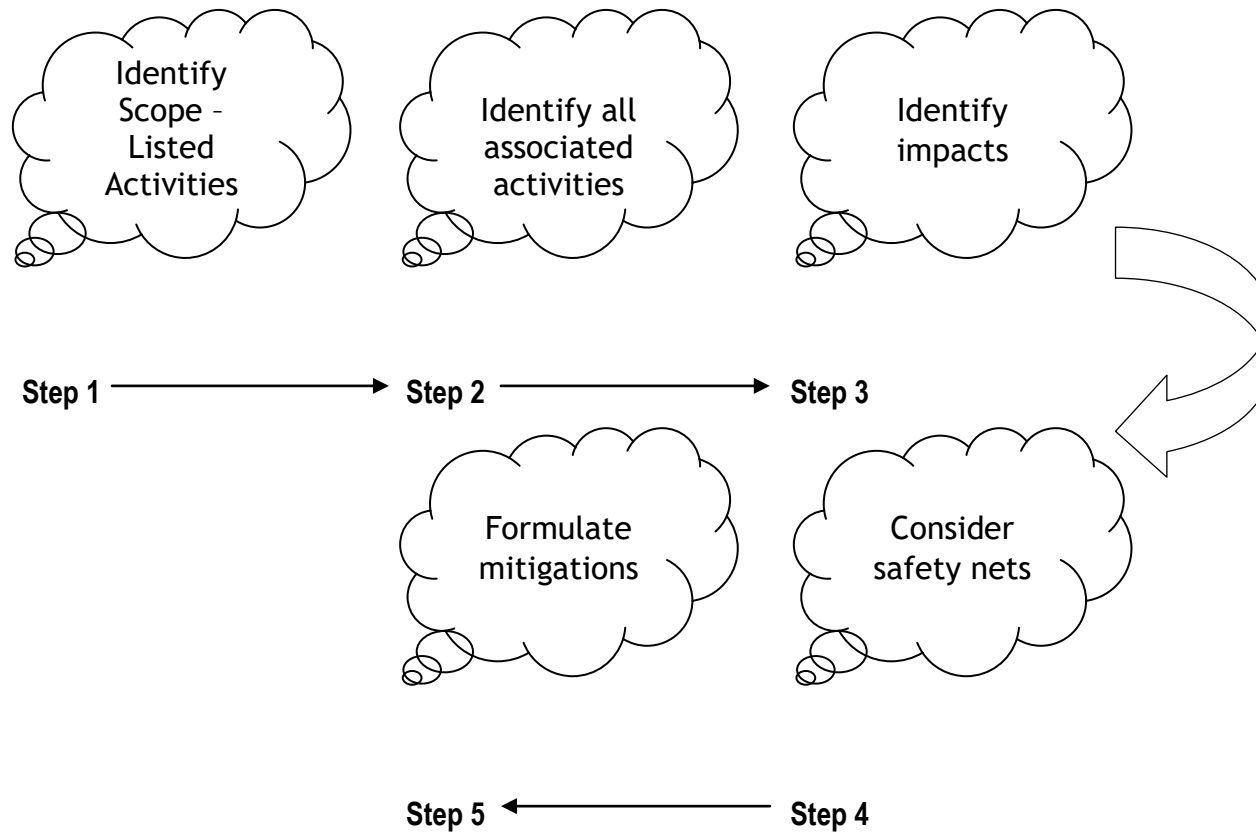


Figure 1: Procedure for identifying the project-specific mitigation of activities.

Identification of Activities

Table 1 (in **SECTION D** of the Environmental Impact Assessment report (EIAR)) includes the Listed Activities identified in terms of GN No. R. 983 & R. 984, as amended, and a description of the associated actual activities to be undertaken by the applicant: The first column in **Table 1** identifies the activity number and Listing Notice; the second column illustrates the listed activities; and the third column describes the actual activities proposed by the applicant, and which triggered the aforementioned listed activities.

Table 1 (in this Impact Assessment report) describes all of the activities that will be undertaken during the lifespan of this project including the identified listed activities (**Table 1 of EIAR**) and associated activities that in their own right do not require environmental authorization, but are needed to achieve the desired objective, that is the supply of renewable energy via:

a 225MW solar photo-voltaic (PV) farm, comprising 3 interconnected 75MW plants, connected to a sub-station that ties into existing Eskom 132KV or 400KV overhead power lines.

Table 1: Typical activities for the construction, operation & decommissioning of a Solar PV Plant.

Phased activities associated with Solar PV projects	
A number of solar cells electrically connected to each other and mounted in a support structure or frame is called a photovoltaic module (solar panel). The facility will include areas used for management, security and control room, maintenance and canteen as well as changing facilities. An on-site substation will be required with the necessary infrastructure to feed the electricity generated, via loop-in and loop-out, into the immediately adjacent 132kv or 400kv Eskom network.	
Planning and Design	
Compliance with legal requirements by acquiring authorisations, permits and/or licenses for activities/uses undertaken during construction and operation.	YES
Sustainable resource requirements (water, energy, etc.) for lifespan of project.	YES
Rezoning (Land use): Listed Activity 28 of GN 983, as amended <i>Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development:</i> <i>(i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or</i> <i>(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.</i>	YES
The current agricultural land-use will be retained for livestock grazing, with the synergistic development of a commercial Solar PV Plant, over a fixed-term.	
Layout and design including consideration of alternatives.	YES
Pre-construction	
Surveying and Pegging (all footprints from permanent to temporary access roads).	YES
Construction	

Site establishment.	YES
Access control including fencing of perimeter.	YES
Human influence (staff conduct, movement).	YES
Construction of permanent and temporary access roads.	YES
Transport on site and accommodation of traffic.	YES
Sourcing & management of water (for drinking, sanitation & construction activities).	YES
Sourcing building sand.	YES
Stockpiling and laydown areas (spoil, mulch, building sand, topsoil, windrows, material & equipment).	YES
Clearing and grading (fence line, operations area, access roads, rack foundations, transformers and inverters, cables, substation and pylons).	YES
Earthworks & excavations (associated with the operations area, road crossings, cabling, transformers and inverters, substation and pylons):	YES
<p>Listed Activity 19 of GN. No. 983, as amended</p> <p><i>The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;</i></p> <p><i>but excluding where such infilling, depositing, dredging, excavation, removal or moving-</i></p> <p><i>(a) will occur behind a development setback;</i></p> <p><i>(b) is for maintenance purposes undertaken in accordance with a maintenance management plan;</i></p> <p><i>(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies.</i></p> <p><i>(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or</i></p> <p><i>(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.</i></p> <p>The Solar PV plant will feed into the existing overhead ESKOM transmission lines that are located within an expansive drainage system, via newly installed pylons.</p>	
Blasting.	NO
Drilling and/or ram piling (the rack foundations for the panel mounting hardware and fence poles).	YES

Erection and construction of the panels arrays and associated infrastructure	YES
Feeding or tying the solar PV plant into existing Eskom grid.	YES
Waste management (solid & liquid waste including 'spoil'/handling, separation, storage and disposal).	YES
Hazardous substance (fuel/oil, cement, bitumen, sewage/grey water) management (handling and storage) at sanitation sites, kitchens, & refuelling areas on site.	YES
Plant management (parking, driving, repair and maintenance, and refuelling).	YES
Building work (concrete work).	YES
Disturbing natural areas.	YES
Construction site closure and rehabilitation.	YES
Operation (including maintenance)	
Human influence.	YES
Consumption (energy, water, and other resources).	YES
Maintenance.	YES
Lighting to create visibility at night.	YES
Waste management	YES
Terrestrial and aquatic ecological management.	YES
PV panels, which convert the sun's radiation to electrical energy.	YES
<p>Listed Activity 1 of GN. No. 984, as amended <i>The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs-</i> <i>(a) within an urban area; or</i> <i>(b) on existing infrastructure.</i></p> <p>The solar PV installation will be a total of 225MW outside an urban area, on a green fields site.</p>	YES

<p>An inverter, which is a key component in matching panels' output to the grid and converts the panels' direct current (DC) electrical output to alternating current (AC).</p> <p>Listed Activity 9 of GN. No. 984, as amended</p> <p>The development of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial complex excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is —</p> <p>(a) temporarily required to allow for maintenance of existing infrastructure;</p> <p>(b) 2 kilometres or shorter in length;</p> <p>(c) within an existing transmission line servitude; and</p> <p>(d) will be removed within 18 months of the commencement of development.</p> <p>The overhead ESKOM lines are 400KVA and the loop-in, loop-out from the sub-station to the ESKOM overhead lines may exceed 2 kilometres in length, depending on which of the two 400KVA ESKOM designates for the tie-in.</p>	YES
Substation	YES
Decommissioning	
Disposal of PV panels and other waste.	YES
Human influence (staff conduct, movement)	YES
Roads and access routes	YES
Rehabilitation of affected footprints.	YES

Identification of Actual and Potential Impacts

The impacts are considered within the scope implicit within the listed activities. The relevant impacts resulting from the listed, actual and associated activities, including environmental, socio-economic and cultural heritage, were determined using a Leibold Matrix (**Table 6**), comments received from Interested & Affected Parties and Specialist Studies (**Table 7**), and, where applicable, the findings contained in specialist studies (**Figure 2**).

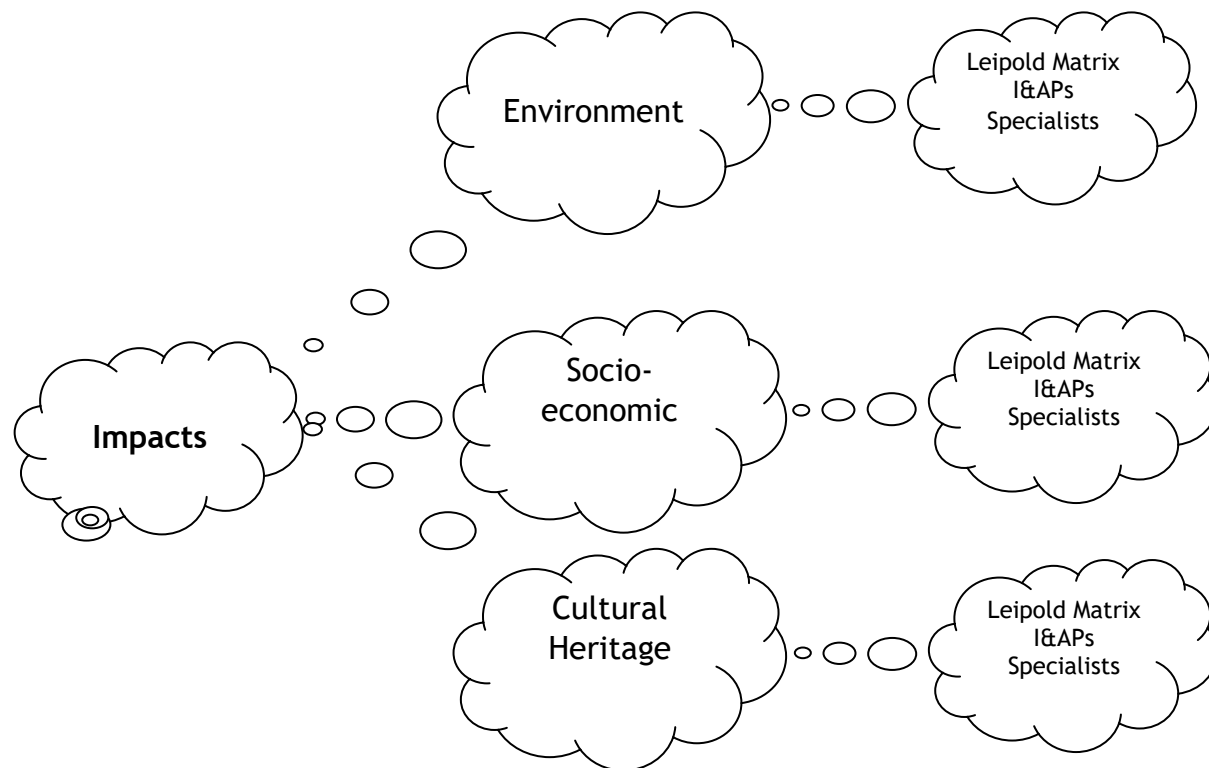


Figure 2: A breakdown of the different types of impacts including the resources used to identify them.

Table 6: Leipold Matrix used to identify environmental impacts - any change to the natural, socio-economic and cultural environment resulting from the development's activities during planning, construction, operation and decommissioning.

See Appendix E, Annexure B

Table 7: Identification of Potential Impacts from registered Interested and Affected Parties (I&APs) and Specialist Studies.

I&AP	Source	Comment - Impacts
<p>Jacoline Mans Designation: Chief Forester Tel: 054 338 5909 Fax: 054 334 0030 E-mail: JacolineMa@daff.gov.za</p>	<p>Email on 04/10/2016</p>	1. Potential impacts on NFA listed protected trees (if any).
		2. Impact on Riparian vegetation.
		3. Obtain Flora and Fauna Permits where necessary.
	<p>Email on 19/12/2016 (Comments on Draft Scoping Report)</p>	4. Land demarcated as agricultural land cannot be changed to another land use without the supported recommendation under the Sub-Division of Agricultural Land Act 70 of 1970 (SALA).
		5. A local authority cannot change the zoning of demarcated agricultural land to any other zoning without a letter from the Registrar of this Act.
		6. If agricultural land will be leased under a long-term lease agreement of 10 years or longer, submit a long-term lease application to the National Department of Agricultural, Forestry and Fisheries for approval from the Minister under the Act 70 of 1970.
<p>Francois Taljaard – Town Planner Emthanjeni Municipality Cel: 083 959 1157 Fax: 053 6311518 Email: taljaardf@emthanjeni.co.za</p>	<p>Email on 14/10/2016</p>	1. Impact of the shortage of water.
		2. Rezoning of each site where development is to take place.
		3. Approval of building plans before construction work can commence.
		4. The disposal or processing of packaging material must be addressed in the EIA. Packaging material is currently being used in the townships for additions to houses, which is illegal and creates a fire hazard.

<p>Bonnie Schumann Senior Field Officer</p> <p>Endangered Wildlife Trust Drylands Conservation Programme</p> <p>W: 053 813068 C: 072 122 4232 Email: bonnies@ewt.org.za</p>	<p>Email on 26/10/2016</p>	<p>1. These are potential areas for Critically Endangered Riverine Rabbits - Riverine Rabbit impacts.</p>
<p>Simon Todd - Fauna & Flora Assessment Study</p> <p>Simon Todd Consulting.</p> <p>Simon.Todd@3foxes.co.za Christy.Bragg@3foxes.co.za</p>	<p>Fauna & Flora Assessment Study Report submitted in January 2017.</p>	<p>1. The operation of the facility will generate noise and disturbance which may deter some fauna from the area.</p> <p>2. The areas inside the facility will require management and if this is not done appropriately, it could impact adjacent intact areas through impacts such as erosion, alien plant invasion and contamination from pollutants, herbicides or pesticides.</p> <p>3. The associated overhead power lines will pose a risk to avifauna susceptible to collisions and electrocution with power line infrastructure.</p> <p>4. Human presence and uncontrolled access to the site may result in negative impacts on fauna and flora through poaching of fauna and uncontrolled collection of plants for traditional medicine or other purpose.</p> <p>5. Site clearing & exploration activities for site establishment would have a negative impact on biodiversity if this was not conducted in a sensitive manner.</p> <p>6. Vegetation clearing for the development, access roads, site fencing etc could impact listed plant species as well as plant communities.</p>

		<p>7. Vegetation clearing will also lead to habitat loss for fauna and potentially the loss of sensitive faunal species, habitats and ecosystems.</p> <p>8. Increased erosion risk would occur due to the loss of plant cover and soil disturbance created during the construction phase. This may impact downstream riparian and wetland habitats if a lot of silt enters the drainage systems.</p> <p>9. Presence and operation of construction machinery on site. This will create a physical impact as well as generate noise, pollution and other forms of disturbance at the site.</p> <p>10. Increased human presence can lead to poaching, illegal plant harvesting and other forms of disturbance such as fire.</p> <p>11. Impacts on vegetation and protected plant species</p> <p>12. Soil erosion and associated degradation of ecosystems</p> <p>13. Direct faunal impacts</p> <p>14. Impacts on Avifauna</p> <p>15. Alien Plant Invasion</p> <p>16. Reduced ability to meet conservation obligations & targets</p> <p>17. Impact on broad-scale ecological processes</p>
<p>Dr Ilse Aucamp - Social Impact Assessment Report Equispectives Research and Consulting Services Tel: 082 828 0668 Fax: 086 648 3149 Email: ilsea@lantic.net</p>	<p>Social Impact Assessment Report submitted in November 2016</p>	<p>1. Expectations regarding creation of opportunities (Jobs etc.).</p> <p>2. Impacts of traffic on people – dust, noise, safety – from a social and nuisance perspective. Impacts on livelihoods – of landowners.</p> <p>3. Safety of community – possible increase in crime due to increased number of strangers in community.</p> <p>4. Negative community relations due to conduct of contractors/ representatives of Soventix.</p>

		<p>5. Impacts of construction camp – HIV/AIDS, movement of people etc. (This impact would only occur if there is a construction camp).</p> <p>6. Influx of people – also possible social disintegration and cultural differentiation, increase in HIV/AIDS etc.</p> <p>7. Creation of jobs and other economic opportunities.</p> <p>8. Impacts on livelihoods – of landowners.</p> <p>9. For some stakeholders their sense of place may change.</p> <p>10. Establishment of infrastructure to generate renewable energy.</p> <p>11. Fire hazards (caused by people).</p> <p>12. Loss of jobs and associated income.</p>
<p>Dawn Cory Toussaint - Chiropteran Study</p> <p>079 604 7322 nycteris.cory2saint@gmail.com</p>	<p>Chiropteran Study Reported submitted in November 2016</p>	<p>1. Disturbance to or destruction of roosting sites during construction activities.</p> <p>2. Light pollution during construction and operational phase may alter species composition, foraging patterns, reproductive success and predation rate.</p> <p>3. Alteration to commuting routes within the landscape as routes may be altered and some species may avoid the solar arrays all together, particularly the low-flying bat species.</p> <p>4. Habitat changes beneath the solar panels and the associated impact on prey insect communities may affect bat foraging patterns and areas.</p> <p>5. Changes in bat community, abundance and activity of bat species.</p>
<p>Anton Pelser & Annie Radford.- APAC (Anton Pelser Archaeological Consulting) apac.heritage@gmail.com</p>	<p>Heritage Impact Assessment Report</p>	<p>1. The proximity of operations in a given area could result in secondary indirect impacts resulting from the movement of people or vehicles in the immediate or surrounding vicinity.</p>

Steven Henwood. - Henwood Environmental Solutions. 078 672 3645 shenwood@mweb.co.za	Visual Impact Assessment Report	1. The visibility of the facility and ancillary infrastructure to, and potential visual impact on observers residing in rural homesteads and farmsteads within the study area.
		2. The potential visual impact of operational, safety and security lighting of the facility and ancillary infrastructure at night on sensitive visual receptors residing in close proximity.
		3. The potential visual impact of the construction of the facility and ancillary infrastructure on sensitive visual receptors in close proximity.
		4. The potential visual impact of the facilities and ancillary infrastructure on the visual character of the landscape and sense of place of the region.

The potential impacts identified by I&APs (**Table 7**), were designated to the applicable phases of implementation (**Table 8**) for appropriate consideration and mitigation during the impact assessment phase.

Table 8: Potential impacts identified by I&APs and Specialist Studies and phases of implementation.

Comments	Description of Impact & Phase of Implementation			
	Planning	Construction	Operation	Decomm
Potential impacts on NFA listed protected trees (if any).	Yes	Yes	Yes	No
Impact on Riparian vegetation.	Yes	Yes	Yes	No
Obtain Flora and Fauna Permits where necessary.	Yes	No	Yes	No
Impact of the shortage of water	Yes	Yes	Yes	No
Rezoning of each site where development is to take place.	Yes	No	No	Yes
Approval of building plans before construction work can commence.	Yes	No	No	No
The disposal or processing of packaging material must be addressed in the EIA. Packaging material is currently being used in the townships for additions to houses, which is illegal and creates a fire hazard.	No	Yes	No	No
These are potential areas for Critically Endangered Riverine Rabbits - Riverine Rabbit impacts.	Yes	Yes	No	No
The operation of the facility will generate noise and disturbance which may deter some fauna from the area.	No	Yes	Yes	No
The areas inside the facility will require management and if this is not done appropriately, it could impact adjacent intact areas through impacts such as erosion, alien plant invasion and contamination from pollutants, herbicides or pesticides.	No	No	Yes	No
The associated overhead power lines will pose a risk to avifauna susceptible to collisions and electrocution with power line infrastructure.	No	No	Yes	No
Human presence and uncontrolled access to the site may result in negative impacts on fauna and flora through poaching of fauna and uncontrolled collection of plants for traditional medicine or other purpose.	Yes	Yes	Yes	No

Site clearing & exploration activities for site establishment would have a negative impact on biodiversity if this was not conducted in a sensitive manner.	No	Yes	No	No
Vegetation clearing for the development, access roads, site fencing etc. could impact listed plant species as well as plant communities.	No	Yes	No	No
Vegetation clearing will also lead to habitat loss for fauna and potentially the loss of sensitive faunal species, habitats and ecosystems.	No	Yes	No	No
Increased erosion risk would occur due to the loss of plant cover and soil disturbance created during the construction phase. This may impact downstream riparian and wetland habitats if a lot of silt enters the drainage systems.	No	Yes	No	No
Presence and operation of construction machinery on site. This will create a physical impact as well as generate noise, pollution and other forms of disturbance at the site.	No	Yes	No	No
Increased human presence can lead to poaching, illegal plant harvesting and other forms of disturbance such as fire.	No	Yes	Yes	Yes
Impacts on vegetation and protected plant species	Yes	Yes	Yes	Yes
Soil erosion and associated degradation of ecosystems	No	Yes	Yes	Yes
Direct faunal impacts	No	Yes	Yes	Yes
Impacts on Avifauna	No	Yes	Yes	Yes
Alien Plant Invasion	No	Yes	Yes	Yes
Reduced ability to meet conservation obligations & targets	Yes	Yes	Yes	No
Impact on broad-scale ecological processes	No	Yes	Yes	Yes
Expectations regarding creation of opportunities (Jobs etc.).	Yes	Yes	Yes	Yes
Establishment of infrastructure to generate renewable energy	Yes	Yes	No	No

Fire hazards (caused by people)	No	Yes	Yes	No
For some stakeholders the sense of place will change	No	Yes	Yes	Yes
Loss of jobs and associated income	No	No	Yes	Yes
Impacts of traffic on people – dust, noise, safety – from a social and nuisance perspective. Impacts on livelihoods – of landowners.	No	Yes	Yes	Yes
Safety of community – possible increase in crime due to increased number of strangers in community.	No	Yes	Yes	Yes
Negative community relations due to conduct of contractors/ representatives of Soventix.	No	Yes	Yes	Yes
Impacts of construction camp – HIV/AIDS, movement of people etc. (This impact would only occur if there is a construction camp).	No	Yes	No	No
Influx of people – also possible social disintegration and cultural differentiation, increase in HIV/AIDS etc.	No	Yes	No	No
Creation of jobs and other economic opportunities. For some stakeholders their sense of place may change.	No	Yes	Yes	No
Disturbance to or destruction of roosting sites during construction activities.	No	Yes	No	No
Light pollution during construction and operational phase may alter species composition, foraging patterns, reproductive success and predation rate.	No	Yes	Yes	No
Alteration to commuting routes within the landscape as routes may be altered and some species may avoid the solar arrays all together, particularly the low-flying bat species.	No	Yes	Yes	No
Habitat changes beneath the solar panels and the associated impact on prey insect communities may affect bat foraging patterns and areas.	No	Yes	Yes	No
Changes in bat community, abundance and activity of bat species.	No	Yes	Yes	No
No constructing activities to take place around or next to the aquatic areas.	Yes	Yes	No	No

Maintain the 100 m buffer around aquatic areas.	Yes	Yes	Yes	No
The operation of the facility will generate noise and disturbance which may deter some fauna from the area.	No	No	Yes	No
The areas inside the facility will require management and if this is not done appropriately, it could impact adjacent intact areas through impacts such as erosion, alien plant invasion and contamination from pollutants, herbicides or pesticides.	No	No	Yes	No
The associated overhead power lines will pose a risk to avifauna susceptible to collisions and electrocution with power line infrastructure.	No	No	Yes	No
The proximity of operations in a given area could result in secondary indirect impacts resulting from the movement of people or vehicles in the immediate or surrounding vicinity.	No	Yes	No	Yes
The visibility of the facility and ancillary infrastructure to, and potential visual impact on observers residing in rural homesteads and farmsteads within the study area.	No	Yes	Yes	No
The potential visual impact of operational, safety and security lighting of the facility and ancillary infrastructure at night on sensitive visual receptors residing in close proximity.	No	No	Yes	No
The potential visual impact of the construction of the facility and ancillary infrastructure on sensitive visual receptors in close proximity.	No	Yes	No	No
The potential visual impact of the facilities and ancillary infrastructure on the visual character of the landscape and sense of place of the region.	No	Yes	Yes	No

Methodology for Assessing Environmental Impacts

Natural environmental, socio-economic, and cultural heritage impacts were assessed using the approach outlined below.

Natural environmental, socio-economic, and cultural heritage impacts were identified systematically by considering how the site-specific activities for each phase of development will interact with all elements of the receiving environment (**Leipold Matrix; Table 6**). All impacts, including those identified by I&APs and Specialists, will be measured against the current land-use activity (the no-go option / option of not implementing the activity) and systematically assessed by rating a suite of generic criteria (**Table 9**) established by the Department of Environmental Affairs and Tourism (DEAT 2002). The criteria are:

- Extent or spatial scale,
- Intensity or severity of the impact,
- Duration of the impact,
- Mitigatory potential,
- Social acceptability,
- Degree of certainty,
- Status of the impact, and
- Legal requirements.

The magnitude and significance of impacts were determined by describing the impacts in terms of the above criteria. The criteria provide a consistent and systematic basis for the comparison and application of judgements.

The suite of criteria was sought for its applicability to EIA, specifically by making provision for the variety of perspectives. Significance is an anthropocentric concept that makes use of value judgements and science-based criteria. Judgement and values are used to greater extent in EIA than science-based criteria and standards (DEAT 2002). Considering value judgements can vary greatly amongst different stakeholders, professional judgement, such as that of the EAP, should ideally be used in conjunction with the different value judgements expressed by various stakeholders. In other words, significance should be communicated from a variety of perspectives other than the professional opinion of a multidisciplinary study team, and include environmental, socio-economic or

cultural attributes perceived by society to be significant. Despite the potential variety of perspectives, they can be categorized into three broad forms of recognition for determination of impact significance, namely institutional (laws, plans or policy statements), public and technical (scientific or technical knowledge or judgement of critical resource characteristics) (DEAT 2002). Consequently, the magnitude and significance of impacts were as far as possible determined by reference to legal requirements, accepted scientific standards and / or social acceptability.

Significance is relative and must always be set in a context to show whose values they represent. The selected criterion provides such a context, taking all three forms of recognition into account by asking whether impacts are legally, publically and professionally recognized as important. The thresholds, against which significance of a given environmental effect was measured or determined, were provided by a set of ratings for each criterion (**Table 9**). Thresholds of significance were as far as possible based on / determined by reference to legal requirements, accepted scientific standards or social acceptability. Ratings are High (H- 4), Moderate (M-3), Low (L-2) or No Impact (N-1) and determined according to clearly defined descriptors. The 'No Impact' rating includes reference to 'no impacts beyond prescribed thresholds'. In other words, mitigations that change the ratings of any particular criteria to 'N' do not necessarily infer zero impact, but rather that the impact is restricted to prescribed thresholds as defined in the goal and objective(s) of the proposed mitigation(s). The significance of the impacts of the proposed project was assessed both with and without mitigation action.

Table 9: Impact Evaluation Criteria, Ratings and Descriptors.

Criteria	Ratings and Descriptors			
	High (4)	Moderate (3)	Low (2)	No Impact (1)
Spatial Scale / Extent	Provincial, National, or International. Far beyond the site boundaries. Widespread.	Local (within the farm boundary) to Regional (beyond the farm boundary, impact affects neighbours).	Development footprint to within the site boundary.	No area is affected.
Intensity / Magnitude	Functioning of processes will cease. Complete change in species occurrence and variety. Disturbance of pristine areas / plants of conservation concern that have important conservation value. Magnitude of impact exceeds legal limits, scientific standards or social acceptability.	Modified processes will continue. Moderate change in species occurrence and variety. Disturbance of potential conservation areas or are of use as a resource.	Natural processes are affected, but not modified. Minor change in species occurrence and variety. Disturbance of degraded areas.	Natural processes are not affected.
Duration	Permanent. Beyond decommissioning. Long term (>2yr).	Temporary. Lifespan of the operational phase. Medium term (>1<2yr).	Immediate, once-off. Lifespan of the construction phase. Short term (<1yr). Restricted to a season.	Project doesn't commence.
Mitigatory Potential	High potential to mitigate and	There is a moderate	There is a potential to	No mechanism for mitigation

	achieve objectives.	potential to mitigate, and achieve objectives.	mitigate, but there remains a risk of the objectives not being met.	and achieving the objectives.
Acceptability	Unacceptable Abandon project or design.	Manageable with expensive regulatory controls and the project proponent's commitments.	Some risk to public health / environment, but it is easily averted using simple controls / mitigations.	Acceptable. No risk to public health / environment.
	Definite (D- 4)	Probable (P -3)	Improbable (I-2)	No Impact (N-1)
Degree of Certainty / Probability of the impact occurring	Substantial supportive data. Impact will occur regardless of preventive measures. High probability. >95%.	There is a chance / risk of the impact occurring. Moderate probability. 5-95%.	It is unlikely that the impact will occur. Low probability. <5%.	The impact will not occur. 0%.
	Negative	Neutral	Positive	
Status	Net loss of resource. Adverse.	No net loss or gain.	Net gain of resource. Beneficial.	

Assessment of Impacts

The identified actual and potential Impacts, including the Leibold Matrix (**Table 6**), comments received from I&APs (**Table 7**) and findings contained in specialist assessments (**Table 7**), are segregated amongst the different phases of implementation (planning and design, construction, operation and decommissioning) (**Table 8**) so that they can be logically managed / mitigated for by the responsible role players at the appropriate time. Apart from the afore-mentioned impacts, a number of mandatory impacts (for consideration during the planning and design phase) are included for evaluation in all environmental impact assessments, including, *inter alia*, Potential Offences and Consumption of Resources. Furthermore, 'Degradation' is always defined and treated as a potential impact during construction (construction site closure) and decommissioning.

Planning and Design Phase

Activity Group 1: Potential Offences

Description of potential impacts

- **Protected Species.** Comments received from **Jacoline Mans**, Chief Forester, DAFF (**Table 7**): investigate potential impacts on NFA listed protected trees & obtain flora and fauna permits where necessary - clearing operations in the PV Solar Plant servitudes will disturb or destroy natural flora and fauna, including protected species. Licenses / permits are required prior to impacting protected species in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)¹, the National Forests Act, 1998 (Act No. 84 of 1998)² and any applicable provincial legislation.
- **Water use.** Excavation for the purposes of erecting pylons / poles inside an extensive drainage system will require section 21 (c) & (i) water use entitlements⁵.
- **Water use.** The operational phase of the plant will generate waste water through ablution and wash-up (kitchen) facilities. The effluent will be treated in a package waste water treatment works (WWTW) (Biorock™ system,) which will discharge into a seep-away site. Incomplete treatment of the effluent poses a risk of contamination to the receiving underground water resource.
- **Water use.** Comments received from **Francois Taljaard**, Town Planner, Emthanjeni Municipality (**Table 8**): investigate potential impacts on the shortage of water - water may be abstracted illegally for use during construction and operation. In terms of section 25(1) of the NWA, 1998⁴ the person authorized to use water for irrigation may request a water management institution to use some of that water for a different purpose, such as construction. In terms of

section 25(2) of the NWA, 1998⁴ a person holding an entitlement to use water may surrender that entitlement or part thereof to facilitate a license application for the use of water from the same resource in respect of other land. A landowner may take water without a water use license but it is subject to the provisions and limitations prescribed in General Authorisation GN No. 538 published in Government Gazette No. 40243 on 2 September 2016⁵. Alternatively, a section 21(a) & (b) water use license will be required to abstract & store during construction and operation.

- **Water use.** A readily available, sustainable and legal source of water will be required for use during construction and operation of the solar PV plant - water will be required to clean the solar PV panels, and provide for construction and operational uses (including site management activities & facilities).
- **Water use.** Comments received from **Francois Taljaard**, Town Planner, Emthanjeni Municipality (**Table 7**) states that the municipality will not be able to supply water to the project as the area's groundwater is already constrained.
- **Borrow Pits.** Material will be required to cover excavations (where applicable), building purposes & road maintenance. Borrow pit licensing is classified as small-scale mining under the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) and is administered by the Department of Minerals Resources (DMR), through whom any permit applications must be lodged. Exemptions are applicable where the borrowing of material is for the improvement of that same land³.
- **Access Roads.** The construction or expansion of any access roads will need to be authorised in terms of the NEMA listed activities, 2014 if they exceed certain thresholds⁶.
- **Servitudes and Wayleaves.** The construction of the PV Solar Plant will intersect Eskom's servitude / power lines (Distribution and/or Transmission). Construction without permission will constitute an offence in terms of the relevant legislation, such as the Electricity Act, 1987 (Act 41 of 1987), as amended in 1994⁷.
- **Compliance Monitoring.** Construction could commence prior to the appointment of an Environmental Control Officer (ECO), which will be a condition of the EMPr.
- **Municipal By-laws.** Comments received from **Francois Taljaard**, Town Planner, Emthanjeni Municipality (**Table 7**); approval of building plans before construction work can commence - Emthanjeni Local Municipality shall not issue a certificate referred to in section 118(1) of the Local Government: Municipal Systems Act, 2000 (Act No. 32 of 2000), regarding land, unless, *inter alia*, the Municipality is satisfied that any building erected on the land, in respect of which plans and specifications are to be drawn and submitted to the Municipality for approval in terms of the Act, is properly erected and maintained in accordance with such plans and specifications⁸.

Uncertainties & limitations with predicting this impact

- None

Assumptions made when assessing the impact

- Protected plants that need to be searched will be visible at the time.
- The water use authorisations will all be approved within the same timeframes as the EIA under General Authorisation.
- Sand for road improvements will be sourced from on-site borrow pits which do not require licensing as per section 106 of the MPRDA.
- No new roads will be constructed nor existing roads widened and associated bridges (where and if applicable) more than the permissible thresholds in the Listed Activities of the EIA Regulations (2014).

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	3	3	3	4	33	3	Negative	H
	With	2	2	2	2	13	2	Neutral	
2	Without	3	3	3	4	33	3	Negative	H
	With	2	2	2	2	13	2	Neutral	
3	Without	3	3	3	4	33	3	Negative	H
	With	2	2	2	2	13	2	Neutral	
No-go	N/A	1	1	1	1	3	1	Positive	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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References (legal, scientific, social or other criteria):

1. National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).
2. The National Forests Act, 1998 (Act No. 84 of 1998), including Schedule in Government Notice No. 1042, dated 10 September 2004.
3. Northern Cape Nature Conservation Act (Act 9 of 2009).
4. Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002); Exemptions Section 106, sub-section 3.
5. National Water Act, 1998 (Act No. 38 of 1998).
6. Section 21(a & b) - General Authorisation GN No. 538 published in Government Gazette No. 40243 on 2 September 2016.
7. Section 21(c) and (i) - General Authorisation GN No. 509 published in Government Gazette No. 40229 on 26 August 2016.
8. Section 21 (g) – General Authorisation GN No. 665 published in Government Gazette No. 36820 on 6 September 2013.
9. GN No. R. 983 & 984, 04th December, 2014, as amended.
10. Electricity Act, 1987 (Act 41 of 1987), as amended in 1994.
11. Building Control By-Law, 2008 (By-law No. 4 2008) – “To provide for the control of buildings erected on land in the Emthanjeni municipality; and for matters concerned therewith.”

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- Section 24G of NEMA allows for the rectification of unlawful commencement or continuation of a listed activity.
- Non-compliance with other legislation may result in criminal prosecution or other actions provided for in the relevant legislation.
- Search & Rescue of protected plants & plants of conservation concern will be necessary to ensure that these plants are transplanted outside the works area, where they will continue to contribute to the biodiversity suite of the area. Should an effective and timeous search & rescue not be carried out, a nett loss in biodiversity is likely to occur.
- Water use must be utilised within the sustainable capacity of the underground resource, so as not to deplete this resource availability to the environment and other land users.

Mitigations

Goal: Achieve compliance.

Objective(s) (including targets):

- Comply with all relevant legislation, regulations, ordinances & by-laws.

Mitigations to potential impacts resulting from Potential Offences		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Applicant ECO	The applicant shall apply for and obtain the relevant licenses / permits from the appropriate authorities (DAFF, DEA, and Provincial Authority) prior to disturbing or destroying any protected species. The list of affected plants are contained in the Terrestrial Ecology Specialist Report, the following species will need to be searched & rescued by a qualified ecologist / botanist prior to clearing operations: <i>Stomatium pluridens</i> and <i>Euphorbia crassipes</i> , which are regional endemics and provincially protected, while other protected species include <i>Aloe broomii</i> var. <i>broomii</i> , <i>Aloe claviflora</i> , <i>Pachypodium succulentum</i> , <i>Ammocharis coranica</i> , and <i>Boscia albitrunca</i>
Avoidance	Applicant	Water required during construction and operation for human consumption (drinking, sanitation and food preparation), building activities (mixing concrete, watering gravel roads), livestock and maintenance (cleaning solar panels) shall be pre-authorised via a General Authorisation, purchase or temporary transfer of irrigation water from a land owner or Water Use License for section 21 (a) and (b) water uses.
Avoidance	Applicant	Ensure adequate on-site water can be provided as the Municipality will not be able to supply.
Reduction	Applicant	Abstraction volumes must be measured and recorded against the static head of the borehole on a monthly basis to ensure the resource is not being depleted (taking cognisance of seasonal variability).
Avoidance	Applicant	The applicant shall apply for a water use entitlement, i.e. a General Authorization or Water Use License for section 21(c) and (i) water uses, prior to constructing access roads and erecting pylons inside a watercourse.
Avoidance	Applicant	The applicant shall apply for a water use entitlement, i.e. a General Authorization or Water Use License for section 21(g) water uses, prior to constructing any facilities that will generate and require disposal of waste water.
Avoidance	Contractor	If building sand is required, the contractor shall be permitted to borrow material from the on-site quarries without the need to apply for a permit or license in alignment with section 106 under the MPRDA, dealing with exemptions.
Avoidance	Applicant Engineer	Newly constructed access roads may not be wider than 4 metres with a reserve less than 13.5 metres, nor the widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre. Prior to the

	Contractor	construction of any new roads, a search & rescue must be conducted by a suitably qualified specialist for protected fauna & flora and that of conservation concern; which must then be transplanted outside the works area in a comparative habitat type. Ascertaining similar habitat types may require soil sampling and analysis over and above above-ground similarities.
Avoidance	Applicant	The applicant shall apply for a wayleave(s) from Eskom prior to commencing with construction within their servitude.
Avoidance	Applicant	An experienced and independent ECO shall be appointed prior to the commencement of construction to oversee construction, including ensuring the identification and permitting / licensing of protected species prior to clearing.
Avoidance	Applicant	The plans and specifications for any building, whether of a temporary or permanent nature, to be erected on the land must be submitted to the Emthanjeni Local Municipality for approval in terms of the Local Government: Municipal Systems Act, 2000 (Act No. 32 of 2000).

Activity Group 2: Socio-economic considerations

Description of potential impacts

- The local community stands to gain from the suite of professionals that will be utilising local facilities (hospitality and others) that will provide economic benefits to the area during the planning phase.
- Job seekers are likely to begin enquiring about employment as awareness around the proposed project grows. This can become burdensome on the property owner should people arrive at the property owner requesting work and opportunities.

Uncertainties & limitations with predicting this impact

- None.

Assumptions made when assessing the impact

- None.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	3	2	3	3	24	2	Negative	M
	With	2	2	2	3	14	1	Neutral	
2	Without	3	2	3	3	24	2	Negative	M
	With	2	2	2	3	14	1	Neutral	
3	Without	3	2	3	3	24	2	Negative	M
	With	2	2	2	2	13	1	Neutral	

No-go	N/A	1	1	1	1	3	1	Positive	N/A
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High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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References (legal, scientific, social or other criteria)

1. Aucamp, I. 2017. *Social Impact Assessment Report for the proposed development of 225 MW solar PV plant in Northern Cape Province*. Equispectives Research & Consulting Services, Pretoria.

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- Improper management of job seekers may have a negative impact on the land owner as they seek to address their employment needs.

Mitigations

Goals: Avoid inconveniencing the landowner and adjacent property owners with incessant job seekers.

Objective(s) (including targets):

- Provide a platform for job seekers from the onset of the planning process through to the operational phase.

Mitigations to potential impacts resulting from Resource Requirements		
Type of mitigation	Responsible authority	Mitigation
Reduction	Applicant	Develop a job seeker database, or integrate with an existing service provider in the adjacent towns, to ensure job seekers' details are captured. As positions become available, this database can be searched for suitable skills within the local populous before positions are outsourced. These measures will reduce the potential nuisance factor to the land owner, caused by job seekers reverting to visiting the proposed site of development.

Activity Group 3: Rezoning and landuse practices

Description of potential impacts

- Comments received from **Francois Taljaard**, Town Planner, Emthanjeni Municipality (**Table 7**); investigate rezoning of each site where development is to take place¹⁻³.
- Comments received from **Jacoline Mans**, Chief Forester, DAFF (**Table 7**); ask for assistance from the National Department of Agricultural, Forestry and Fisheries for approval from the Minister under the Act 70 of 1970, with respect to the land rezoning or leasing.
- Solar facilities may interfere with existing land uses. Unlike wind facilities, there is less opportunity for solar projects to share land with consumptive agricultural practices.
- Loss of habitat for agricultural use, if solar developments become exclusion zones for livestock and game.

Uncertainties & limitations with predicting this impact

- A rezoning application (to 'Special' or other appropriate zoning) will only be prepared and submitted to the national, provincial and local authorities if the proposed project attains preferred bidder status and the application to "lease" the land by the Department of Agriculture is declined (currently underway).
- Land demarcated as agricultural land cannot be changed to another land use or leased without the supported recommendation under the Sub-Division of Agricultural Land Act 70 of 1970 (SALA).

Assumptions made when assessing the impact

- The proposed site and alternative sites are currently zoned as Agriculture and has historically been used as grazing for small game and livestock. It is further assumed that grazing of livestock within the developed footprint can be implemented effectively as a vegetation management tool.
- The developer has agreed to implement the proposed project in synergy with the current landuse practices and not at the expense of them.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	3	3	4	3	30	3	Negative	M
	With	2	2	3	2	14	2	Neutral	
2	Without	3	3	4	3	30	2	Negative	M
	With	2	3	3	3	24	1	Neutral	
3	Without	3	3	4	3	30	2	Negative	M
	With	3	3	4	3	30	1	Neutral	
No-go	N/A	1	1	1	1	3	1	Positive	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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References (legal, scientific, social or other criteria)

1. Northern Cape Planning and Development Act, 1998.
2. Emthanjeni Local Municipality, Integrated Development Plan (IDP), 2016/2021
3. Emthanjeni Municipality, Spatial Planning & Land Use, Management By-law, Northern Cape Province, GN No. 192 of 2015, Provincial Gazettes (Northern Cape), No. 1979 of 14th December, 2015. Spatial Planning & Land Use Mgt Act No. 16 of 2013 (came into force on 01st July 2015).

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- The developer has agreed to accommodate the normal grazing activities within the solar PV footprints, by increasing the installation heights of the solar arrays. In turn, the livestock will act in a mutually beneficial role to manage vegetation growth beneath the panels. Hence, the vegetation community both within and outside the solar PV footprint should closely mimic one another, except for the exclusion of game, and no substantive loss of resources should occur.
- The fact that limited hard structures will be used, there is a high probability that the area will recover well following decommissioning of the plant.

Mitigations

Goal: No commercial use of land in the absence of appropriate zoning or lease approval.

Objective(s) (including targets):

- To have the land zoned or leased for the multiple land use practices prior to commencement of the project.

Mitigations to potential impacts from Rezoning and Landuse practices		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Applicant	Submit a long-term lease application to the National Department of Agricultural, Forestry and Fisheries for approval from the Minister under the Act 70 of 1970.
Avoidance	Applicant	A rezoning application (to 'Special' or other appropriate zoning) will be submitted to the national, provincial and local authorities if the proposed project attains preferred bidder status and the lease application is declined.
Reduction	Applicant	To avoid penalties and / or fines the applicant must not commence with construction until the rezoning application has received a successful and / or positive status.
Avoidance	Applicant	Construction will not commence unless approval / success in application has been granted.
Avoidance	Applicant	Obtain the supported recommendation under the Sub-Division of Agricultural Land Act 70 of 1970 (SALA) land demarcated as agricultural land to another land use.
Reduction	Applicant	Ensure the grazing of livestock within the solar PV footprints is within the established grazing capacity of the area.

Activity Group 4: Layout and design including consideration of alternatives

Description of potential impacts

- Comments received from **Jacoline Mans**, Chief Forester, DAFF (**Table 7**); investigate impact on riparian vegetation - permanent footprints can destroy sensitive habitats, including Riparian vegetation.
- Comments received from **Bonnie Schumann**, Senior Field Officer, Endangered Wildlife Trust (**Table 7**); these are potential areas for Critically Endangered Riverine Rabbits, investigate Riverine Rabbit impacts - permanent footprints can destroy sensitive habitats, including Riverine Rabbit habitat.
- The following concerns were identified by Simon Todd (Fauna & Flora Assessment Study):
 - Human presence and uncontrolled access to the site may result in negative impacts on fauna and flora through poaching of fauna and uncontrolled collection of plants for traditional medicine or other purpose.
 - Site clearing & exploration activities for site establishment would have a negative impact on biodiversity if this was not conducted in a sensitive manner.
 - Permanent footprints can disturb immovable flora, i.e. fence line, operations area, access roads, rack foundations, transformers and inverters, cables, substation and pylons.
 - Placement of high risk (pollution generating) activities within close proximity to a watercourse can cause water pollution.
 - Poor alignment of linear activities like roads, fences, pipelines or other cleared servitudes can increase runoff, cause erosion and sedimentation of aquatic habitats.
 - Layout, alignments and design of permanent structures and roads can influence or redistribute surface water flow patterns.
 - Layout and designs can be disruptive to local migration by causing fragmentation.
 - Placement can be visually intrusive to sensitive receptors.
- Permanent footprints can disturb sites of historical significance, including graves.
- It has been suggested by Visser (2016) that collision mortality could be reduced at solar facilities by using 28 cm-spaced contrasting bands or 10 cm spatial gaps between solar panels. This enables birds, particularly waterbirds, to differentiate the expansive layout of panels as a solid structure, reducing the likelihood that they may try to land and collide with the panels. These recommendations should therefore be incorporated into new solar facilities until further research into panel design and layout suggests otherwise.
- The layout of solar arrays should be placed so as to avoid bird flight paths between focal points such as water bodies, foraging and roosting sites.

Uncertainties & limitations with predicting this impact

- None.

Assumptions made when assessing the impact

- The no-go areas defined by the specialists will effectively mitigate impacts to the environment, when the development footprints are located outside their boundaries.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	3	4	4	4	44	4	Negative	M
	With	2	2	3	2	14	2	Neutral	
2	Without	3	4	4	4	44	4	Negative	M
	With	2	2	3	2	14	2	Neutral	
3	Without	3	4	4	4	44	4	Negative	M
	With	3	3	3	3	27	2	Neutral	
No-go	N/A	1	1	1	1	3	1	Positive	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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Reference (legal, scientific, social or other criteria)

1. Todd, S. & Bragg, C. 2017. *Fauna & flora specialist scoping report – Environmental Impact Assessment for the proposed Soventix Solar PV project: De Aar, Northern Cape Province.*

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- Improper planning of the layout to accommodate sensitive receptors is likely to result in a significant reduction in biodiversity within the development footprints. Mobile species may be able to re-occupy the areas following decommissioning, but flora will be affected for a much longer time period.

Mitigations

Goal: Avoid layouts & designs that will have negative impacts on the environment by avoiding identified sensitive receptors.

Objective(s) (including targets):

- To have preference given to those layouts and designs with the least negative impacts to the environment and that pose the most practicable option financially and technically.

Mitigations to potential impacts resulting from Layout and Design		
Type of mitigation	Responsible authority	Mitigation
Reduction	Contractor Applicant	Ensure that the preferred environmentally friendly layout and design is inclusive of all environmental aspects and impacts and employs the necessary mitigations.
Reduction	Applicant	Special attention must be given to habitat of the Riverine Rabbit and layouts adapted accordingly.
Rectification	Contractor Applicant	Ensure that following new information that may impact the development footprint, these changes are adopted where the change results in a nett environmental benefit.
Avoidance	Contractor Applicant	Ensure that suitable measures are employed to manage job-seekers, to avoid inadvertent impacts by trespassers on fauna & flora and affected landowners.
Avoidance	Engineer Applicant	Ensure that permanent footprints do not disturb immovable flora & destroy sensitive habitats.
Avoidance	Engineer Applicant	Avoid placing high risk (pollution generating) activities within close proximity to a watercourse as they can cause water pollution.

Avoidance	Engineer Applicant	Layout, alignments and design (including poor alignment) of permanent structures and roads should not influence or redistribute surface water flow patterns, increase runoff, cause erosion and/or sedimentation of aquatic habitats.
Avoidance	Engineer Applicant	Have more than one layout and design, and assess each alternative objectively, so as to avoid disruption to local migration through fragmentation.
Avoidance	Engineer Applicant	Ensure that none of the layout & designs of permanent footprints will disturb sites of historical significance, including graves.
Reduction	Contractor Applicant	Have minimal placements that can be visually intrusive to sensitive receptors.

Construction Phase

Activity Group 1: Site establishment

Description of potential impacts

- Light pollution impacts both negatively and positively on bats and can alter species composition, foraging patterns, reproductive success and predation rate (Stone et al. 2015). Research has shown that there are open-area foraging bat populations that may benefit from feeding on insects attracted to artificial light sources (Jones et al. 2009, Voigt et al. 2016). Conversely, if artificial lighting is located close to roosting sites, the foraging emergence times of the bats can be delayed.
- Construction footprints can disturb immovable flora. i.e. operations buildings, transformers, inverters, pylons, rack foundations and the substation.
- Placement of high risk (pollution generating) construction activities within close proximity to a watercourse can cause pollution.
- Poor placement or alignment: Sedimentation of the watercourse can result from the erosion of exposed areas adjacent to or within the watercourse, including linear activities like pipelines or other cleared servitudes.
- Incorrect placement of structures can influence or redistribute surface water flow patterns, cause erosion and sedimentation.
- Placement of construction areas including toilets can be visually intrusive to sensitive receptors.
- Construction footprints can disturb sites of historical significance, i.e. Graves.

Uncertainties & limitations with predicting this impact

- The exact positions of immovable flora is not known, and the successful identification and positioning of affected species and specimens will be dependent on the competence and thoroughness of the appointed botanist at the time of clearing & grubbing.

Assumptions made when assessing the impact

- The defined sensitive areas and delineated watercourses are accurate and relatively exhaustive, which has informed decision-making on the best site alternative and layout extent.
- The actual placement of infrastructure and laydown areas will confirm to the generated layout map.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	3	4	4	4	44	3	Negative	M
	With	2	2	3	3	21	2	Neutral	
2	Without	3	4	4	4	44	3	Negative	M
	With	2	2	2	3	18	2	Neutral	
3	Without	3	4	4	4	44	3	Negative	M
	With	2	2	2	3	18	2	Neutral	
No-go	N/A	1	1	1	1	3	1	Positive	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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References (legal, scientific, social or other criteria)

1. Cory Toussaint, D. 2017. *Chiropteran Draft Scoping Report for Soventix Solar Farm, Hanover, Northern Cape.*
2. Todd, S. & Bragg, C. 2017. *Fauna & flora specialist scoping report – Environmental Impact Assessment for the proposed Soventix Solar PV project: De Aar, Northern Cape Province.*

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- Incorrect placement of development footprints in sensitive habitats can affect flora & fauna over lengthy time frames, even altering the species assemblages.

Mitigations

Goal: No nett loss in biodiversity through site establishment activities.

No degradation of watercourses, directly or indirectly.

Objective(s) (including targets):

- To select the most environmentally suitable site establishment footprint within technical capabilities.
- To reduce in situ losses of protected flora & fauna and of conservation importance.
- To reduce artificial lighting impacts.
- To ensure that infrastructure that impedes surface water flows does not negatively affect the area's hydrological patterns leading to erosion and / or sedimentation of receiving watercourses.
- To reduce the visual impact of all structures as far as practicable.

Mitigations to potential impacts resulting from Site Establishment		
Type of mitigation	Responsible authority	Mitigation
Reduction	Contractor	Ensure downlighting is utilised to reduce the distance of visual intrusion, both to surrounding land users and wildlife.
Reduction	Contractor	Lighting types that have a lower attraction value to insects must be selected preferentially.
Avoidance	Contractor	Construction shall be limited to daylight hours, and only lighting utilised at night for security purposes.
Avoidance	Contractor Applicant	A layout plan must be developed for the full project including approved sites for site establishment including but not limited to laydown areas, stockpiles and stores.
Avoidance	Contractor	The site establishment footprint must be clearly demarcated on the ground to ensure that no construction creep results toward any watercourses or defined sensitive areas.
Avoidance	Contractor	A search and rescue must be undertaken of any and all footprints that will be temporarily or permanently affected during site establishment. All fauna and flora that are protected or of conservation importance must either be cordoned off and protected, or translocated outside of the site establishment and solar PV footprint, into habitats of a similar nature. All search & rescue & translocation activities must be carried out by suitably

		qualified specialists.
Avoidance	Contractor	Defined sensitive areas must be demarcated as no-go areas that must be strictly enforced.
Avoidance	Contractor	Activities with high pollution potential must not be located on the watercourse-side of established footprints, and adequate provision must be made to contain any waste streams from these activities.
Avoidance	Contractor	Placement of infrastructure and laydown & stockpile areas must be done so as not to negatively affect surface water runoff in a way that leads to erosion and export of material to be deposited in any watercourses.
Avoidance	Contractor	Ensure adequate ablution facilities are provided and are screened-off to reduce visual obtrusiveness.
Avoidance	Contractor	No site establishment must be undertaken close to any identified heritage sites. These sites must be cordoned off and protected to avoid accidental damage.
Avoidance	Contractor	A Storm water management plan must be developed to inter alia limit contact with contaminated areas, laydown areas and areas prone to erosion.
Avoidance	Contractor	The Contractor shall locate the construction camp on existing disturbed or the least sensitive sites above the 1:100 year flood line or further than 100m from the edge of a watercourse, whichever is greatest.
Avoidance	Contractor	The contractor shall restrict the following activities to the construction camp: Sanitation, Waste storage, Parking, Storing hazardous materials, Emergency repair / maintenance of plant Re-fuelling, Cleaning of ready-mix concrete trucks, Material stockpiles, and Lay down areas.
Reduction	Contractor	Establish and implement an Integrated Waste Management Strategy including avoidance, reduction, re-using, recycling and disposal, i.e. the production of hazardous waste can be avoided by providing drip trays, reduce

		waste by using the correct quantities, re-use concrete rubble as back fill or recycle steel off-cuts and dispose of non-hazardous solid waste at a registered municipal dump site.
Reduction	Contractor	Induct all labourers on the waste management strategy and enforce it through regular (at least weekly) toolbox talks.
Reduction	Contractor	Separate general, recyclable, natural (vegetation and soil/rock) and hazardous waste, and demarcate different containers for different waste types using colour codes.
Avoidance	Contractor	Do not litter, burn or bury waste on any property.
Avoidance	Contractor	A dustbin shall be available at each work front during working hours.
Avoidance	Contractor	The contractor shall dispose of general waste at a registered municipal dump site.
Avoidance	Contractor	The contractor shall return used oil to the supplier or an oil recycling company.
Avoidance	Contractor	Washing of construction plant and mechanical equipment including brushes shall not occur on site or in a watercourse, but shall be restricted to the main construction camp where adequate containment measures are in place.
Avoidance	Contractor	The contractor shall contain contaminated water from washing brushes in a conservancy tank until sufficient volume warrants disposal by a registered hazardous waste management company.
Reduction	Contractor	Remove ineffective danger tape/netting that has begun to litter the site or surrounding areas.
Avoidance	Contractor	Designate a temporary waste storage area, enclose it in a fence that cannot be breached by fauna, and provide sufficient scavenger proof dust bins with black bags inside the construction camp.
Reduction	Contractor	Imported material stockpiles shall be located outside (to also avoid driving on top of them) the demarcated disturbed wetland system and on a disturbed site or other site approved by the ECO as a stockpile area.
Avoidance	Contractor	The contractor shall provide sufficient (1:10) chemical toilets, unless existing facilities can be used.
Avoidance	Contractor	Chemical toilets shall be located in the shade further from any watercourse.
Avoidance	Contractor	Use chemical toilets that contain the sewerage in a closed and removable 'tank', i.e. do not use open drums. Environmentally friendly toilets should also be considered e.g. E-loo's.
Avoidance	Contractor	All persons shall use only the provided facilities for sanitation.

Avoidance	Contractor	Chemical toilets shall be kept hygienic and cleaned daily.
Avoidance	Contractor	The contractor is prohibited from discharging waste water, including domestic water from sanitation facilities, and grey water from washing equipment or plant into a watercourse.
Reduction	Contractor	Re-fuelling with a mobile fuel bowser shall take place outside any watercourse.
Avoidance	Contractor	The contractor shall store hazardous material within a secure, safe and bunded facility at the construction camp.
Avoidance	Contractor	Use drip trays for refuelling, repair/maintenance work and all stationary construction plant and equipment that can leak, such as TLBs, compressors and generators.
Reduction	Contractor	Construction plant and equipment shall be kept in a good state of repair to reduce hydrocarbon leakages and emissions.
Reduction	Contractor	Emergency repairs or maintenance shall include procedures to minimize contamination of the ground.
Avoidance	Contractor	Remove topsoil from the area within the perimeter of the construction camp and stockpile separately for use during rehabilitation of the site.
Avoidance	Contractor	Do not cover spills with virgin soil. It merely increases the disposal cost for a greater volume of hazardous waste.
Rectification	Contractor	Immediately remove contaminated soil to the depth of penetration and temporarily store in a designated solid hazardous waste container until sufficient volume warrants disposal at a registered hazardous waste dump site. Alternatively, onsite treatment of contaminated soil should be considered with a registered hazardous waste management company.

Activity Group 2: Access control including fencing of perimeter

Description of potential impacts

- Electric fences can cause death or injury to mammals.
- Fences and walls aligned perpendicular to the contour can increase surface water runoff, cause erosion and sedimentation of a watercourse.
- Restricted access can deny the practice of similar, neighbouring agricultural land uses like grazing.
- Restricted access and management can prevent natural drivers, such as selective grazing pressures and fire from influencing species composition within the local plant community.
- Fences can cause habitat fragmentation.
- High walls and fences can be visually intrusive by visibly altering the natural landscape.
- Increased security can protect the assets from theft.

Uncertainties & limitations with predicting this impact

- The long-term impacts associated with fencing the solar PV footprint off, and only allowing grazing pressure from sheep and not the full suite of wildlife, as on the remainder of the property, is unknown.

Assumptions made when assessing the impact

- A wire mesh security fence or Clearvu™ fencing will not significantly alter existing surface water (rainfall runoff) flow patterns, if accumulating debris is removed regularly.
- The fencing will only be electrified at the top as a security measures against human theft and trespassing, and is unlikely to pose a significant threat to wildlife (birds sitting on the wire are not earther and hence, not at risk of electrocution).
- Fire is not a significant ecosystem driver in this plant community, and excluding fire from the development footprint will not contribute to ecosystem changes.
- The Clearvu™ is designed as such so as not to create a visual intrusion and allows almost unabated views through the fence.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	3	3	3	3	27	2	Negative	H
	With	2	3	3	2	16	2	Neutral	
2	Without	3	3	3	4	36	2	Negative	M
	With	2	3	3	3	24	2	Neutral	
3	Without	3	3	3	3	27	2	Negative	H
	With	2	3	3	2	16	2	Neutral	
No-go	N/A	1	1	1	1	3	1	Neutral	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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Reference (legal, scientific, social or other criteria)

- Todd, S. & Bragg, C. 2017. *Fauna & flora specialist scoping report – Environmental Impact Assessment for the proposed Soventix Solar PV project: De Aar, Northern Cape Province.*

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- Fencing creates an exclusion zone, other than for the farmed livestock, that can be manually manipulated in and out of the fenced areas, as a vegetation management tool. Other large non-flying or burrowing species will have limited utilisation of this habitat until the plant is decommissioned.

Mitigations

Goal: Maintain the current agricultural potential of the fenced areas.

Ensure the fence installation does not cause mortality of indigenous wildlife.

Ensure fencing does not affect the surface hydrology of the area, nor cause erosion.

Objective(s) (including targets):

- To utilise the fenced areas as controlled grazing areas for livestock.
- To install electric fencing high enough above ground that mammals are not at risk.
- To regularly maintain fencelines to reduce impacts on surface hydrology flow patterns.

Mitigations to potential impacts resulting from Fencing & Access Control		
Type of mitigation	Responsible authority	Mitigation
Reduction	Contractor	Avoid using fences aligned perpendicular to the contour as well as dirt roads which increase surface water runoff, cause erosion and/or sedimentation of a watercourse.
Reduction	Contractor	Fencelines must be regularly cleared of accumulating debris, to allow surface water to flow uninhibited across the development footprint.
Reduction	Contractor / Landowner	Allow the landowners sheep to access the fenced-off footprint at the calculated grazing capacity (see Grazing Capacity report by F. de Wet, 2017) and return periods.
Avoidance	Contractor	Ensure electric strands are only installed along the top of the fenceline to mitigate unauthorised human access to the area, without posing a threat to fauna.

Activity Group 3: Contractor's employees (staff conduct, movement)

Description of potential impacts

- Employees can harvest indigenous plants for muthi, firewood and poach animals.
- Littering can pose a risk of suffocation to wild animals (littering is likely to be more prevalent at designated eating / rest areas).
- Employees can burn fires to keep warm and runaway fires can destroy fauna and flora.
- Excessive sanitation at latrine sites can kill plants.
- Litter can get washed into storm water drains and watercourses.
- Contamination of the watercourse from improper sanitation (bathing).
- Noise from Contractor's employees (when communicating verbally and / or when playing radios / watching TV, etc.) can be a nuisance.
- Improper sanitation at latrine sites can cause an odour.
- Work related activities extending beyond the footprint - called construction creep - can disturb habitats.
- New employment opportunities and influx of workers could disrupt public transport.
- There may not be enough local accommodation.
- Littering is visually intrusive.
- Increased security can protect the assets from theft.
- Daily transporting of employees, materials and equipment will have an impact on existing road users.

Uncertainties & limitations with predicting this impact

- Availability of accommodation in the adjacent towns to accommodate staff is unknown.

Assumptions made when assessing the impact

- It is assumed that the staff related impacts can be effectively managed and mitigated by appointing a full-time Health & Safety and Environmental Officer for the duration of construction.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	3	3	2	4	32	3	Negative	H
	With	2	2	2	2	12	2	Neutral	
2	Without	3	3	2	4	32	3	Negative	H
	With	2	2	2	2	12	2	Neutral	
3	Without	3	3	2	4	32	3	Negative	H
	With	2	2	2	2	12	2	Neutral	
No-go	N/A	1	1	1	1	3	1	Neutral	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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References (legal, scientific, social or other criteria)

1. Krige, A. 2017. *Traffic impact statement for the proposed development of a 225MW solar PV plant on several portions of farm Goedehoop, Hanover district, Northern Cape*. Element Consulting Engineers, Western Cape.
2. South African National Standard (SANS) 10103:2008: The measurement and rating of environmental noise with respect to annoyance and speech communication and the Noise Control Regulations promulgated in terms of Section 25 of the Environment Conservation Act, 1989(Act No. 73of 1989). Govt. Gazette. No. 13717, 10 January 1992.

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- Effective human resource management will help ensure impacts of a significant nature do not occur ensuring no irreplaceable loss of resources.

Mitigations

Goal: Reduce human induced impacts and nuisance factors.

Objective(s) (including targets):

- To enforce sound housekeeping practices throughout the construction process.
- To ensure use is made of the supplied facilities for sanitation and waste management.
- To ensure that construction only takes place within the designated footprint.

Mitigations to potential impacts resulting from Contractor's staff		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor	Zero tolerance policy must be implemented toward harvesting any natural products from the veld.
Avoidance	Contractor	Adequate waste receptacles must be available, including those that track with the active work fronts, to ensure effective waste management.
Avoidance	Contractor	A no fire policy must be instituted to avoid the creation of runaway fires.
Avoidance	Contractor	Adequate toilets must be available, including tracking active construction areas.
Avoidance	Contractor	No staff must be permitted outside the designated construction area, to avoid contamination of watercourses and littering.
Avoidance	Contractor	Noise generation must be managed, including the use of radios and other music playing appliances.
Avoidance	Contractor	A suitable off-site platform must be created to accommodate job seekers, that will avoid them coming to site in search of employment.
Avoidance	Contractor	Security must be appointed throughout construction to discourage criminal elements from site.
Reduction	Contractor	Adequate accommodation and transport must be provided for all staff to reduce impact on the local towns and road networks.

Activity Group 4: Construction of permanent & temporary access roads

Description of potential impacts

- A formalised road network (including prioritisation of existing roads) will protect flora and fauna from off-road driving, and improves the visibility of fauna to drivers.
- Dirt roads can increase surface water runoff, cause erosion and sedimentation of a watercourse.
- The linear alignment of all roads can redistribute surface water flow patterns.
- Storm water outlets and culverts, if improperly or inadequately protected, can cause erosion to the receiving environment.
- Dust entrainment from unsurfaced roads can result in unacceptably high dust fallout.
- Construction of new roads reduces the grazing potential of the land.
- Roads can act as firebreaks and prevent natural drivers, such as fire from influencing species composition within the local plant community.
- Roads that alter surface water flow patterns within the local landscape will redistribute the availability of run-off as a source of water to plants - this impact is more significant in arid areas.
- Additional roads add a visual impact to the landscape.
- Access to site is required for construction purposes.
- Roads with storm water outlets can channel litter, oil and fuel spills into a watercourse, causing water pollution.
- Expansive, cleared areas are vulnerable to soil erosion.
- Water used to control dust on dirt roads can cause erosion if too much water is sprayed.
- Cleared and compacted areas without grass tussocks to impede surface water run-off, can erode.
- Rehabilitated sites are susceptible to erosion.
- Topsoil can be mixed with cement, subsoil or pulverised by trucks.
- Soil will be required for road maintenance.
- During the construction phase and maintenance of power lines, substations and service roads, some habitat destruction and alteration inevitably takes place. These activities have an impact on birds breeding, foraging and roosting in close proximity to the servitude through the modification of habitats and disturbance, particularly during breeding activities.

- It is anticipated that only the delivery of the solar panels and the personnel trips will influence the existing traffic operations on the affected road. The construction machinery will only have a traffic impact on delivery to and collection from the site and are therefore regarded as negligible.

Uncertainties & limitations with predicting this impact

- The preferred footprints have pre-existing roads, the number of additional tracks is uncertain.

Assumptions made when assessing the impact

- Irrespective of the number of additional tracks required for construction, existing roads will be used and the creation of new tracks will be below the listed activity thresholds.
- Limited temporary access roads will be constructed, and maintained as two-tracks and not graded or paved.
- Erosion is a natural phenomenon and cannot be prevented without permanent and / or hard structures. It can, however, be controlled and reduced.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	3	4	4	4	44	2	Negative	H
	With	2	2	2	2	12	2	Neutral	
2	Without	3	4	4	4	44	2	Negative	H
	With	2	2	2	3	18	2	Neutral	
3	Without	3	4	4	4	44	2	Negative	H
	With	2	2	2	3	18	2	Neutral	
No-go	N/A	1	1	1	1	3	1	Positive	N/A

High Significance: 30 - 40

Medium Significance: 20 - 29

Low Significance: 1 - 19

References (legal, scientific, social or other criteria)

1. National dust control regulations. GG No. 36974, GN No. R. 827, 1 November 2013.
2. Minerals and Petroleum Resources Development Act (Act 28 of 2002), GG No. 23922 dated 10 October 2002.

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- Lost topsoil cannot be replaced, given the geological time scale required for its creation through the weathering of parent material / rock; unless imported from elsewhere.
- In the case of degraded or lost soil, organic modifications to in situ material will need to be undertaken to return fertility to the affected areas and promote vegetation growth.
- Grading of existing farm tracks will increase the construction footprint / impact and increase exposure to dust emissions and surface water runoff induced erosion; effects of which if not remediated will persist indefinitely.
- The extent of reversibility is dependent on the severity of the erosion, including the nature of the remaining *in situ* material, the amount of soil that has been exported from a site and whether or not the exported soil is recoverable. For example, soil washed from a gravel road into a mitre drain can be graded back onto the surface of the road, whereas soil that is washed from a gully into a water course is not recoverable and the source cannot be re-instated without significant intervention and cost. Although erosion has the potential to irreversibly change the relief, eroded sites can be stabilized through rehabilitation measures.

Mitigations

Goal: Reduce the creation of new roads and ensure the stability of existing roads.

Objective(s) (including targets):

- To prioritise the use of existing road networks.
- To discourage the creation of new tracks.
- To manage dust entrainment on access roads which may not exceed the thresholds stipulated in the National Dust Control Regulations.

- To mitigate incidental impacts associated with road and road usage.
- To reduce any deleterious effects to existing road users.

Mitigations to potential impacts resulting from construction of permanent & temporary access roads		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor	Existing roads must be used to avoid additional impacts on the fauna & flora of the area.
Control	Contractor Surveyor	The alignment and / or placement of access roads, relative to the prevailing slope and existing surface water (rainfall runoff) flow patterns must not cause erosion and / or sedimentation of a watercourse.
Reduction	Contractor	Protect all areas (including rehabilitated areas) susceptible to erosion by installing all the necessary, temporary and / or permanent mechanisms for controlling / diverting storm water run-off, dissipating water energy and encouraging infiltration as soon as possible.
Reduction	Contractor	Grading of existing farm roads must not be promoted, but farm tracks must be utilised as far as possible.
Rectification	Contractor	Correct any cause of erosion at the onset thereof by controlling / diverting storm water run-off, immediately repairing and stabilizing / rehabilitating impacted areas in the most appropriate manner.
Reduction Avoidance	Contractor	Dust suppression must be carried out on access roads where high dust entrainment is evident. To reduce water usage, a suitable soil binder must be used in dust suppression activities.
Avoidance	Contractor	The contractor shall obtain material from the on-site approved borrow pits or from a licensed, commercial borrow pit, in the event that the quality of material sourced from on-site borrow pits is unsuitable.
Avoidance	Contractor	The Contractor is prohibited from driving on topsoil stockpiles and windrows.
Avoidance	Contractor	Topsoil is to be used for rehabilitation only.
Avoidance	Contractor	Topsoil shall be windrowed separately from the subsoil and opposite the working side of the works area.
Avoidance	Contractor	Do not mix topsoil with cement and / or subsoil or let it be pulverised by trucks.
Avoidance	Contractor	Do not use too much water straight from the nozzles to control dust on dirt roads as it can cause erosion.

Activity Group 5: Transport on site & accommodation of traffic (including parking areas)

Description of potential impacts

- Parking and driving carelessly can increase collisions with mammals, birds, reptiles, amphibians and insects - roadkills.
- Designated parking areas will protect local flora and fauna by reducing construction creep.
- Hardened surfaces in parking areas with storm water outlets can channel litter, oil and fuel spills into a watercourse, causing water pollution.
- Contamination from spills when refuelling, parking, driving, repairing, washing and operating plant or equipment nearby or within the watercourse.
- Cleared or dirt parking areas are susceptible to oil and fuel spills from leaking vehicles, causing soil pollution.
- Driving can compact soil stockpiles.
- Topsoil can be pulverised by trucks.
- Driving on dirt roads at speed in dry, windy conditions can generate dust.
- Construction plant can generate noise.
- Dust may be generated when transporting, handling and stockpiling material / cement in windy conditions.
- Excessive traffic and dust can smother plants growing on the verge of gravel access roads.

Uncertainties & limitations with predicting this impact

- The amount of construction plant and vehicles is uncertain.

Assumptions made when assessing the impact

- That the largest impact by vehicles will be the delivery by large trucks of all the infrastructure and equipment.
- Smaller vehicle will have a lower impact and require less space for parking etc.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	4	4	3	4	44	3	Negative	H
	With	4	2	2	2	16	2	Neutral	
2	Without	4	4	3	4	44	3	Negative	M
	With	4	2	2	3	24	2	Neutral	
3	Without	4	4	3	4	44	3	Negative	M
	With	4	2	2	3	24	2	Neutral	
No-go	N/A	1	1	1	1	3	1	Positive	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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References (legal, scientific, social or other criteria)

1. DEA (undated). Booklet guideline for the administration of emergency incidents.
2. National Dust Control Regulations. GG No. 36974, GN No. R. 827, 1 November 2013, read in combination with SANS 1929: 2005.
3. South African National Standard (SANS) 10103:2008: The measurement and rating of environmental noise with respect to annoyance and speech communication.
4. DEA Regulations No. R.154. Noise Control Regulations promulgated in terms of Section 25 of the Environment Conservation Act, 1989 (Act No. 73 of 1989). GG No. 13717, 10 January 1992.

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- Injudicious placement of parking areas can result in the removal of protected flora.
- Dust fallout adjacent to haul routes and roads may result in only resilient vegetation persisting – enforcing an “edge effect”.

Mitigations

Goal: Reduce impacts associated with transport and parking areas.

Objective(s) (including targets):

- To ensure that dust fallout rates resulting from transport does not exceed legal limits.
- To ensure parking areas are located in suitable areas that do not affect protected flora.
- To reduce contamination of soil from leaking plant and vehicles and upon occurrence is remediated promptly.
- To reduce nuisance impacts from transporting vehicles.

Mitigations to potential impacts resulting from transport on site & accommodation of traffic (including parking areas)		
Type of mitigation	Responsible authority	Mitigation
Reduction	Contractor	Drivers shall adhere to the relevant speed limit(s) (ON the existing road network) at all times and restrict their movements to the existing and / or approved roadway or servitude. The speed limit on the property shall be 40 km/h.
Reduction	Contractor	Designate parking areas in order to protect local flora and fauna and the injudicious driving off-road.
Remedial	Contractor	Oil & fuel spills on roadways and parking areas must be removed to depth of penetration as soon as possible after their discovery and placed in a designated hazardous container for safe disposal.
Avoidance	Contractor	Drip trays must be placed under all plant that is parked overnight and extended periods not in operation.
Avoidance	Contractor	Drip trays can be filled with hydrophobic hydrocarbon absorbent material to avoid content being leached out during rainfall events.
Avoidance	Contractor	No servicing or washing of vehicles or plant may take place in parking bays, and all servicing must be done off-site, no service or wash-bays are to be constructed on site.
Avoidance	Contractor	Emergency breakdowns in the parking areas or along roads, must be addressed after adequate pollution containment measures have been implemented including but not limited to drip trays and spill kits.
Avoidance	Contractor	Refuelling of vehicles and plant may only take place at a designated and permitted (from local Fire Chief) fuel storage tank or mobile fuel bowser, under the guidance of a Specific Operating Procedure (SOP) that limits spillage

		and addresses remedial actions in the event of a spillage.
Avoidance	Contractor	Any topsoil removed during the establishment of parking areas and temporary roads, must be protected from vehicular and construction impacts.
Avoidance	Contractor	Excessive vehicle movement, on highly windy days must be avoided and / or additional dust suppression exercised, including transport and off-loading of dispersive materials.
Reduction	Contractor	Vehicles and plant must be in a good state of repair to limit noisy operations.

Activity Group 6: Sourcing & management of water (for drinking, sanitation & construction activities)

Description of potential impacts

- Uncontrolled abstraction from a watercourse or aquifer (borehole) can reduce the natural reserve required for ecological function and downstream users (including irrigation), such as when the demand for water during construction exceeds the permissible allocation.
- Water required for human consumption and construction can be used excessively / wastefully.
- Water used to control dust on dirt roads can cause erosion if too much water is sprayed from the nozzles.
- Untreated water can cause health problems when drunk by staff.
- Open water in arid and semi-arid environments (such as in the Nama-Karoo) may be an important resource influencing survival, resource use, distribution and activity of insectivorous bats (Korine et al. 2016).
- It is important that areas with low lying depressions where water pools during the autumn and summer rainfall season are not altered as they may be important areas not only for bats to drink and forage but also for socialising.

Uncertainties & limitations with predicting this impact

- The sustainable yield of the available boreholes has not yet been determined.

Assumptions made when assessing the impact

- It is assumed that the sustainable yield of the boreholes will suffice for the needs of the construction process and potable water requirements.
- The groundwater abstraction limits stipulated in the relevant General Authorisation for the quaternary catchment are sustainable.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	3	4	3	3	30	3	Negative	M

	With	2	2	3	3	21	2	Neutral	
2	Without	3	4	3	4	40	4	Negative	L
	With	2	2	2	2	12	2	Neutral	
3	Without	3	4	3	4	40	4	Negative	L
	With	3	2	2	3	21	2	Neutral	
No-go	N/A	1	1	1	1	3	1	Positive	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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References (legal, scientific, social or other criteria)

1. DWAF, 2013. General Authorisation GN No. 665 published in Government Gazette No. 36820 on 6 September 2013.
2. SANS 241-1:2015. South African drinking water standards.
3. Cory Toussaint, D. 2017. *Chiropteran Draft Scoping Report for Soventix Solar Farm, Hanover, Northern Cape.*

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- Excessive abstraction of groundwater from the available boreholes can deplete the underground resource affecting other abstraction points on this property and adjacent landowners, limiting water supply to livestock and domestic needs.

Mitigations

Goal: Ensure sustainable water utilisation from existing boreholes.

Objective(s) (including targets):

- To ensure abstraction rates within the determined sustainable yield.

Mitigations to potential impacts resulting from sourcing & management of water (for drinking, sanitation & construction activities)		
Type of	Responsible	Mitigation

mitigation	authority	
Avoidance	Contractor	Water meters must be installed on all boreholes to ensure that utilisation rates are measured and monitored and do not exceed the permissible limits.
Avoidance	Contractor	All water bowsers must maintain logbooks in which quantities used for construction and dust suppression are recorded.
Avoidance	Contractor	Water bowsers implementing dust suppression, must determine optimal rates of application to ensure over-wetting does not occur.
Reduction	Contractor	An environmentally friendly water-soluble dust control additive / binder must be added as an additive to the water used for dust suppression. The additives generally assist with surface stabilization thereby significantly reducing water usage.
Avoidance	Contractor	Water used for potable (drinking) purposes must be tested monthly against SANS 241, to ensure compliance with the minimum standards. Should elements of the water not comply, the water must be treated to ensure no acute or chronic health risks.

Activity Group 7: Sourcing & management of building material / sand

Description of potential impacts

- Animals & people can drown in water-filled borrow pits.
- Exposed areas from sand mining can erode and cause sedimentation of watercourses.
- Borrow pits can trap surface water runoff or expose the water table.
- Soil mining degrades the landscape, making it unsuitable for certain land uses like agriculture.
- Sand mining destroys natural habitats and creates visibly intrusive scars in the natural landscape.
- Areas that are deprived of their soil through mining, limits ecological function and land capability to generate ecosystem goods and services and tangible economic benefits including income from conservation or farming.

Uncertainties & limitations with predicting this impact

- There is uncertainty as to the actual quantities of sand required for the project (although assumed to be very low) and whether or not the existing borrow pits will meet the quality of material required.

Assumptions made when assessing the impact

- As all concrete will be purchased as “ready-mix”, it is expected that limited sand will be required from the existing borrow pits, other than that required to maintain existing roads and tracks.
- Should the material sourced from the existing borrow pits be deemed technically unsuitable, material will be sourced from licensed commercial sources and no new borrow pits will be opened.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
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1	Without	3	3	3	3	27	2	Negative	H
	With	2	2	2	2	12	1	Neutral	
2	Without	3	3	3	3	27	2	Negative	H
	With	2	2	2	2	12	1	Neutral	
3	Without	3	3	3	3	27	2	Negative	H
	With	2	2	2	2	12	1	Neutral	
No-go	N/A	1	1	1	1	3	1	Positive	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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Reference (legal, scientific, social or other criteria)

1. Minerals and Petroleum Resources Development Act, 2002 (No 28 of 2002). GG No. 23922 dated 10 October 2002.

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- A risk of irreplaceable loss exists if the contractor creates new unauthorised borrow pits with a consequent loss of habitat and legal non-compliance.
- Extensive expansion of existing borrow pits will remove soil and limit the area to another other land use.

Mitigations

Goal: Utilise existing borrow pits or commercial sources.

Objective(s) (including targets):

- To ensure the existing surface area footprint of the borrow pits does not increase significantly as a consequence of the project.
- To ensure utilisation of the borrow pits does not increase risk of drowning to humans or livestock.
- To ensure that only verified licensed commercial sources for sand & stone are used.

Mitigations to potential impacts resulting from sourcing & management of building material / sand

Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor	Ensure utilisation of sand from existing borrow pits does not result in storage of rainwater and runoff and that the profile remains free-draining.
Avoidance	Contractor	Ensure the free-draining nature of the borrow pits doesn't result in erosion and the export of material into watercourses.
Avoidance	Contractor	No new borrow pits will be permitted.
Avoidance	Contractor Surveyor	The footprint of the borrow pits must be surveyed and clearly demarcated to ensure no construction creep takes place increasing the impact.

Activity Group 8: Stockpiling and material laydown areas (spoil, mulch, building sand, topsoil, windrows, material & equipment)

Description of potential impacts

- Material stockpiles and lay down areas can be located in undisturbed areas, trampling or smothering tunnelling, burrowing or nesting fauna in / on the ground.
- Rainfall can wash soil stockpiles and windrows into a watercourse and cause sedimentation.
- Stockpiles and windrows can impede and / or redistribute surface water flow patterns.
- Soil stockpiles can erode, resulting in a loss of material for rehabilitation.
- Handling stockpiles in dry, windy conditions can generate dust.
- Spoil, soil, mulch or any other stockpiles, if left on site, will remove natural habitat and will interfere with certain land use practices like agriculture.
- Stockpiles are susceptible to alien and / or invasive plant infestation.
- Alien plants can also be introduced by importing foreign contaminated material including topsoil for construction.
- Unwanted stockpiles can be visually intrusive in the natural landscape.
- Areas that are smothered with stockpiles, cannot retain the ecological functions and land use required to generate ecosystem goods and services and tangible economic benefits including income from conservation or farming.
- Plants of conservation value & protected species can be impacted if not effectively searched & rescued before-hand.

Uncertainties & limitations with predicting this impact

- None.

Assumptions made when assessing the impact

- Limited trenching and clearing of natural vegetation will be required and stockpiling of topsoil and other in situ material.
- Most cleared areas will constitute temporary laydown areas.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	3	3	2	3	24	2	Negative	H
	With	2	2	2	2	12	2	Neutral	
2	Without	3	3	2	3	24	2	Negative	H
	With	2	2	2	2	12	2	Neutral	
3	Without	3	3	2	3	24	2	Negative	H
	With	2	1	2	2	10	1	Neutral	
No-go	N/A	1	1	1	1	3	1	Positive	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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References (legal, scientific, social or other criteria)

1. Conservation of Agricultural Resources Act (No 43 of 1983) and the regulations dealing with declared weeds and invader plants as amended from time to time.
2. National Dust Control Regulations. GG No. 36974, GN No. R. 827, 1 November 2013, read in combination with SANS 1929: 2005.
3. National Environmental Management: Biodiversity Act, 2004 (No 10 of 2004), Alien and invasive species lists. GG No. 37885, GN No. 598, 1 August 2014.
4. National Environmental Management: Biodiversity Act, 2004 (No 10 of 2004), Threatened or protected species regulations, GG No. 38600, GN No. 255, 31 March 2015.
5. Northern Cape Nature Conservation Act (Act 9 of 2009).

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- Locating of stockpiles in sensitive areas will likely result in the smothering of the associated vegetation and removal of faunal habitat, which depending on the duration and extent of the stockpiling activities, will unlikely recruit in the area again.

Mitigations

Goal: Effectively manage stockpiling activities.

Objective(s) (including targets):

- To ensure stockpiles are located in the least environmentally sensitive areas.
- To ensure that stockpiles do not provide a platform for the establishment of alien & invasive weeds.
- To ensure that stockpiles do not influence natural drainage patterns.

Mitigations to potential impacts resulting from stockpiling and material laydown areas (spoil, mulch, building sand, topsoil, windrows, material & equipment)		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor	Ensure the footprint of intended stockpile areas are searched for fauna and flora of conservation concern and protected status by a qualified ecologist, prior to allocation.
Avoidance	Contractor	Ensure stockpile and laydown areas are not positioned close to watercourses - maintain the 100 m buffer around aquatic areas.
Avoidance	Contractor	Ensure stockpiles and laydown areas do not impede natural surface water drainage, resulting in erosion and export of the stockpiled material.
Avoidance	Contractor	No residues of stockpiled material must be left on site, that can impede restoration of ecological function and remain a visual intrusion on the landscape.
Avoidance	Contractor	Sediment traps may be necessary to prevent erosion and soil movement if there are topsoil or other waste heaps present during the wet season.
Reduction	Contractor	Recruitment of alien and invasive plants must be controlled to ensure they do not seed and propagate (both declared weeds and those that are outside of their natural distribution).

Activity group 9: Clearing and grubbing (fence line, operations area, access roads, rack foundations, transformers and inverters, cables, substation and pylons)

Description of potential impacts

- Direct contact with fauna and flora, including ground nesting birds and burrowing mammals, can cause injury or death. The impacts are exacerbated when the species affected are classified as protected, sensitive, rare, or threatened and endangered.
- Construction activities, such as clearing, may extend beyond the development footprint, known as construction creep.
- Cleared and compacted areas without grass tussocks to impede surface water run-off, can increase surface water runoff, cause erosion and sedimentation, if adjacent to or within the watercourse, i.e. sand mining areas and linear activities like roads, fences, pipelines or other cleared servitudes.
- Exposed areas are susceptible to wind erosion and the generation of dust.
- Cleared areas that are not rehabilitated are susceptible to degradation and loss of other sustainable land use practices like grazing and conservation.
- Habitat is destroyed by clearing. The disturbance created by clearing activities within plant communities creates favourable habitat for the life history strategies of undesirable plant species - and infestation by alien and / or invasive plants.
- Cleared areas are visibly intrusive in the natural landscape.
- Cleared areas cannot retain the ecological functions and land use required to generate ecosystem goods and services and tangible economic benefits including income from conservation or farming.
- Clearing and other earthmoving activities can reveal and disturb heritage resources, sites of archaeological significance and graves.
- Changes in landscape and habitat conversion can affect bat populations and assemblages on a local and regional scale (Jones et al. 2009, Jones et al. 2003, Jung and Kalko 2011).
- Large scale removal of natural vegetation for the installation and operation of solar power plants can cause a change in prey availability and thus a change in bat activity in the landscape.
- Habitat loss is potentially the most significant avifauna impact, dependent on location and scale of the development, associated with the construction and operation (maintenance) of Solar Energy Facilities (SEFs). Extensive areas of vegetation (habitat) are cleared to accommodate the considerable amount of infrastructure required at these facilities, reducing the amount of habitat available to birds for foraging, roosting and breeding (Smallie, 2013). This impact is likely to affect smaller bird species (e.g., larks) with small home ranges, as entire territories could be removed during construction activities.

Uncertainties & limitations with predicting this impact

- The full extent of clear and grub is unknown, although expected to be limited.

Assumptions made when assessing the impact

- The developer has committed to minimal clearing, and that vegetation beneath the solar panel arrays will be left intact.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	3	3	3	3	27	2	Negative	H
	With	2	2	3	2	14	2	Neutral	
2	Without	3	3	3	3	27	2	Negative	H
	With	2	2	3	2	14	2	Neutral	
3	Without	3	3	3	3	27	2	Negative	H
	With	2	1	3	2	12	1	Neutral	
No-go	N/A	1	1	1	1	3	1	Positive	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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References (legal, scientific, social or other criteria)

1. Conservation of Agricultural Resources Act (No 43 of 1983) and the regulations dealing with declared weeds and invader plants as amended from time to time.
2. Cory Toussaint, D. 2017. *Chiropteran Draft Scoping Report for Soventix Solar Farm, Hanover, Northern Cape.*

3. National Environmental Management: Biodiversity Act, 2004 (No 10 of 2004). GG No. 26436 dated 7 June 2004.
4. National Environmental Management: Biodiversity Act, 2004 (No 10 of 2004), Alien and invasive species lists. GG No. 37885, GN No. 598, 1 August 2014.
5. National Environmental Management: Biodiversity Act, 2004 (No 10 of 2004), Threatened or protected species regulations. GG No. No. 38600, GN No. 255, 31 March 2015.
6. National Heritage Resources Act, 1999 (No 25 of 1999). GG No. 19974, 28 April 1999.

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- The extent of clearing and grubbing will determine the level of habitat transformation, as the affected footprint / s post rehabilitation, are unlikely to mimic unaffected areas.

Mitigations

Goal: Reduce clearing of naturally vegetated areas, with associated impacts, to a minimum.

Objective(s) (including targets):

- To minimise the impact on affected flora, fauna & heritage resources through clearing & grubbing.

Mitigations to potential impacts resulting from <i>clearing and grubbing</i> <i>(fence line, operations area, access roads, rack foundations, transformers and inverters, cables, substation and pylons)</i>		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor	Search & rescue for protected flora & fauna must be undertaken by a qualified ecologist prior to clear & grub activities.
Avoidance	Contractor	Areas to be cleared must be clearly demarcated to avoid increasing the size unnecessarily.
Avoidance	Contractor	Site layout plans must be developed identifying all areas of activity to ensure clearing only happens in pre-authorised areas and the location of topsoil stockpiles and / or windrows is clearly defined.
Avoidance	Contractor	Storm water management measures must be implemented on all cleared surfaces to ensure no erosion and export of material occurs.

Reduction	Contractor	Dust entrainment from cleared unvegetated surfaces must be managed.
Reduction	Contractor	A soil binding agent must be used along with the dust suppressant.
Avoidance	Contractor	The undisturbed / natural vegetation units, which fall outside permanent and temporary construction footprints, must be designated and demarcated as no-go areas during construction.
Reduction	Contractor	Once impacted upon, disturbed habitats must be rehabilitated immediately before further disturbance.
Rectification	Contractor	All areas of heritage value must be demarcated and avoided. Incidental discoveries during clearing and grubbing must be disclosed to site management with immediate cessation of activities until their significance can be assessed by a qualified heritage specialist.

Activity Group 10: Earthworks & excavations (associated with the operations area, road crossings, cabling, transformers and inverters, substation and pylons)

Description of potential impacts

- Open excavations can trap terrestrial fauna causing injury or death, including snakes.
- Animals can drown in water-filled excavations.
- Excavations and trenches can trap and channel rainwater, erode and, if adjacent to or within a watercourse, cause sedimentation.
- Prolonged exposure of disturbed areas, including trenches, within a watercourse will increase the risk of seasonal flows, causing erosion and sedimentation.
- Excavating can mix different soil types and horizons (topsoil can be mixed with subsoil).
- Trenches can channel uninterrupted flow, thereby increasing run-off and causing erosion, particularly on steep slopes.
- Excavations can cause injury to people who fall inside.
- Earthworks can unearth artefacts of archaeological significance.

Uncertainties & limitations with predicting this impact

- None.

Assumptions made when assessing the impact

- The need for excavations will be limited and not extensive.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	3	3	2	3	24	2	Negative	M

	With	2	2	2	2	12	2	Neutral	
2	Without	2	2	2	3	18	2	Negative	H
	With	2	2	2	2	12	2	Neutral	
3	Without	2	2	2	2	12	2	Negative	H
	With	2	2	2	2	12	2	Neutral	
No-go	N/A	1	1	1	1	3	1	Positive	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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Reference (legal, scientific, social or other criteria)

1. None.

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- The extent of the anticipated trenching and earthworks is unlikely to lead to irreplaceable loss of resources.

Mitigations

Goal: To reduce impacts on terrestrial & aquatic environments resulting from earthworks.

Objective(s) (including targets):

- To avoid mortality and injury to humans and animals in and around earthworks.
- To ensure clear separation of soil types to allow for effective rehabilitation.

Mitigations to potential impacts resulting from Earthworks & excavations (associated with the operations area, road crossings, cabling, transformers and inverters, substation and pylons)		
Type of mitigation	Responsible authority	Mitigation

Avoidance	Contractor	Open excavations must be secure and cordoned off to avoid accidental injury to humans and animals alike.
Avoidance	Contractor	Ensure that water laden with silt does not exit excavations and cause sedimentation of aquatic and / or terrestrial systems.
Avoidance	Contractor	Soil horizons must be stockpiled or windrowed separately during excavation to ensure they can be reinstated in reverse order and ensure restored soil structure.
Rectification	Contractor	Once impacted upon, disturbed habitats must be rehabilitated immediately before further disturbance.
Rectification	Contractor	Any archaeological artefacts unearthed during excavations must be protected and left in situ. Works must cease until the significance of the finding can be assessed by a qualified archaeological specialist.
Avoidance	Contractor	If trenches need to be dug for electrical cabling or other infrastructure, these should not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches which are standing open should have places where there are soil ramps allowing fauna to escape the trench.

Activity Group 11: Drilling, ram piling, erection & construction (associated with the rack foundations for the panel mounting hardware and fence poles)

Description of potential impacts

- Drill holes can trap fauna, especially those filled with rain water or ground water.
- Drilling can mix the different horizons.
- Excess soil will be leftover once the drill holes are filled with the rack foundations and fence poles.
- Drilling & ram piling machines can be noisy.
- Drilling generates dust emissions, especially under windy conditions.
- Drilling can unearth artefacts of archaeological significance.

Uncertainties & limitations with predicting this impact

- The method of drilling & anchoring is a patent and as such the proposed service provider (PiA Solar SA) only provides limited detail, leaving impact predictions to some level of assumption.
- The drilling method & technology selected will depend on the ground conditions (soil vs. rock), and PiA Solar has confirmed their ability to effectively drill and mount within the dolerite sills, in spite of the geotechnical expert's initial misgivings.

Assumptions made when assessing the impact

- The chosen drilling method will be one that will have minimal vibrations, less noise & no unnecessary vegetation clearances, but will require limited amounts of ready-mix concrete in each hole, for stability.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
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1	Without	2	2	2	3	18	2	Negative	M
	With	2	2	2	2	12	1	Neutral	
2	Without	2	2	2	3	18	2	Negative	M
	With	1	1	1	2	12	1	Neutral	
3	Without	2	2	2	3	18	2	Negative	M
	With	2	2	2	2	12	1	Neutral	
No-go	N/A	1	1	1	1	3	1	Positive	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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References (legal, scientific, social or other criteria)

1. Stapelberg, F. 2017.05.18. *Geotechnical assessment study at Goedehoop solar site, district Hanover for an environmental impact assessment*. Council for Geoscience.
2. van den Berg, H. 2017. *Soil & Wetland Assessment – Soventix solar PV project in the Hanover district, Northern Cape (De Aar/Hanover Area)*. Iris International, Potchefstroom.

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- The removal of the sub-surface concrete is likely to leave multiple depressions in the affected landscape and significant effort will have to go into filling them to mitigate a long-term associated impact.

Mitigations

Goal: To minimise impacts associated with drilling and mounting activities.

Objective(s) (including targets):

- To avoid impacting the wetlands & soils in the area.
- To reduce dust & noise emissions by drilling operations.

**Mitigations to potential impacts resulting from Drilling, ram piling, erection & construction
(associated with the rack foundations for the panel mounting hardware and fence poles)**

Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor	Permanent and temporary construction footprints (including fence poles) must be designated and sensitive terrestrial habitats demarcated as no-go areas during construction, including required buffer zones.
Reduction	Contractor	Trenches may not be excavated more than one day prior to installing the panel arrays and wiring. Open holes must be plugged if infrastructure is not installed within 1 day.
Reduction	Contractor	Once impacted upon, disturbed habitats must be rehabilitated immediately before further disturbance.
Reduction	Contractor	Drilling operations must not be undertaken outside of normal working hours, in order to reduce noise impacts on affected landowners.
Reduction	Contractor	Dust suppressant must be prioritised for the drilling activities.
Rectification	Contractor	Any archaeological artefacts unearthed during drilling activities must be protected and left in situ. Works must cease until the significance of the finding can be assessed by a qualified archaeological specialist.

Activity Group 12: Erection and construction of the panels arrays and associated infrastructure

Description of potential impacts

- Changes in landscape and habitat conversion can affect bat populations and assemblages on a local and regional scale.
- Invertebrate diversity will be influenced by botanical diversity as plants provide forage, habitat and structure for reproduction (Montag et al. 2016), and thus in turn may positively influence and possibly increase bat foraging activity.
- The construction of the proposed Solar facility and its associated infrastructure will have a visual impact on the scenic resources of this region.
- Construction of SEFs requires a significant amount of machinery and labour to be present on site for a period of time. For shy, sensitive species or ground-nesting birds resident in the area, construction activities are likely to cause a temporary disturbance or even result in displacement from the site entirely. In addition, species commuting around the site may become disorientated by the reflected light and consequently fly longer distances to avoid the area, potentially resulting in displacement and energy implications (Smallie, 2013).

Uncertainties & limitations with predicting this impact

- None.

Assumptions made when assessing the impact

- None.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	2	3	3	3	24	2	Negative	M
	With	2	2	2	2	12	2	Neutral	
2	Without	2	3	3	3	24	2	Negative	M

	With	2	2	2	2	12	2	Neutral	
3	Without	2	3	3	3	24	2	Negative	M
	With	2	2	2	2	12	2	Neutral	
No-go	N/A	1	1	1	1	3	1	Positive	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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References (legal, scientific, social or other criteria)

1. Cory Toussaint, D., 2017. *Chiropteran Specialist Report for the Proposed Soventix Solar Power Plant, Hanover, Northern Cape.*
2. Henwood, S. 2017. *Visual impact assessment report for the proposed Soventix photovoltaic plant – on several portions of the farm Goedehoop, Hanover district, Northern Cape.* Henwood Environmental Services, Mbombela, Mpumalanga.
3. Krige, A. 2017. *Traffic impact statement for the proposed development of a 225mw solar PV plant on several portions of the farm Goedehoop, Hanover district, Northern Cape.* Element Consulting Engineers, Western Cape.
3. Stapelberg, F. 2017.05.18. *Geotechnical assessment study at Goedehoop solar site, district Hanover for an environmental impact assessment.* Council for Geoscience.

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- The impacts may be reversed if during the decommissioning phase, the site is rehabilitated to as close as possible its natural state, through landscaping and vegetation growth enhancers.

Mitigations

Goal: To reduce the changes in landscape and habitats.

Objective(s) (including targets):

- Avoid unnecessary extensions to the construction footprints.
- Ensure that construction is kept to the demarcated authorised area.

- Reduce as much as possible the visual & traffic effects.

Mitigations to potential impacts resulting from erection and construction of the panels arrays and associated infrastructure		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor	Permanent and temporary construction footprints (including fences) must be designated and positioned away from the bat populations, where possible.
Reduction	Contractor	It is recommended that if the solar power farm is to be installed near the numerous rocky outcrops in the southwest portion of the farm, it would be preferable for a 100m buffer zone to be extended around the area to limit any potential impact on roosting sites in the rocky outcrops
Reduction	Contractor	Use visual screens to minimise the visual impact on the scenic resources of this region.
Reduction	Contractor	Once impacted upon, disturbed habitats must be rehabilitated immediately before further disturbance.
Reduction	Contractor	It is recommended that during the rehabilitation phase, a seed mix containing a variety of the local floral species is used and that the management practices are focused on biodiversity conservation
Avoidance	Contractor	Delivery & collection from the site need to take place in bulk and/or around the same time, in order to minimally affect the existing traffic operations.

Activity Group 13: Feeding or tying the solar PV plant into existing Eskom grid

Description of potential impacts

- The current 400KVA overhead powerline runs within an expansive watercourse, which the project will loop-in & -out, necessitating work in the watercourse.
- Pylons for the loop-in, loop-out overhead powerlines will be installed within the watercourse, acting as an impediment to surface flows and affecting the beds of the watercourse.
- The power may need to be turned off when the solar PV plant is connected to the existing Eskom grid, temporarily disrupting the supply of electricity to local communities.

Uncertainties & limitations with predicting this impact

- The power may need to be turned off when the solar PV plant is connected to the existing Eskom grid, temporarily disrupting the supply of electricity to local communities.

Assumptions made when assessing the impact

- Eskom will not be opposing this feed.
- Eskom will have the capacity to accommodate the energy generated by this facility.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	2	3	3	3	24	2	Negative	M
	With	2	2	3	2	14	2	Neutral	
2	Without	2	3	3	3	24	2	Negative	M

	With	2	2	3	2	14	2	Neutral	
3	Without	1	1	1	2	6	1	Negative	N/A
	With	1	1	1	1	3	1	Neutral	
No-go	N/A	1	1	1	1	3	1	Positive	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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Reference (legal, scientific, social or other criteria)

- Section 21(c) and (i) - General Authorisation GN No. 509 published in Government Gazette No. 40229 on 26 August 2016.

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- Once at the decommissioning phase, the poles that were used to support the tying in lines can be demolished and the watercourse rehabilitated.

Mitigations

Goal: To reduce transformation and fragmentation of the watercourse.

Objective(s) (including targets):

- To preserve the watercourse.

Mitigations to potential impacts resulting from feeding or tying the solar PV plant into existing Eskom grid		
Type of mitigation	Responsible authority	Mitigation
Reduction	Contractor	Only impact an area of the watercourse that will be affected (do not demarcate large areas unnecessarily).
Reduction	Contractor	Ensure that the necessary licenses and / or permits are in place before impeding the watercourse.
Avoidance	Applicant/Contractor	Ensure that the municipality and / or public know of any possible cuts in electricity supply timeously.
Avoidance	Contractor	Do not place high risk (pollution generating) construction activities within close proximity to a watercourse as it can

		cause pollution.
Reduction	Contractor	Make means of ensuring that rainfall does not wash soil stockpiles and windrows into a watercourse and cause sedimentation.

Activity Group 14: Waste generation (solid waste including 'spoil', liquid waste, separation, storage and disposal)

Description of potential impacts

- Solid and liquid waste can be harmful to fauna if swallowed / ingested or if the creature becomes entangled or impaled.
- Improper handling, storage or disposal of waste can cause toxicity – the introduction of toxic or hazardous substances into a watercourse - spills can be washed into the watercourse by storm water run-off.
- Construction activities will produce solid and liquid waste, which can contaminate the ground (litter, spillage) if improperly handled, stored or disposed.
- Drip trays and bunds using sand as an absorbant will contaminate the sand and generate more hazardous waste.
- Spills may be covered with virgin soil.
- Burning waste can generate toxic smoke emissions.
- Illegal dumping will result in the loss of certain land uses like agriculture and conservation.
- Illegal dumping will remove natural habitat.
- Improper handling, storage and disposal of waste can cause toxicity – is the introduction of toxic or hazardous substances into an environment that may adversely affect the health of people.
- Burning waste can cause smoke inhalation.
- Solid waste can be blown away and into the landscape.
- Waste contaminated or storage areas and illegal dumps can be visibly intrusive in a natural landscape.
- The disposal or processing of packaging material must be addressed in the EIA. Packaging material is currently being used in the townships for additions to houses, which is illegal and creates a fire hazard.
- Littering is visually intrusive.
- Ensure that rubble, litter and disused construction materials are managed and removed regularly (VIA).
- Excess waste puts a burden on existing landfill sites.
- Hazardous waste, particularly large amounts of it is expensive to dispose of.
- Illegal dumping sites cannot retain the ecological functions and land use required to generate ecosystem goods and services and tangible economic benefits including income from conservation or farming.

- All temporary anthropogenic influences required during construction can clutter the site and make it look untidy.

Uncertainties & limitations with predicting this impact

- The ability of the local municipalities to service the site in terms of waste removal.

Assumptions made when assessing the impact

- None.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	3	2	3	3	24	2	Negative	H
	With	2	1	2	2	10	1	Neutral	
2	Without	3	2	3	3	24	2	Negative	H
	With	2	1	2	2	10	1	Neutral	
3	Without	3	2	3	3	24	2	Negative	H
	With	2	1	2	2	10	1	Neutral	
No-go	N/A	1	1	1	1	3	1	Neutral	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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References (legal, scientific, social or other criteria)

2. Aucamp, I. 2017. *Social Impact Assessment Report for the proposed development of 225 MW solar PV plant in Northern Cape Province*. Equispectives Research & Consulting Services, Pretoria.
3. Henwood, S. 2017. *Visual impact assessment report for the proposed Soventix photovoltaic plant – on several portions of the farm Goedehoop, Hanover district, Northern Cape*. Henwood Environmental Services, Mbombela, Mpumalanga.

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- The impacts may be reversed if proper disposal methods can be adhered to, i.e. waste hierarchy, waste separation, waste cycle, etc.

Mitigations

Goal: To avoid improper disposal of waste and promote good housekeeping.

Objective(s) (including targets):

- Enforce proper and approved (legal) disposal of waste.
- Implement an effective waste management strategy based on the waste hierarchy.

Mitigations to potential impacts resulting from waste generation (solid waste including 'spoil', liquid waste, separation, storage and disposal)		
Type of mitigation	Responsible authority	Mitigation
Reduction	Contractor	Establish and implement an Integrated Waste Management Strategy including avoidance, reduction, re-using, recycling and disposal, i.e. the production of hazardous waste can be avoided by providing drip trays, reduce waste by using the correct quantities, re-use concrete rubble as back fill or recycle steel off-cuts and dispose of non-hazardous solid waste at a registered municipal dump site.
Reduction	Contractor	Induct all labourers on the waste management strategy and enforce it through regular (at least weekly) toolbox talks.
Reduction	Contractor	Separate general, recyclable, natural (vegetation and soil/rock) and hazardous waste, and demarcate different containers for different waste types using colour codes.

Avoidance	Contractor	Do not litter, burn or bury waste on any property.
Avoidance	Contractor	A dustbin shall be available at each work front during working hours.
Avoidance	Contractor	The contractor shall dispose of general waste at a registered municipal dump site.
Avoidance	Contractor	The contractor shall return used oil to the supplier or an oil recycling company.
Avoidance	Contractor	The contractor shall contain contaminated water from washing brushes in a conservancy tank until sufficient volume warrants disposal by a registered hazardous waste management company.
Reduction	Contractor	Remove ineffective danger tape / netting that has begun to litter the site or surrounding areas.
Avoidance	Contractor	Designate a temporary waste storage area, enclose it in a fence that cannot be breached by fauna, and provide sufficient scavenger proof dust bins with black bags inside the construction camp.
Avoidance	Contractor	The contractor is prohibited from discharging waste water, including domestic water from sanitation facilities, and grey water from washing equipment or plant into a watercourse.
Reduction	Contractor	Re-fuelling with a mobile fuel bowser shall take place outside any watercourse.
Avoidance	Contractor	The contractor shall store hazardous material within a secure, safe and bunded facility at the construction camp.
Avoidance	Contractor	Use drip trays for refuelling, repair / maintenance work and all stationary construction plant and equipment that can leak, such as TLBs, compressors and generators.
Avoidance	Contractor	Do not cover spills with virgin soil. It merely increases the disposal cost for a greater volume of hazardous waste.
Rectification	Contractor	Immediately remove contaminated soil to the depth of penetration and temporarily store in a designated solid hazardous waste container until sufficient volume warrants disposal at a registered hazardous waste dump site. Alternatively, onsite treatment of contaminated soil should be considered with a registered hazardous waste management company.
Avoidance	Contractor	Do not mix concrete on open ground. Mix in a wheel barrow, a mixing tray or on a level plastic sheet.
Avoidance	Contractor	The contractor shall prevent the run-off of slurry or cement contaminated water from concrete / plaster mixing sites.

Reduction	Contractor	The contractor shall implement appropriate procedures, such as the use of a ground cover, to prevent the contamination of the ground when handling hazardous materials, including re-fuelling.
Reduction	Contractor	As far as possible, commence construction (clearing) at the onset of the dry season in order to prevent erosion, siltation and wash-away of topsoil and sedimentation into the wetlands, seepage areas, drainage lines or rivers.
Reduction	Contractor	Hard-surfaced roads and parking areas with storm water outlets should not channel litter, oil and fuel spills into a watercourse, causing water pollution.

Activity Group 15: Handling of hazardous substances (fuel/oil, cement, bitumen, sewage/grey water) & management (including storage) at sanitation sites, kitchens, batching sites, workshops, washbays, refuelling areas and on site.

Description of potential impacts

- Improper handling (refuelling, vehicle repairs, mixing cement or bitumen) and storage of hazardous substances (fuel tanks, cement bags, oil & bitumen drums) can cause toxicity – the introduction of toxic or hazardous substances into an environment that may adversely affect the health of animals, humans and / or into a watercourse and can cause spillage and consequential soil & topsoil contamination.
- Discharge or pumping dirty water from the works area, discharge of grey water from washing equipment, plant, or persons, and discharge of sewerage from improper sanitation within the watercourse.
- The release of hazardous substances and effluent can enter into and contaminate groundwater resources, including but not limited to untreated waste water and unremediated spillages.
- Cement may incorrectly be mixed with topsoil to make concrete.
- Mixing cement powder in windy conditions can generate hazardous dust emissions.
- Chemical toilets and other organic waste can produce an unpleasant odour.
- Contaminated areas will result in a loss and reduced productivity of certain land uses including agriculture and conservation.
- Concrete work, specifically mixing on bare ground can smother living plants and create a hard pan layer that prevents recovery.
- Contaminated areas including fuel or oil spills will remove natural habitat.
- Inhaling dangerous fumes can be harmful to people.
- Unremediated spills may result in sterile patches that will be unsightly.
- Contamination will disturb the natural habitat, diluting or interfering with the overall ecological functioning that sustains ecosystem goods and services.
- It is very expensive to rehabilitate contaminated areas.
- Concrete ready-mix trucks can cause spillages, and if not supplied a dedicated area in which to clean their chutes, are likely to do so in the surrounding veld and on adjacent properties.

Uncertainties & limitations with predicting this impact

- The magnitude of the impact, specifically the extent and severity of the soil and water pollution, is not known.
- The volumes and types of different waste produced by individuals, construction and plant are unknown.

Assumptions made when assessing the impact

- Mobile fuel bowsers, including their bunds as well as chemical toilets will not be located within 100m from the edge of the watercourse / wetland.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	3	3	4	4	40	2	Negative	M
	With	2	2	3	3	21	2	Neutral	
2	Without	3	3	4	4	40	2	Negative	M
	With	2	2	2	2	12	2	Neutral	
3	Without	3	3	4	4	40	2	Negative	H
	With	2	2	2	2	12	2	Neutral	
No-go	N/A	1	1	1	1	3	1	Neutral	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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References (legal, scientific, social or other criteria)

1. None.

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- The reversibility of the impact is dependent on the nature and extent of the pollution caused.

Mitigations

Goal: To control soil, surface and watercourse pollution.

Objective(s) (including targets):

- To prevent all manner of waste from entering the pristine environment.
- To reduce soil and water contamination, including *inter alia* sedimentation, associated with construction activities.

Mitigations to potential impacts resulting from handling of hazardous substances (fuel/oil, cement, bitumen, sewage/grey water) & management (including storage) at sanitation sites, kitchens, batching sites, workshops, washbays, refuelling areas and on site.		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor	The Contractor shall locate the construction activities on existing disturbed or the least sensitive sites & further than 100m from the edge of a watercourse.
Avoidance	Contractor	The contractor shall restrict the following activities to the construction camp: Sanitation, Waste storage, Parking, Storing hazardous materials, Emergency vehicle & plant repair & maintenance Re-fuelling, Ready-mix concrete truck cleaning area Material stockpiles, and Lay down areas.

Avoidance	Contractor	Washing of construction plant and mechanical equipment including brushes shall not occur on site or in a watercourse, but shall be restricted to the main construction camp where adequate containment measures are in place.
Avoidance	Contractor	The contractor shall contain contaminated water from washing brushes in a conservancy tank until sufficient volume warrants disposal by a registered hazardous waste management company.
Avoidance	Contractor	Chemical toilets shall be located in the shade, at least 100m from any watercourse.
Avoidance	Contractor	Use chemical toilets that contain the sewerage in a closed and removable 'tank', i.e. do not use open drums. Environmentally friendly toilets should also be considered e.g. E-loo's.
Avoidance	Contractor	The contractor is prohibited from discharging waste water, including domestic water from sanitation facilities, and grey water from washing equipment or plant into a watercourse.
Reduction	Contractor	Re-fuelling with a mobile fuel bowser shall take place outside any watercourse.
Avoidance	Contractor	The contractor shall store hazardous material within a secure, safe and bunded facility at the construction camp.
Avoidance	Contractor	Use drip trays for refuelling, repair/maintenance work and all stationary construction plant and equipment that can leak, such as TLBs, compressors and generators.
Reduction	Contractor	Construction plant and equipment shall be kept in a good state of repair to reduce hydrocarbon leakages and emissions.
Avoidance	Contractor	Do not cover spills with virgin soil. It merely increases the disposal cost for a greater volume of hazardous waste.
Rectification	Contractor	Immediately remove contaminated soil to the depth of penetration and temporarily store in a designated solid hazardous waste container until sufficient volume warrants disposal at a registered hazardous waste dump site. Alternatively, onsite treatment of contaminated soil should be considered with a registered hazardous waste management company.
Avoidance	Contractor	Do not mix concrete on open ground. Mix in a wheel barrow, a mixing tray or on a level plastic sheet.
Avoidance	Contractor	The contractor shall prevent the run-off of slurry or cement contaminated water from concrete / plaster

		mixing sites.
Rectification	Contractor	Break up all concrete hard pan layers and dispose of appropriately (at a legitimate dump site) or re-use the concrete.
Reduction	Contractor	The contractor shall implement appropriate procedures, such as the use of a ground cover, to prevent the contamination of the ground when handling hazardous materials, including re-fuelling.
Avoidance	Contractor	Do not place high risk (pollution generating) construction activities within close proximity to a watercourse as it can cause pollution.
Avoidance	Contractor	A dedicated, lined facility must be provided for ready-mix concrete trucks to wash their chutes, before leaving site. Once no longer needed this dry, inert waste can be disposed of at a local registered municipal landfill site.
Reduction	Contractor / Proponent	The Waste Water Treatment Package Plant should be constructed at the onset of construction activities, to ensure the reduction of hazardous waste production.

Activity Group 16: Plant management (parking, driving, repair and maintenance, and refuelling)

Description of potential impacts

- Oil spillages resulting in fauna & flora mortality.
- Parking, driving, repair and maintenance, and refuelling can cause toxicity – the introduction of toxic or hazardous substances into an environment that may adversely affect the health of animals and/or into a watercourse.
- Parking, driving, repair and maintenance, and refuelling can cause spillage and consequential soil & topsoil contamination

Uncertainties & limitations with predicting this impact

- None

Assumptions made when assessing the impact

- All parking, emergency repair and maintenance, and refuelling will take place at the designated construction camp, if on site.
- All scheduled servicing of plant will take place off-site at an appropriate service centre.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	Without	2	2	3	3	2	Negative	M
	With	With	2	1	2	2	1	Neutral	
2	Without	Without	2	2	3	3	2	Negative	M
	With	With	2	1	2	2	1	Neutral	
3	Without	Without	2	2	3	2	2	Negative	H

	With	With	2	1	2	2	1	Neutral	
No-go	N/A	1	1	1	1	3	1	Neutral	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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Reference (legal, scientific, social or other criteria)

1. None.

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- The reversibility of the impact is dependent on the nature and extent of the pollution caused.

Mitigations

Goal: To control soil, surface and watercourse pollution.

Objective(s) (including targets):

- To reduce soil and water contamination, including *inter alia* sedimentation, associated with plant & equipment.

Mitigations to potential impacts resulting from plant management (parking, driving, repair and maintenance, and refuelling)		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor	Use drip trays for refuelling, repair / maintenance work and all stationary construction plant and equipment that can leak, such as TLBs, compressors and generators.
Reduction	Contractor	Construction plant and equipment shall be kept in a good state of repair to reduce hydrocarbon leakages and emissions.
Avoidance	Contractor	The contractor is prohibited from discharging waste water and grey water from washing equipment or plant into a watercourse.

Reduction	Contractor	Re-fuelling with a mobile fuel bowser shall take place outside any watercourse, and with the appropriate pollution containment measures.
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Activity Group17: Building work (concrete work)

Description of potential impacts

- Soil quality deterioration due to concrete hard pans.
- Transformation of areas due to hardened surfaces.

Uncertainties & limitations with predicting this impact

- The amount of concrete work is expected to be low, but undefined.

Assumptions made when assessing the impact

- No unnecessary concrete work will be undertaken.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	2	2	3	3	21	2	Negative	H
	With	2	1	2	2	10	1	Neutral	
2	Without	2	2	3	3	21	2	Negative	H
	With	2	1	2	2	10	1	Neutral	
3	Without	2	2	3	3	21	2	Negative	H
	With	2	1	2	2	10	1	Neutral	
No-go	N/A	1	1	1	1	3	1	Positive	N/A

High Significance: 30 - 40

Medium Significance: 20 - 29

Low Significance: 1 - 19

Reference (legal, scientific, social or other criteria)

1. None

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- Once all concrete works are broken and the ground rehabilitated, the impacts will be slowly reversed.

Mitigations

Goal: To avoid unnecessary use of cement & concrete.

Objective(s) (including targets):

- To reduce soil and water contamination, including *inter alia* sedimentation, associated with construction activities.

Mitigations to potential impacts resulting from building work (concrete work)

Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor	Permanent and temporary construction footprints (including fences) must be designated and sensitive terrestrial habitats demarcated as no-go areas during construction.
Reduction	Contractor	Once impacted upon, disturbed habitats must be rehabilitated immediately before further disturbance.
Avoidance	Contractor	Do not mix concrete on open ground. Mix in a wheel barrow, a mixing tray or on a level plastic sheet.
Avoidance	Contractor	The cement trucks must be cleaned in a bunded area with a lining to protect the soil.
Avoidance	Contractor	The contractor shall prevent the run-off of slurry or cement contaminated water from concrete/plaster mixing sites.
Rectification	Contractor	Break up all concrete hard pan layers and dispose of appropriately (at a legitimate dump site) or re-use the concrete.
Reduction	Contractor	The contractor shall implement appropriate procedures, such as the use of a ground cover, to prevent the

		contamination of the ground when handling cement and/or concrete.
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Activity Group 18: Disturbing natural areas

Description of potential impacts

- Disturbance of natural established vegetation will affect the bat populations of the area, as this is where the food base is.
- It is not envisaged that the proposed development will result in major soil erosion or any other degradation of the soils of the focus areas provided that there is proper runoff management from roads and other bare areas (Soils).
- Activities undertaken for the development have the potential to disturb and damage heritage resources within the affected property and footprint.

Uncertainties & limitations with predicting this impact

- None.

Assumptions made when assessing the impact

- Of all the disturbed natural areas, permanent disturbance will be minimal.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	2	2	3	3	21	2	Negative	H
	With	2	1	2	2	10	1	Neutral	
2	Without	2	3	3	3	24	2	Negative	H
	With	2	1	2	2	10	1	Neutral	
3	Without	3	4	3	3	30	2	Negative	M
	With	2	2	2	2	12	1	Neutral	

No-go	N/A	1	1	1	1	3	1	Neutral	N/A
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High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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References (legal, scientific, social or other criteria)

1. van den Berg, H. 2017. *Soil & Wetland Assessment – Soventix solar PV project in the Hanover district, Northern Cape (De Aar/Hanover Area)*. Iris International, Potchefstroom.
2. Cory Toussaint, D., 2017. *Chiropteran Specialist Report for the Proposed Soventix Solar Power Plant, Hanover, Northern Cape*.

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- The impacts may be reversed if proper rehabilitation is exercised.

Mitigations

Goal: To avoid transformation and fragmentation of natural habitats.

Objective(s) (including targets):

- Preserve the natural habitat as far as possible.

Mitigations to potential impacts resulting from disturbing natural areas		
Type of mitigation	Responsible authority	Mitigation
Reduction	Contractor	Once impacted upon, disturbed habitats must be rehabilitated immediately before further disturbance.
Reduction	Contractor	As much of the natural established vegetation is conserved.
Reduction	Contractor	Use pre-existing farm roads during construction. Discourage construction vehicles from driving through the natural vegetation and drainage lines where construction activities are not taking place.
Reduction	Contractor	Seed disturbed areas after construction with seeds of the naturally occurring plant species to encourage invertebrate species richness.

Avoidance	Contractor	It is important that areas with low lying depressions where water pools during the autumn and summer rainfall season, are not altered as they may be important areas not only for bats to drink and forage but also for socialising (Bats).
Reduction	Contractor	If possible, refrain from using herbicides to control the height of vegetation as it can affect insect abundance which in turn may affect bats.
Reduction	Contractor	It is important not to overgraze the vegetation because of loss of precious topsoil, the restoration of these areas will be difficult.

Activity Group 19: Site closure & rehabilitation

Description of potential impacts

- New growth on rehabilitated sites can be overgrazed by mammals.
- Rehabilitated sites can cause erosion and, if adjacent to or within a watercourse, sedimentation.
- Disturbed sites will comprise mostly cleared / denuded areas that are vulnerable to degradation, including erosion, leading to a loss of biodiversity and ecosystem functions and processes.
- Rehabilitation that is not in accordance with the natural plant communities of the area can result in the introduction of non-indigenous plants.
- Disturbed areas, including those recently rehabilitated by the contractor are susceptible to weed, invader and alien plant recruitment and the replacement of indigenous plant communities if not controlled.
- Temporary workers will lose their employment.
- Rehabilitate all disturbed areas, construction areas, road servitudes and cut and fill slopes to acceptable visual standards.
- Rehabilitation can be expensive, but will depend on the extent to which the contractor mitigated his impacts during construction.
- The income generation or buying power of local residents employed during construction will return to 'normal'.
- Permanent contracting staff will cease renting accommodation in the area.

Uncertainties & limitations with predicting this impact

- The magnitude of the impact, specifically the extent and severity of the erosion and sedimentation, is not known.

Assumptions made when assessing the impact

- The disturbance including areas that are vulnerable to alien plant invasion will be to areas completely devoid of indigenous vegetation.
- Disturbed areas are likely to degrade if left alone.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	2	2	3	3	21	2	Negative	H
	With	2	1	2	2	10	1	Neutral	
2	Without	2	3	3	3	24	2	Negative	H
	With	2	2	2	2	12	1	Neutral	
3	Without	3	3	3	3	27	2	Negative	H
	With	2	2	2	2	12	1	Neutral	
No-go	N/A	1	1	1	1	3	1	Neutral	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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References (legal, scientific, social or other criteria)

1. The Principles of NEMA require that a proponent is responsible for any development s/he has initiated from the beginning to the end of the project (“From the cradle to the grave”). This responsibility is passed on from one title deed holder to the next. In line with this principle a rehabilitation plan has got to be drawn up to specify how the area will be rehabilitated once the project has ceased for whatever reason.

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- Disturbed areas can be rehabilitated. The cost thereof will depend on the severity and extent of the degradation.
- The extent of reversibility is dependent on the severity of the erosion, including the nature of the remaining *in situ* material, the amount of soil that has been exported from a site and whether or not the exported soil is recoverable. For example, soil washed from a gravel road into a mitre drain can be graded back onto the surface of the road, whereas soil that is washed from a gully into a water course is not recoverable and the source cannot be re-instated without significant intervention and cost. Although erosion has the potential to irreversibly change the relief, eroded sites can be stabilized through rehabilitation measures.

- If controlled timeously the impact of alien plant species can be negligible. However, if allowed to grow unabated, alien invasive species can replace entire plant communities with homogeneous stands. Biodiversity is significantly reduced and ecosystem function is altered. In the latter case, rehabilitation will require significant intervention and cost.

Mitigations

Goal:

Facilitate the natural rehabilitation of disturbed areas and control the replacement of indigenous vegetation by weed, invader and exotic plant species.

Objective(s) (including targets):

- To avoid long-term degradation.
- To reduce erosion of and rehabilitated access roads.
- To prevent the maturation and reproduction of weed, invader and exotic plant species from occurring on any land that is rehabilitated after construction.

Mitigations to potential impacts resulting from site closure & rehabilitation		
Type of mitigation	Responsible authority	Mitigation
Rectification	Contractor	Bulk shape the areas where material is introduced to mimic or blend in with the surrounding, natural topography. Do not fine shape or rake because an uneven surface will impede surface water run-off and facilitate infiltration.
Reduction	Contractor	Ensure storm water run-off is adequately controlled on disturbed sites before rehabilitating them (ripping, replacing the topsoil and mulching/brush packing), i.e. cut-off berms.
Rectification	Contractor	Topsoil shall be returned to the source areas during rehabilitation of the PV Solar Plant servitudes.
Rectification	Contractor	Ensure a quick and adequate cover with indigenous and local grass species on all PV Solar Plant servitudes.
Avoidance	Contractor	Kikuyu grass (<i>Pennisetum clandestinum</i>) is a highly invasive plant that threatens wetland habitats and must not be used in areas adjacent to wetland habitats and drainage lines. Non-invasive indigenous grasses such as <i>Cynodon dactylon</i> must be used, or species best suited for that environment.
Reduction	Contractor	The Contractor shall monitor the rehabilitated servitudes for the duration of the contract defects and liability period

		for signs of erosion.
Rectification	Applicant Contractor	If erosion is found to occur during the aforesaid monitoring, the Contractor / Applicant shall immediately correct (the 'source') and repair (the 'symptom') the erosion using method(s) that are an improvement on the mitigations proposed in the EMP or on the unsuccessful mitigations originally used on site.
Reduction	Contractor Applicant	The rehabilitated solar plant servitudes shall be monitored at least twice during the summer rainfall season for two years following the completion of the PV Solar Plants for the recruitment of weed, invader and alien plant species.
Rectification	Contractor Applicant	The Contractor /Applicant shall immediately uproot, cut or debark weed, invader and alien plant species upon being identified.
Rectification	Contractor Applicant	The Contractor/Applicant shall collect and destroy all seeds of weed, invader and alien plant species occurring within disturbed and/or rehabilitated areas.
Avoidance	Applicant	The introduction of sheep into the solar panel plant will be done in accordance with the grazing capacity management plan formulated.
Rectification	Contractor Applicant	Rehabilitate all disturbed sites and minimise overgrazing by mammals.
Rectification	Contractor Applicant	Seed disturbed areas after construction with grass seeds of the naturally occurring plant species to encourage invertebrate species richness (Bats).

Activity Group 20: Social impacts

Description of potential impacts

- Change of land use / livelihoods.
- Traffic and road impacts to local residents and road users.
- Damage to farm infrastructure.
- Safety and security concerns due to an influx of people to the area.
- Concern about social disturbance and community safety.
- Economic impacts.
- Sense of place changes.
- Comments received from **Francois Taljaard**, Town Planner, Emthanjeni Municipality (**Table 8**); investigate potential impacts on the shortage of water - uncontrolled abstraction from a watercourse or an aquifer can reduce the amount of water that is available to downstream users.
- Comments received from **Francois Taljaard**, Town Planner, Emthanjeni Municipality (**Table 8**); the disposal or processing of packaging material must be addressed in the EIA. Packaging material is currently being used in the townships for additions to houses, which is illegal and creates a fire hazard.

Uncertainties & limitations with predicting this impact

- Identified concerns from local residents have not been forthcoming thus far in the Public Participation Process.

Assumptions made when assessing the impact

- It is unlikely that any significant impacts on the receiving social environment will result from the proposed development as the area will be minimally disturbed and positive employment & economic opportunities will result.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	3	4	3	4	37	3	Negative	H
	With	3	3	3	3	28	2	Neutral	
2	Without	3	4	3	4	37	3	Negative	H
	With	3	3	3	3	28	2	Neutral	
3	Without	3	4	3	4	37	3	Negative	H
	With	3	3	3	3	28	2	Neutral	
No-go	N/A	1	1	1	1	3	1	Neutral	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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References (legal, scientific, social or other criteria)

1. Aucamp, I. 2017. *Social Impact Assessment Report for the proposed development of 225 MW solar PV plant in Northern Cape Province*. Equispectives Research & Consulting Services, Pretoria.

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- Following the construction period there will be a loss of employment, followed by the retention of a few operational staff.

Mitigations

Goal: Address social concerns.

Objective(s) (including targets):

- To avoid creating false hope where job creation opportunities are concerned.

Mitigations to potential impacts resulting from social impacts		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor	Water must be used sparingly to ensure no depletion of water resources take place to the detriment of downstream water users and other ground water users.
Avoidance	Contractor	Adequate provision must be made for employment seekers, to avoid uncontrolled access to the property.
Avoidance	Contractor	Adequate potable water must be supplied to the labour force throughout the construction process.
Avoidance	Contractor	Open borrow pits, excavation and quarries must be fenced-off and / or demarcated when construction activities are taking place, to ensure the safety of unsuspecting public or job seekers.
Avoidance	Contractor	AIDS / HIV awareness training must be undertaken to ensure that the labour force is well informed on the matter.
Avoidance	Contractor	Dangerous fumes, noise, dust and water impacts must be avoided that may affect both the labour force and surrounding landowners and users.
Avoidance	Contractor	Open fires must be prohibited during the construction process for fear of runaway fires.
Avoidance	Contractor	Waste, especially waste packaging from inter alia the solar panels, must be well managed to ensure it does not infiltrate the surrounding environment and / or be used illegitimately for informal housing purposes.
Avoidance	Contractor	All construction activities must be carried out in an environmentally sensitive manner (including clearing of stockpiles) to ensure no deterioration in the agricultural potential of the land results.
Avoidance	Contractor	Increase security to protect trespassers from being electrocuted.
Avoidance	Contractor	Arrange for alternative, private and/ or additional transport and accommodation for the new employment opportunities and influx of workers.
Avoidance	Contractor	Drive carefully to avoid killing or injuring people and damage to property.
Reduction	Contractor	Make the terms and conditions of employment known to all employees (temporary & permanent).
Reduction	Contractor	Keep lighting on at night and increasing security will help improve security to prevent theft.
Reduction	Applicant Contractor	Transparent communication through the right channels to communicate with the community as power may need to be turned off when the solar PV plant is connected to the existing Eskom grid, temporarily disrupting the supply of electricity.

Aspect 21: Terrestrial impacts (including fauna & flora)

Description of potential impacts

- Direct Faunal Impacts:
- Poaching, vehicles, open excavations and runaway fires pose a direct threat to the Riverine Rabbit. Indirect threats include improper handling (refueling, vehicle repairs, mixing cement or bitumen) and storage of hazardous substances (fuel tanks, cement bags, oil & bitumen drums), which can cause toxicity – the introduction of toxic or hazardous substances into an environment that may adversely affect the health of animals.
- Disturbance to or destruction of roosting sites during construction activities. Light pollution during construction and operational phase may alter species composition, foraging patterns, reproductive success and predation rate. Alteration to commuting routes within the landscape as routes may be altered and some species may avoid the solar arrays all together, particularly the low-flying bat species. Habitat changes beneath the solar panels and the associated impact on prey insect communities may affect bat foraging patterns and areas. Changes in bat community, abundance and activity of bat species.
- Lighting at night can attract insects and bats, but may also discourage foraging by certain bat species – create a preferential habitat for one species at the expense of another.
- Electric fences can cause death or injury to mammals.
- Employees can harvest indigenous plants for muthi, firewood and poach animals.
- Littering can pose a risk of suffocation to wild animals (littering is likely to be more prevalent at designated eating / rest areas).
- Employees can burn fires to keep warm and runaway fires can destroy fauna and flora.
- Use of the existing road network will avert the need for off-road driving and protect flora and fauna that are normally less visible.
- Parking and driving carelessly can increase collisions with mammals, birds, reptiles, amphibians and insects – road kills.
- Designated parking areas will protect local flora and fauna.
- Animals can drown in water-filled borrow pits.
- Material stockpiles and lay down areas can be located in undisturbed areas, trampling or smothering tunneling, burrowing or nesting fauna in/on the ground.

- Clearing and grading (operations area, access roads, rack foundations, transformers and inverters, cables, substation and pylons); direct contact with fauna can cause injury or death. The impacts are exacerbated when the species affected are classified as protected, sensitive, rare, or threatened and endangered.
- Open excavations and drill holes can trap terrestrial fauna causing injury or death, including snakes.
- Animals can drown in water-filled excavations and drill holes.
- Solid and liquid waste can be harmful to fauna if swallowed/ingested or if the creature becomes entangled or impaled.
- Vegetation clearing for the development, access roads, site fencing etc could impact listed plant species as well as plant communities. Vegetation clearing will also lead to habitat loss for fauna and potentially the loss of sensitive faunal species, habitats and ecosystems. Increased erosion risk would occur due to the loss of plant cover and soil disturbance created during the construction phase. This may impact downstream riparian and wetland habitats if a lot of silt enters the drainage systems. Presence and operation of construction machinery on site. This will create a physical impact as well as generate noise, pollution and other forms of disturbance at the site. Increased human presence can lead to poaching, illegal plant harvesting and other forms of disturbance such as fire.
- Disturbance to or destruction of roosting sites during construction activities.
- Light pollution during construction and operational phase may alter species composition, foraging patterns, reproductive success and predation rate.
- Soil erosion & associated degradation of ecosystems:
- Stockpiles are susceptible to alien and / or invasive plant infestation.
- Alien plants can also be introduced by importing foreign contaminated material for construction, including topsoil.
- The disturbance created by clearing activities within plant communities creates favourable habitat for the life history strategies of undesirable plant species. There is an ongoing threat for invasion because alien plants have effective dispersal mechanisms, such as birds. Cleared patches can become invaded and act as sources to colonize other vulnerable areas.

Uncertainties & limitations with predicting this impact

- The proposed development footprints have deliberately been located away from sensitive habitats such as watercourses and rocky ridges, to minimize conflict with local fauna and reduce impact on habitat.

Assumptions made when assessing the impact

- Fauna are highly mobile organisms, which can flee from dangers posed by construction activities. With the exception of smaller tunnelling, burrowing or nesting fauna (in the ground or tree trunks), fauna will instinctively flee, upon an intrusion of their personal space, specifically the ‘flight’ zone, until the animal has extended the distance to its ‘comfort’ zone.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	2	3	3.5	3.5	30	3	Negative	H
	With	2	2	2.5	2.5	16	2	Negative	
2	Without	2	3	3.5	3.5	30	3	Negative	H
	With	2	2	2.5	2.5	16	2	Negative	
3	Without	2	3	3.5	3.5	30	3	Negative	H
	With	2	2	2.5	2.5	16	2	Negative	
No-go	N/A	1	1	1	1	3	1	Neutral	N/A
High Significance: 30 - 40		Medium Significance: 20 - 29			Low Significance: 1 - 19				

References (legal, scientific, social or other criteria)

1. Cory Toussaint, D. 2017. *Chiropteran Draft Scoping Report for Soventix Solar Farm, Hanover, Northern Cape.*
2. Comments received from **Bonnie Schumann**, Senior Field Officer, Endangered Wildlife Trust
3. Todd, S. & Bragg, C. 2017. *Fauna & flora specialist scoping report – Environmental Impact Assessment for the proposed Soventix Solar PV project: De Aar, Northern Cape Province.*
4. The National Forests Act, 1998 (No. 84 of 1998), including Schedule in Government Notice No. 1042, dated 10 September 2004
5. National Environmental Management: Biodiversity Act, 2004 (No. 10 of 2004).

6. National Environmental Management: Biodiversity Act – Threatened or protected species regulations, GG No. 38600, GN No. 255, 31 March 2015;
7. DEA (2011), National list of ecosystems that are threatened and in need of protection. GN 1002, GG 34809, 9 December 2011.
8. Northern Cape Nature Conservation Act, 2009 (No. 9 of 2009).

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- With the exception of critically endangered species or populations, the loss of life can be recovered through the reproduction of surviving individuals/populations.
- Effective rehabilitation and remediation can restore ecological function and habitat to affected species.

Mitigations

Goal: Control loss of terrestrial and avifauna.

Objective(s) (including targets):

- To reduce harm to terrestrial and avifauna.
- To restore ecological function of areas affected by construction activities.

Mitigations to potential impacts resulting from terrestrial impacts (including fauna & flora)		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor ECO	With the exception of search and rescue operations authorized by the ECO, no mammal, bird, reptile, invertebrate or fish shall be intentionally caught and / or killed.
Reduction	Contractor	Drivers shall adhere to the relevant speed limit(s) (ON the existing road network) at all times and restrict their movements to the existing and /or approved roadway or servitude.
Reduction	Contractor	The site will be kept tidy at all times. All waste shall be picked up daily.
Avoidance	Contractor	Designate a temporary waste storage area, enclose it in a fence that cannot be breached by fauna, and provide sufficient scavenger proof dust bins with black bags inside the construction camp.

Reduction	Contractor	Material stockpiles shall be located on a disturbed site or other site approved by the ECO.
Reduction	Contractor	Anthropogenic impacts must be minimized to reduce impacts on nocturnal species, including but not limited to reduced lighting that may influence bat foraging behaviour.
Avoidance	Applicant	Fencing options must be utilised that provide adequate security to the plant, but will not result in animal mortality or require onerous vegetation clearing. Clearvu™ type fencing is preferred over electric fencing.
Avoidance	Contractor	Drilled holes and open excavations should not be left open for extended periods, and should be covered at night.
Avoidance	Contractor	No harvesting of natural resources may be permitted by contractor staff. Adequate induction training must be undertaken to sensitise the staff to this matter.
Avoidance	Contractor	Borrow pits, water-filled excavations and drill holes should as far as possible have smooth slopes, allowing access and exit points to animals, especially when filled with water.
Reduction	Contractor	Avoid direct contact with fauna, through clearing and grading as it can cause injury or death.
Reduction	Contractor	Designate parking areas in order to protect local flora and fauna.
Avoidance	Contractor	Employees must not burn fires to keep warm, because runaway fires can destroy fauna and flora.
Avoidance	Contractor	The undisturbed / natural vegetation units, such as the terrestrial habitats, which fall outside permanent and temporary construction footprints must be designated and demarcated as no-go areas during construction.
Rectification	Contractor	Once impacted upon, disturbed habitats must be rehabilitated immediately before further disturbance.
Avoidance	Contractor	Development of access road and temporary tracks must be limited to those absolutely necessary.
Avoidance	Contractor	Soil may only be obtained from the three already operational borrow pits.
Avoidance	Contractor	Suitable designated areas must be demarcated as laydown and stockpile areas, to reduce impacts on terrestrial habitat.
Avoidance	Contractor	No concrete work may take place directly on the ground or on live vegetation.
Reduction	Contractor	Keep surveying and pegging minimal as it can place footprints in sensitive habitats.
Reduction	Contractor	Do not leave spoil, soil, mulch or any other stockpiles on site, because it will degrade natural habitat.
Avoidance	Contractor	Do not clear unnecessarily.

Activity Group 22: Visual impacts

Description of potential impacts

- Impact of construction on visual receptors in close proximity to the solar facility.
- Impact of access roads on observers in close proximity to the solar facility.
- Placement of construction areas including toilets can be visually intrusive to sensitive receptors.
- Lighting at night can be visibly intrusive in remote areas.
- High walls and fences can be visually intrusive by visibly altering the natural landscape.
- Soil mining creates visibly intrusive scars in the natural landscape.
- Unwanted stockpiles can be visually intrusive in the natural landscape.
- Cleared areas are visibly intrusive in the natural landscape.
- Solid waste can be blown away and into the landscape.
- Waste contaminated or storage areas and illegal dumps can be visibly intrusive in a natural landscape.

Uncertainties & limitations with predicting this impact

- None.

Assumptions made when assessing the impact

- There is no way of totally preventing the visual changes or alterations.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
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1	Without	3	3.5	3	3.5	33	2	Neutral	H
	With	3	2.5	3	2	17	1	Neutral	
2	Without	3	3.5	3	3.5	33	2	Neutral	H
	With	3	2.5	3	2	17	1	Neutral	
3	Without	3	3.5	3	3.5	33	2	Neutral	H
	With	3	2.5	3	2	17	1	Neutral	
No-go	N/A	1	1	1	1	3	1	Positive	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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References (legal, scientific, social or other criteria)

1. Henwood, S. 2017. *Visual impact assessment report for the proposed Soventix photovoltaic plant – on several portions of the farm Goedehoop, Hanover district, Northern Cape*. Henwood Environmental Services, Mbombela, Mpumalanga.

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- Until the decommissioning phase, the impacts are irreversible.

Mitigations

Goal: To address visual concerns.

Objective(s) (including targets):

- Keep the visual changes as minimal as possible.
- The mitigation and possible negation of visual impacts associated with the decommissioning of the proposed Solar facility.
- Minimal visual intrusion by construction activities and intact vegetation cover outside of immediate works areas

Mitigations to potential impacts resulting from visual impacts		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor	Place construction areas including toilets where they will not be visually intrusive to sensitive receptors.
Avoidance	Contractor	Ensure sound housekeeping practices to ensure litter and waste are not visible features of the landscape.
Reduction	Contractor	Minimise lighting at night as it can be visibly intrusive in remote areas.
Reduction	Contractor	Avoid altering the natural landscape (through soil mining, unwanted stockpiles, cleared areas, etc) as far as possible.
Reduction	Contractor	Utilise fencing options that do not create a significant visual barrier.
Reduction	Contractor	Reduce the creation of cleared areas to the absolute minimum to lessen the visual scarring of the landscape.

Aspect 23: Heritage impacts

Description of potential impacts

- Surveying and pegging of temporary footprints can disturb sites of historical significance, i.e. Graves.
- Clearing and other earthmoving activities (such as excavating, drilling) can reveal and disturb heritage resources¹, sites of archaeological significance and graves.

Uncertainties & limitations with predicting this impact

- None.

Assumptions made when assessing the impact

- It is unlikely that any significant impacts on heritage resources will result from the proposed development, as initial indications are that limited heritage sites are present on the proposed footprints.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	3	4	4	4	44	3	Negative	M
	With	2	3	3	3	24	2	Neutral	
2	Without	2	3	3	3	24	2	Negative	H
	With	2	2	2	2	12	2	Neutral	
3	Without	2	2	2	2	12	2	Negative	H
	With	1	1	1	1	3	1	Neutral	

No-go	N/A	1	1	1	1	3	1	Positive	N/A
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High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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References (legal, scientific, social or other criteria)

1. van de Venter, A. & Pelsler, A.J. 2017. *Report on a phase 1 heritage assessment for the proposed Soventix solar PV project on various farms, near Hanover, Enthanjeni municipality, Pixley Ka Seme district, Northern Cape*. Apelsler archaeological consulting, Lynnwood Ridge, Pretoria.
2. National Heritage Resources Act, 1999 (No 25 of 1999). GG No. 19974, 28 April 1999.

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- Heritage resources are irreplaceable.

Mitigations

Goal: Address social concerns.

Objective(s) (including targets):

- Zero loss of heritage resources and all finds are to be recorded.

Mitigations to potential impacts resulting from heritage impacts		
Type of mitigation	Responsible authority	Mitigation
Reduction	Contractor	Include an awareness of heritage resources in the environmental induction. Categories of heritage resources include, <i>inter alia</i> : <ul style="list-style-type: none"> • Evidence of archaeological sites or remains include remnants of stone-made structures, indigenous ceramics, bones, stone artifacts, ostrich eggshell fragments, marine shell and charcoal/ash concentrations. • Archaeological or paleontological sites over 100 years old,

		<ul style="list-style-type: none"> • Sites of cultural significance associated with oral histories, • Significant cultural landscapes or viewsapes, • Burial grounds, unmarked human burials, graves of victims of conflict, and/or graves older than 60 years, • Structures older than 60 years, • Fossils, etc.
Avoidance	Applicant Contractor	All formal and informal cemeteries and burials must be left in situ and not be disturbed. If this is not possible, a permit must be applied for in terms of Section 36 of the NHRA (Act 25 of 1999), and is subject to mandatory public consultation.
Avoidance	Contractor	Contact a professional archaeologist or palaeontologist, depending on the nature of the finds, as soon as possible to inspect the findings.
Avoidance	Contractor	In the event of discovering a heritage resource, stop reconstruction activities and alert the SAHRA Archaeology, Palaeontology and Meteorites (APM) Unit immediately. Natasha Higgitt, Heritage Officer T: +27 21 462 4502 F: +27 21 462 4509 C: +27 82 507 0378. E: nhiggitt@sahra.org.za

Operational Phase

Activity Group 1: Human influence (staff conduct and movement)

Description of potential impacts

- Litter can get washed into storm water drains and watercourses.
- Littering can pose a risk of suffocation to wild animals.
- New (permanent) jobs for local residents will increase income and buying power within the local community.
- Littering is visually intrusive.
- Increased human presence can lead to poaching, illegal plant harvesting and other forms of disturbance such as fire.
- Increase in traffic due to entering and exiting the site during the operational phase can impact on affected landowners and road users.

Uncertainties & limitations with predicting this impact

- None.

Assumptions made when assessing the impact

- Once construction is over, only operational staff will be on-site, whose impact will be manageable & negligible.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	3	3	3	3	27	2	Negative	H
	With	1	2	3	2	12	1	Positive	

2	Without	3	3	3	3	27	2	Negative	H
	With	1	2	3	2	12	1	Positive	
3	Without	3	3	3	3	27	2	Negative	H
	With	1	2	3	2	12	1	Positive	
No-go	N/A	1	1	1	1	3	1	Positive	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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References (legal, scientific, social or other criteria)

1. Aucamp, I. 2017. *Social Impact Assessment Report for the proposed development of 225 MW solar PV plant in Northern Cape Province*. Equispectives Research & Consulting Services, Pretoria.

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- If staff conduct is managed by a firm policy and adhered to, any impact caused will be reversible.

Mitigations

Goal: To avoid human influence on degrading the socio-environmental balance.

Objective(s) (including targets):

- Minimize human influence on environmental degradation and community structure.

Mitigations to potential impacts resulting from human influence (staff conduct and movement)		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Employees	No dry wood, living plant or part thereof may be harvested from any plant community (including poaching of animals).

Reduction	Employees	No burning, including of waste for any reason.
Rectification	Employees	Follow housekeeping rules in order to avoid littering (littering is likely to be more prevalent at designated eating/rest areas).
Avoidance	Employees	Have environmental toolbox / educational talks on at least a fortnightly basis.
Avoidance	Employees	All staff must undergo a site induction that outlines the socio-environmental constraints of the site.
Reduction	Employees	If possible use common transport to get workers on and off the site.
Reduction	Employer	Have adequate dustbins on and around the site.
Avoidance	Applicant	Monitoring of social mitigation and management measures.
Avoidance	Applicant	Implementation of a community relations strategy.
Avoidance	Applicant	Implement safety plan, access protocols, grievance mechanism and compensation policy.

Activity Group 2: Consumption (energy, water, and other resources)

Description of potential impacts

- Comments received from **Francois Taljaard**, Town Planner, Emthanjeni Municipality (**Table 8**); investigate potential impacts on the shortage of water - uncontrolled abstraction from a watercourse or aquifer (borehole) can reduce the natural reserve required for ecological function, such as when the demand for water during operation exceeds the permissible allocation.
- Solar PV cells do not use water for generating electricity, but they do need to be cleaned. Water will also be required for human consumption (drinking, sanitation and food preparation).
- Water required for human consumption and maintenance of the solar panels can be used excessively / wastefully.
- Uncontrolled abstraction from a watercourse or aquifer (borehole) can reduce the natural reserve required for ecological function, such as when the demand for water during operation exceeds the permissible allocation.
- Increase in the number of people in the area might have an influence on the depletion of resources.

Uncertainties & limitations with predicting this impact

- The underground aquifer / groundwater resource is capable of meeting the water requirements of the project without affecting the landowner nor adjacent landowner's yields.

Assumptions made when assessing the impact

- South Africa is a dry country and water will be used sparingly - without waste.
- Electricity to the operations building will be required from the Eskom grid, and will be duly supplied.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)

1	Without	3	2	4	3	27	2	Neutral	H
	With	2	1	3	2	12	1	Positive	
2	Without	3	2	4	3	27	2	Neutral	H
	With	2	1	3	2	12	1	Positive	
3	Without	3	2	4	3	27	2	Neutral	H
	With	2	1	3	2	12	1	Positive	
No-go	N/A	1	1	1	1	3	1	Positive	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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Reference (legal, scientific, social or other criteria)

1. Section 21(a & b) - General Authorisation GN No. 538 published in Government Gazette No. 40243 on 2 September 2016.

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- Water required for human consumption and construction that is not used sparingly and within the resource capability can affect yields of the landowner and possibly adjacent landowners too. The quantities deemed necessary for the project are unlikely to result in overutilization or irreversible impacts on the resource.

Mitigations

Goal: Avoid wasteful use of water resources.

Objective(s) (including targets):

- Use resources sparingly and sustainably within the determined sustainable yield of each resource and within promulgated abstraction rates.

Mitigations to potential impacts resulting from Consumption (energy, water, and other resources)		
Type of	Responsible	Mitigation

mitigation	authority	
Avoidance	Employees	Water leaks shall be repaired immediately upon being found.
Avoidance	Employees	Water shall be used sparingly even for consumption purposes.
Avoidance	Employees	Water taps shall be closed when not in use.
Avoidance	Employees	Water-saving showerheads shall be used, where relevant.
Reduction	Employees	Reuse and recycling of water could be considered.
Avoidance	Employees	Water meters will be installed at all abstraction points to ensure the volumes used falls within the resource capacity as well as legal limits.

Activity Group 3: Maintenance activities

Description of potential impacts

- Gravel roads and fences are also sources of erosion if not maintained or managed because they channel uninterrupted flow of surface water runoff.
- Sediment export from uncontrolled runoff-induced erosion depositing into watercourses.
- Monitor rehabilitated areas, and implement remedial action as and when required (VIA).
- Any movements by vehicle and personnel should be limited to within the footprint of power lines and other associated infrastructure, especially during routine maintenance procedures. Utmost care should be taken to not disturb nests that may be constructed on power line structures.

Uncertainties & limitations with predicting this impact

- None.

Assumptions made when assessing the impact

- Due to low fire risk, fence lines and service roads will not be completely devoid of vegetation cover and have stormwater controls installed where necessary.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	2	2	4	3	24	3	Negative	H
	With	1	1	2	2	8	2	Neutral	
2	Without	2	2	4	3	24	3	Negative	H
	With	1	1	2	2	8	2	Neutral	
3	Without	2	3	4	3	27	3	Negative	H

	With	1	1	2	2	8	2	Neutral	
No-go	N/A	1	1	1	1	3	1	Neutral	N/A
High Significance: 30 - 40		Medium Significance: 20 - 29			Low Significance: 1 - 19				

References (legal, scientific, social or other criteria)

1. Henwood, S. 2017. *Visual impact assessment report for the proposed Soventix photovoltaic plant – on several portions of the farm Goedehoop, Hanover district, Northern Cape*. Henwood Environmental Services, Mbombela, Mpumalanga.

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- Poor stormwater management resulting in erosion can result in large-scale export of in situ soil, leaving inadequate substrate for vegetation growth and ongoing erosion systems.

Mitigations

Goal: To ensure continued environmental sustainability and ecological functionality.

Objective(s) (including targets):

- To avoid long-term degradation.
- To promote ecological function

Mitigations to potential impacts resulting from maintenance activities		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Applicant	All fences have to be maintained to ensure continued operational efficiency.
Avoidance	Applicant	Areas disturbed and rehabilitated during construction shall be monitored for signs of erosion and if found to occur, immediately corrected ('source') and repaired ('symptom').
Avoidance	Applicant	Areas disturbed during construction shall be monitored for the recruitment of weed, invader and alien plant species

		and controlled immediately upon being found to occur.
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Activity Group 4: Lighting to create visibility at night

Description of potential impacts

- Lighting can cause light pollution and be visibly intrusive in remote areas.
- Lighting can help improve security to prevent theft at night.
- If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects.
- The use of lighting at night should be kept to a minimum, so as not to unnecessarily attract invertebrates to the solar facility and possibly their avian predators, and to minimise disturbance to birds flying over the facility at night.

Uncertainties & limitations with predicting this impact

- The level of lighting at night for inter alia security purposes is uncertain.

Assumptions made when assessing the impact

- The main office, security office and perimeter will be lit at night.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	3	2	3	2	16	2	Neutral	M
	With	1	1	2	1	4	1	Neutral	
2	Without	3	2	3	2	16	2	Neutral	M
	With	1	1	2	1	4	1	Neutral	

3	Without	3	2	3	2	16	2	Neutral	M
	With								
No-go	N/A	1	1	1	1	3	1	Neutral	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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Reference (legal, scientific, social or other criteria)

1. Cory Toussaint, D. 2017. *Chiropteran Draft Scoping Report for Soventix Solar Farm, Hanover, Northern Cape.*
2. Todd, S. & Bragg, C. 2017. *Fauna & flora specialist scoping report – Environmental Impact Assessment for the proposed Soventix Solar PV project: De Aar, Northern Cape Province.*

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- Effective lighting will limit visibility to surrounding landowners and users.

Mitigations

Goal: To supply adequate lighting to ensure security of assets with limited dispersal to the surrounding area.

Objective(s) (including targets):

- To ensure that the lighting does not disperse beyond the operational footprint.

Mitigations to potential impacts resulting from lighting to create visibility at night		
Type of mitigation	Responsible authority	Mitigation
Reduction	Contractor	Install lighting that focusses light onto the footprint alone.
Reduction	Contractor	Utilise light sources that are energy efficient with reduced attraction for local insect life.
Reduction	Contractor	If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights

		(such as most LEDs), which do not attract insects.
Reduction	Contractor	The use of lighting at night should be kept to a minimum, so as not to unnecessarily attract invertebrates to the solar facility and possibly their avian predators, and to minimise disturbance to birds flying over the facility at night.

Activity Group 5: Waste generation

Description of potential impacts

- Solid and liquid waste can contaminate the ground (litter, spillage) if improperly handled, stored or disposed.
- Improper handling, storage or disposal of waste can cause toxicity – the introduction of toxic or hazardous substances into a watercourse, i.e. acidification, the increased acidity of waterways through leeching (i.e. acid forming substances).
- Improper handling, storage and disposal of waste can cause toxicity – is the introduction of toxic or hazardous substances into an environment that may adversely affect the health of people.
- Burning waste can cause smoke inhalation.
- Illegal dumping will remove natural habitat and result in the loss of certain land uses like agriculture and conservation.
- Excess waste puts a burden on existing landfill sites.
- Hazardous waste, particularly large amounts of it is expensive to dispose of.
- Illegal dumping sites cannot retain the ecological functions and land use required to generate ecosystem goods and services and tangible economic benefits including income from conservation or farming.
- Solid waste can be blown away and into the landscape.
- Waste contaminated or storage areas and illegal dumps can be visibly intrusive in a natural landscape.

Uncertainties & limitations with predicting this impact

- The full suite of waste types generated during the operational phase uncertain.

Assumptions made when assessing the impact

- The Municipality will collect waste on a regular (as required) basis and dispose of the waste at a designated landfill site.
- Waste will be largely office waste.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	3	2	3	3	24	2	Negative	H
	With	2	1	2	2	10	1	Neutral	
2	Without	3	2	3	3	24	2	Negative	H
	With	2	1	2	2	10	1	Neutral	
3	Without	3	2	3	3	24	2	Negative	H
	With	2	1	2	2	10	1	Neutral	
No-go	N/A	1	1	1	1	3	1	Neutral	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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References (legal, scientific, social or other criteria)

1. Cory Toussaint, D. 2017. *Chiropteran Draft Scoping Report for Soventix Solar Farm, Hanover, Northern Cape.*
2. Todd, S. & Bragg, C. 2017. *Fauna & flora specialist scoping report – Environmental Impact Assessment for the proposed Soventix Solar PV project: De Aar, Northern Cape Province.*

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- Poor waste management is unlikely to affect areas outside of the footprint due to secure fencing of perimeter, so no irreplaceable loss of resource expected.

Mitigations

Goal: To ensure sound waste management practices.

Objective(s) (including targets):

- To properly manage, store and dispose of waste.
- To keep accurate records of waste generated by type.
- To endeavour to recycle waste and minimise disposal to landfill.

Mitigations to potential impacts resulting from waste generation		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor	No burning, burying or illegal dumping of waste will be permitted.
Avoidance	Contractor	Handling, storage and disposal of hazardous waste must ensure not contamination and legal disposal results.
Avoidance	Contractor	An integrated waste management plan must be formulated that holistically manages all waste streams on site.

Activity Group 6: Working within aquatic and terrestrial ecology systems

Description of potential impacts

- Comments from **Jacoline Mans**, Chief Forester, DAFF (**Table 8**); investigate the impacts on the riparian vegetation - employees can harvest indigenous plants for muthi, firewood and poach animals.
- The following identified by Simon Todd (Fauna & Flora Assessment Study): The operation of the facility will generate noise and disturbance which may deter some fauna from the area. The areas inside the facility will require management and if this is not done appropriately, it could impact adjacent intact areas through impacts such as erosion, alien plant invasion and contamination from pollutants, herbicides or pesticides. The associated overhead power lines will pose a risk to avifauna susceptible to collisions and electrocution with power line infrastructure.

Uncertainties & limitations with predicting this impact

- A full understanding of the receiving terrestrial and aquatic potential impacts is unknown due to a relatively low literature base on the subject.

Assumptions made when assessing the impact

- The preferred development footprint has been effectively located outside of critical terrestrial & aquatic environments, significantly reducing the impact on sensitive biodiversity.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	3	3	4	3	30	2	Negative	M
	With	2	2	3	2	14	1	Neutral	
2	Without	3	3	4	3	30	2	Negative	M
	With	2	2	3	2	14	1	Neutral	

3	Without	3	3	4	3	30	2	Negative	M
	With	2	2	3	2	14	1	Neutral	
No-go	N/A	1	1	1	1	3	1		N/A
High Significance: 30 - 40		Medium Significance: 20 - 29			Low Significance: 1 - 19				

References (legal, scientific, social or other criteria)

- Comments from **Jacoline Mans**, Chief Forester, DAFF
- Todd, S. & Bragg, C. 2017. *Fauna & flora specialist scoping report – Environmental Impact Assessment for the proposed Soventix Solar PV project: De Aar, Northern Cape Province.*

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- Dependent on the nature and extent of the impact.

Mitigations

Goal: To minimize the impacts on terrestrial & aquatic ecology.

Objective(s) (including targets):

- To have effective terrestrial and aquatic ecological management.

Mitigations to potential impacts resulting from working within aquatic and terrestrial ecology systems		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Operator	Do not harvest any of the vegetation for any purposes whatsoever.
Reduction	Operator	Ensure a no fire policy where the risk of runaway fires can occur.
Avoidance	Operator	Do not poach or hunt animals within the footprints. “Problem” animals must be dealt with assistance from the provincial conservation authority.

Reduction	Operator	Noise monitoring must take place following any complaints of a noise generation nature.
Rectification	Operator	Bird kills as a consequence of overhead powerlines, substation or solar panel collision, must be reported to the developer immediately, and corrective actions implemented to mitigate & remedy the casual factors.
Reduction	Operator	Alien invasive vegetation recruitment must be controlled within and along the fence lines of the solar PV footprints. Manual control measures are preferred, but where herbicides are used they must be those endorsed & selective for the target species with the lowest environmental toxicity.

Activity Group 7: Operation of the PV panels, inverter & substation.

Description of potential impacts

- Solar PV panels do not release Greenhouse Gas / Global Warming Emissions, that contribute to climate change.
- The reflection of sunlight off the solar panels can be visibly intrusive in the natural environment.
- The change in the microclimate beneath the solar panels and between the solar panels may provide different ecological conditions which may encourage or provide suitable conditions for botanical diversity (Montag et al. 2016).

Uncertainties & limitations with predicting this impact

- The ultimate reflectance effect of the solar PV panels on the surrounding natural environment is unquantified.

Assumptions made when assessing the impact

- Solar PV “farms” are not new to other parts of the world, and significant operational environmental impacts are likely to have been exposed since their inception, if significant deleterious effects were present.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	2	2	3	3	21	2	Negative	H
	With	1	1	2	2	8	1	Positive	
2	Without	2	2	3	3	21	2	Negative	H
	With	1	1	2	2	8	1	Positive	
3	Without	2	2	3	3	21	2	Negative	H

	With	1	1	2	2	8	1	Positive	
No-go	N/A	1	1	1	1	3	1	Neutral	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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Reference (legal, scientific, social or other criteria)

1. Cory Toussaint, D. 2017. *Chiropteran Draft Scoping Report for Soventix Solar Farm, Hanover, Northern Cape.*

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- The solar PV plant's operational impact on the receiving environment is expected to be low, other than acting as an exclusion zone to wild life, it is not expected that any irreplaceable loss of resources will occur.

Mitigations

Goal: To minimize the impact of the reflection of sunlight off the solar panels.

Objective(s) (including targets):

- To manage the operation of the plant in a way that minimised its reflectance impacts on the surrounding environment.

Mitigations to potential impacts resulting from operation of the PV panels, inverter & substation.		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Applicant	Use non-reflective material for the PV panels (if possible).
Reduction	Applicant	If birds are nesting on the infrastructure of the facility and cannot be tolerated due to operational risks of fire, electrical short, soiling of panels or other problems, birds should be prevented from accessing nesting sites by using mesh or other manner of excluding them. Birds should not be shot, poisoned or harmed as this is not an effective control method and has negative ecological consequences. Birds already with eggs and chicks should be allowed

		to fledge their chicks before nests are removed.
Rectification	Proponent	All incidents of collision with panels should be recorded as meticulously as possible, including data related to the species involved, the exact location of collisions within the facility, and suspected cause of death. Post-construction monitoring with the aid of video surveillance should be considered, as this will contribute towards understanding bird interactions with solar panels.

Activity Group 8: Social & community changes.

Description of potential impacts

- Community relations.
- Economic benefits.
- Safety and security.
- Generation of renewable energy.
- Sense of place.

Uncertainties & limitations with predicting this impact

- Potential changes to the social receiving environment is difficult to quantify.

Assumptions made when assessing the impact

- Preference will be given to locals when employment opportunities present themselves.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	3	4	3	4	40	2	Negative	H
	With	3	3	3	4	38	2	Neutral	
2	Without	3	4	3	4	40	2	Negative	H
	With	3	3	3	4	38	2	Neutral	
3	Without	3	4	3	4	40	2	Negative	H

	With	3	3	3	4	38	2	Neutral	
No-go	N/A	1	1	1	1	3	1	Positive	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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References (legal, scientific, social or other criteria)

1. Aucamp, I. 2017. *Social Impact Assessment Report for the proposed development of 225 MW solar PV plant in Northern Cape Province*. Equispectives Research & Consulting Services, Pretoria.

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- Following the decommissioning of the plant, there will be a loss of employment and economic benefits derived from the project.

Mitigations

Goal: To minimize the negative social impacts.

Objective(s) (including targets):

- To ensure the timeous drafting and implementation of an Exit Strategy.

Mitigations to potential impacts resulting from social & community changes		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Proponent	Monitoring of social mitigation and management measures
Avoidance	Proponent	Implementation of community relations strategy
Avoidance	Proponent	Implement safety plan, access protocols, grievance mechanism and compensation policy
Avoidance	Proponent	Develop and implement a holistic Exit Strategy.

Activity Group 9: Terrestrial Aspects

Description of potential impacts

- Alien Plant Invasion Risk.
- Soil erosion & associated degradation of ecosystems.
- Faunal Impacts.

Uncertainties & limitations with predicting this impact

- None.

Assumptions made when assessing the impact

- Fauna are highly mobile organisms, which can flee from dangers posed by construction activities. With the exception of smaller tunnelling, burrowing or nesting fauna (in the ground or tree trunks), fauna will instinctively flee, upon an intrusion of their personal space, specifically the 'flight' zone, until the animal has extended the distance to its 'comfort' zone.
- The proposed development footprints have deliberately been located away from sensitive habitats such as watercourses and rocky ridges, to minimize conflict with local fauna and reduce impact on habitat.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	2	3	4	3	26	2	Negative	M
	With	2	2	2	2	12	1	Negative	
2	Without	2	3	4	3	26	2	Negative	M

	With	2	2	2	2	12	1	Negative	
3	Without	2	3	4	3	26	2	Negative	M
	With	2	2	2	2	12	1	Negative	
No-go	N/A	1	1	1	1	3	1	Neutral	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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References (legal, scientific, social or other criteria)

2. Todd, S. & Bragg, C. 2017. *Fauna & flora specialist scoping report – Environmental Impact Assessment for the proposed Soventix Solar PV project: De Aar, Northern Cape Province.*

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- The solar PV plant's operational impact on the receiving environment is expected to be low, it is not expected that any irreplaceable loss of resources will occur.

Mitigations

Goal: To minimize the impact of the solar operation on the terrestrial habitat.

Objective(s) (including targets):

- To manage the operation of the plant in a way that minimises its impacts on the terrestrial environment.

Mitigations to potential impacts resulting from terrestrial Aspects		
Type of mitigation	Responsible authority	Mitigation
Reduction	Contractor	Anthropogenic impacts must be minimized to reduce impacts on nocturnal species, including but not limited to reduced lighting that may influence bat foraging behaviour.

Avoidance	Applicant	Fencing options must be utilised that provide adequate security to the plant, but will not result in animal mortality or require onerous vegetation clearing. Clearvu™ type fencing is preferred over electric fencing.
Reduction	Contractor	Avoid direct contact with fauna, as it can cause injury or death.
Reduction	Contractor	Designate parking areas in order to protect local flora and fauna.
Avoidance	Contractor	Employees must not burn fires to keep warm, because runaway fires can destroy fauna and flora.
Avoidance	Contractor	The undisturbed / natural vegetation units, such as the terrestrial habitats, which fall outside permanent and temporary construction footprints must be designated and demarcated as no-go areas during construction.

Activity Group 10: Visual Aspects.

Description of potential impacts

- Impact on sensitive visual receptors within the region.
- Impact on users on residents of various settlements and homesteads in close proximity to the proposed solar facility.
- Impact on users of national, arterial and secondary roads in close proximity to the proposed solar facility.

Uncertainties & limitations with predicting this impact

- The ultimate reflectance effect of the solar PV panels on the surrounding natural environment is unquantified.

Assumptions made when assessing the impact

- Solar PV “farms” are not new to other parts of the world, significant operational environmental impacts are likely to have already been exposed since their inception.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	2	2	3	3	21	2	Negative	H
	With	1	1	2	2	8	1	Positive	
2	Without	2	2	3	3	21	2	Negative	H
	With	1	1	2	2	8	1	Positive	
3	Without	2	2	3	3	21	2	Negative	H
	With	1	1	2	2	8	1	Positive	

No-go	N/A	1	1	1	1	3	1	Neutral	N/A
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High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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Reference (legal, scientific, social or other criteria)

1. Henwood, S. 2017. *Visual impact assessment report for the proposed Soventix photovoltaic plant – on several portions of the farm Goedeheop, Hanover district, Northern Cape*. Henwood Environmental Services, Mbombela, Mpumalanga.

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- The solar PV plant's operational impact on the receiving environment is expected to be low to medium, it is not expected that any irreplaceable loss of resources will occur.

Mitigations

Goal: To minimize the impact of the reflection of sunlight off the solar panels.

Objective(s) (including targets):

- To manage the operation of the plant in a way that minimised its reflectance impacts on the surrounding environment.

Mitigations to potential impacts resulting from visual aspects		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Applicant	Use non-reflective material for the PV panels (if possible).
Rectification	Applicant	Angle the panels in such a way that the reflection is minimized.
Reduction	Applicant	Make use of a shield-like sheet to prevent direct exposure

Activity Group 10: Fauna Management.

Description of potential impacts

- Light pollution during construction and operational phase may alter species composition, foraging patterns, reproductive success and predation rate.
- Alteration to commuting routes within the landscape as routes may be altered and some species may avoid the solar arrays all together, particularly the low-flying bat species
- Habitat changes beneath the solar panels and the associated impact on prey insect communities may affect bat foraging patterns and areas.
- Changes in bat community, abundance and activity of bat species.
- Bird mortality has been shown to occur due to direct collisions with solar panels. Species affected include waterbirds, small raptors, doves, sparrows and warblers (Kagan et al., 2014). The reflective surfaces of PV panels may confuse approaching birds and in some cases act as an attractant, being mistaken for large water bodies, resulting in injuries and/or mortalities when birds attempt to land on the installations.
- Power lines pose a significant collision risk to birds, affecting a particular suite of collision prone species. These are mostly heavy-bodied birds such as bustards, cranes, storks, large eagles and various species of waterbirds that have limited manoeuvrability in flight, which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines (Anderson, 2001; van Rooyen 2004a; Jenkins et al., 2010).
- Avian electrocutions occur when a bird perches or attempts to perch on an electrical structure and causes an electrical short circuit by physically bridging the gap between live components and/or live and earthed components (van Rooyen, 2004b; Lehman et al., 2007). Electrocution risk is strongly influenced by the power line voltage and the design of the pole structure and mainly affects larger, perching species such as vultures, eagles and storks that are capable of spanning the spaces between energised components.

Uncertainties & limitations with predicting this impact

- Although bird mortality is a documented impact associated with solar PV facilities elsewhere, it is not yet well documented in South Africa and its full risk is still uncertain.

Assumptions made when assessing the impact

- The ultimate reflectance effect of the solar PV panels on the surrounding natural environment is unquantified.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	2	2	3	3	21	2	Negative	H
	With	1	1	2	2	8	1	Positive	
2	Without	2	2	3	3	21	2	Negative	H
	With	1	1	2	2	8	1	Positive	
3	Without	2	2	3	3	21	2	Negative	H
	With	1	1	2	2	8	1	Positive	
No-go	N/A	1	1	1	1	3	1	Neutral	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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References (legal, scientific, social or other criteria)

1. Cory Toussaint, D. 2017. *Chiropteran Draft Scoping Report for Soventix Solar Farm, Hanover, Northern Cape.*
2. Todd, S. & Bragg, C. 2017. *Fauna & flora specialist scoping report – Environmental Impact Assessment for the proposed Soventix Solar PV project: De Aar, Northern Cape Province.*

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- The solar PV plant’s operational impact on the receiving faunal community is expected to be low.

Mitigations

Goal: To minimize the impact of the solar facility on the affected faunal community.

Objective(s) (including targets):

- To manage the operation of the plant in a way that minimises and adapts its management to the fauna of the area.

Mitigations to potential impacts resulting from fauna management.		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Applicant	Use non-reflective material for the PV panels (if possible).
Rectification	Applicant	Angle the panels in such a way that the reflection is minimized.
Avoidance	Contractor ECO	With the exception of search and rescue operations authorized, no mammal, bird, reptile, invertebrate or fish shall be intentionally caught and / or killed.
Reduction	Contractor	Anthropogenic impacts must be minimized to reduce impacts on nocturnal species, including but not limited to reduced lighting that may influence bat foraging behaviour.
Reduction	Contractor	Avoid direct contact with fauna as it can cause injury or death.
Reduction	Contractor	Designate parking areas in order to protect local flora and fauna.
Avoidance	Contractor	Employees must not burn fires to keep warm, because runaway fires can destroy fauna and flora.
Avoidance	Contractor	The undisturbed / natural vegetation units, such as the terrestrial habitats, which fall outside permanent and temporary construction footprints must be designated and demarcated as no-go areas during operation.
Rectification	Contractor	Once impacted upon, disturbed habitats must be rehabilitated immediately before further disturbance.

Decommissioning Phase

Activity Group 1: Disposal of PV panels and other waste

Description of potential impacts

- Illegal dumping of solar PV panels will remove natural habitat.
- Illegal dumping of solar PV panels will result in the loss of certain land uses like agriculture and conservation.
- Excess waste puts a burden on existing landfill sites.
- Illegal dumping sites cannot retain the ecological functions and land use required to generate ecosystem goods and services and tangible economic benefits including income from conservation or farming.
- Waste contaminated areas and illegal dumps can be visibly intrusive in a natural landscape.

Uncertainties & limitations with predicting this impact

- Adequate disposal sites / facilities available for solar PV panels at the termination of the project.

Assumptions made when assessing the impact

- The amount of solar PV plants globally is likely to give rise to new sustainable disposal practices and technologies that will not necessitate disposal to landfill.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	2	3	3	2	16	2	Negative	H
	With	1	2	2	2	10	1	Neutral	

2	Without	2	2	2	2	12	2	Negative	H
	With	1	1	2	2	8	1	Neutral	
3	Without	2	2	2	2	12	2	Negative	H
	With	1	1	2	2	8	1	Neutral	
No-go	N/A	1	1	1	1	3	1	Positive	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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Reference (legal, scientific, social or other criteria)

3. None

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- The decommissioning of the site will allow for the restoration of the full property to agriculture and wild life land uses, assuming decommissioning is done in a responsible and environmentally responsible manner.

Mitigations

Goal: To minimize waste and ensure suitable disposal at the end of project life.

Objective(s) (including targets):

- Avoid improper waste disposal.

Mitigations to potential impacts resulting from <i>disposal of PV panels and other waste</i>		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Applicant	Properly dispose of waste (including the PV panels).
Reduction	Applicant	Apply the "reuse, reduce, recycle" waste management model

Reduction	Applicant	If there are active nests at the site at decommissioning, these should be left along until the birds have finished breeding.
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Activity Group 2: Human influences (staff conduct, movement)

Description of potential impacts

- Loud employees can cause a noise nuisance factor.
- Improper sanitation at latrine sites can cause an odour.
- Litter can get washed into watercourses.
- Employees can harvest indigenous plants for muthi, firewood and poach animals.
- Littering can pose a risk of suffocation to wild animals (littering is likely to be more prevalent at designated eating/rest areas).
- Employees can burn fires to keep warm and runaway fires can destroy fauna and flora and infrastructure.
- Work related activities extending beyond the footprint - called construction (or decommissioning) creep - can disturb habitats.
- Littering is visually intrusive.
- Comments from the Social Impact Assessment Report by Isle Dr Ilse Aucamp of Equispectives Research and Consulting Services - Negative community relations due to conduct of contractors/ representatives of Soventix. Creation of jobs and other economic opportunities. Establishment of infrastructure to generate renewable energy. Fire hazards (caused by people). For some stakeholders the sense of place will change.

Uncertainties & limitations with predicting this impact

- None.

Assumptions made when assessing the impact

- At time of decommissioning of the plant, a small work force will be required to remove all infrastructure, and necessary facilities (ablution, water etc.) will be left on site, to provide the necessary facilities for the decommissioning teams.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	2	2	3	3	21	2	Neutral	H
	With	1	1	2	2	8	1	Neutral	
2	Without	2	2	3	3	21	2	Neutral	H
	With	1	1	2	2	8	1	Neutral	
3	Without	2	2	3	3	21	2	Neutral	H
	With	1	1	2	2	8	1	Neutral	
No-go	N/A	1	1	1	1	3	1	Neutral	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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Reference (legal, scientific, social or other criteria)

1. Aucamp, I. 2017. *Social Impact Assessment Report for the proposed development of 225 MW solar PV plant in Northern Cape Province*. Equispectives Research & Consulting Services, Pretoria.

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- Well managed human resource practices should ensure no further degradation of the footprints during decommissioning.

Mitigations

Goal: To avoid human induced environmental pollution, through waste & noise management and human behaviour.

Objective(s) (including targets):

- To maintain good housekeeping tendencies.

Mitigations to potential impacts resulting from human influences (staff conduct, movement)		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Employees Contractor	No dry wood, living plant or part thereof may be harvested from any plant community.
Reduction	Employees Contractor	No burning, including of waste for any reason.
Rectification	Employees Contractor	Follow housekeeping rules in order to avoid littering.
Reduction	Employees Contractor	Avoid loud noise (i.e. screaming).
Reduction	Employees Contractor	Use the chemical toilets provided for sanitation.
Reduction	Employees Contractor	Clearly demarcate the construction / decommissioning footprint.
Reduction	Employees Contractor	Ensure that local accommodation is available as and when needed.
Reduction	Employees Contractor	Rehabilitate as much as possible so as to retain the original state of the site, as for some stakeholders the sense of place will change.
Avoidance	Employees Contractor	All personnel should undergo environmental induction with regards to avifauna and in particular not disturbing or harming birds.

Activity Group 3: Rehabilitation of affected footprints

Description of potential impacts

- Rehabilitated sites can cause erosion and, if adjacent to or within a watercourse, sedimentation.
- New growth on rehabilitated sites can be overgrazed by mammals.
- Rehabilitation that is not in accordance with the natural plant communities of the area can result in the introduction of non-indigenous plants.
- Disturbed areas, including those recently rehabilitated by the contractor are susceptible to weed, invader and alien plant¹ recruitment and the replacement of indigenous plant communities if not controlled.
- If shaped or sloped incorrectly, such as when the rehabilitated areas are not returned to their original morphology, the resulting landscape can change surface water flow patterns and so too plant communities, more so in arid environments.
- Reinstate ecological function by recreating an open system.
- Comments received from **Francois Taljaard**, Town Planner, Emthanjeni Municipality (**Table 8**); investigate rezoning of each site where development is to take place⁷⁻⁹ - the zoning associated with the operation of a solar PV plant may hinder the successful implementation of the original land use.
- Disturbed sites will comprise mostly cleared / denuded areas that are vulnerable to degradation, including erosion, leading to a loss of biodiversity and ecosystem functions and processes.
- Rehabilitation can be expensive.
- All anthropogenic influences required during operation can be visibly intrusive in the natural landscape.
- The degradation of disturbed sites can result from erosion and plant replacement.

Uncertainties & limitations with predicting this impact

- The magnitude of the impact, specifically the extent and severity of the erosion and sedimentation at time of decommissioning, was not known.
- The magnitude of the impact, specifically the extent of alien plant invasion onto rehabilitated areas at time of decommissioning, was not known.

Assumptions made when assessing the impact

- Disturbed areas will degrade if left alone.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	2	2	3	3	21	2	Negative	M
	With	2	1	2	2	10	1	Positive	
2	Without	2	2	3	3	21	2	Negative	M
	With	2	1	2	2	10	1	Positive	
3	Without	2	2	3	3	21	2	Negative	M
	With	2	1	2	2	10	1	Positive	
No-go	N/A	1	1	1	1	3	1	Positive	N/A

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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References (legal, scientific, social or other criteria)

1. The Principles of NEMA require that a proponent is responsible for any development s/he has initiated from the beginning to the end of the project (“From the cradle to the grave”). This responsibility is passed on from one title deed holder to the next. In line with this principle a rehabilitation plan has got to be drawn up to specify how the area will be rehabilitated once the project has ceased for whatever reason.
2. Conservation of Agriculture Resources Act (Act 43 of 1983) as amended, and administered by the DAFF, including the following:
 - a. Section 15A(1) of CARA, 1983, as amended: Category 1 plants may not occur on any land or inland water surface other than in biological control reserves.
 - b. Section 15A(2) of CARA, 1983, as amended: A land user shall control any category 1 plants that occur on any land or inland water surface in contravention of the provisions of sub-regulation (1) by means of the methods prescribed in regulation 15E.

- c. Section 15B(1) of CARA, 1983, as amended: Category 2 plants may not occur on any land or inland water surface other than a demarcated area or a biological control reserve.
 - d. Section 15B(8) of CARA, 1983, as amended: A land user shall control any category 2 plants that occur on any land or inland water surface in contravention of the provisions of sub-regulation (1) by means of the methods prescribed in regulation 15E.
 - e. Section 15C(1) of CARA, 1983, as amended: Category 3 plants shall not occur on any land or inland water surface other than in a biological control reserve.
 - f. Section 15C(3)(a) of CARA, 1983, as amended: No land user shall allow category 3 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland.
3. Northern Cape Planning and Development Act, 1998.
 4. Emthanjeni Local Municipality, Integrated Development Plan (IDP), 2016/2021
 5. Emthanjeni Municipality, Spatial Planning & Land Use, Management By-law, Northern Cape Province, GN No. 192 of 2015, Provincial Gazettes (Northern Cape), No. 1979 of 14th December, 2015. Spatial Planning & Land Use Mgt Act No. 16 of 2013 (came into force on 01st July 2015).

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- Disturbed areas can be rehabilitated. The cost thereof will depend on the severity and extent of the degradation.
- The extent of reversibility is dependent on the severity of the erosion, including the nature of the remaining *in situ* material, the amount of soil that has been exported from a site and whether or not the exported soil is recoverable. For example, soil washed from a gravel road into a mitre drain can be graded back onto the surface of the road, whereas soil that is washed from a gully into a water course is not recoverable and the source cannot be re-instated without significant intervention and cost. Although erosion has the potential to irreversibly change the relief, eroded sites can be stabilized through rehabilitation measures.
- If controlled timeously the impact of alien plant species can be negligible. However, if allowed to grow unabated, alien invasive species can replace entire plant communities with homogeneous stands. Biodiversity is significantly reduced and ecosystem function is altered. In the latter case, rehabilitation will require significant intervention and cost.

Mitigations

Goal:

Facilitate the natural rehabilitation of disturbed areas and control the replacement of indigenous vegetation by weed, invader and exotic plant species.

Objective(s) (including targets):

- To avoid long-term degradation.
- To reduce erosion of and rehabilitated access roads.
- To prevent the maturation and reproduction of weed, invader and exotic plant species from occurring on any land that is rehabilitated after construction.

Impact 3: Degradation, Alien plant invasion risk, Soil erosion & associated degradation of ecosystems and Faunal Impacts		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Applicant	Reinstate the original land use - rezoning
Reduction	Applicant	Applicant shall monitor the rehabilitated servitudes for signs of erosion.
Rectification	Applicant	If erosion is found to occur during the aforesaid monitoring, the Applicant shall immediately correct (the 'source') and repair (the 'symptom') the erosion using method(s) that are an improvement on the mitigations proposed in the EMPr or on the unsuccessful mitigations originally used on site.
Reduction	Applicant	The rehabilitated plant servitudes shall be monitored following the completion of the construction of the Solar PV plant for the recruitment of weed, invader and alien plant species.
Rectification	Applicant	Applicant shall immediately uproot, cut or debark weed, invader and alien plant species upon being identified.
Rectification	Applicant	Applicant shall collect and destroy all seeds of weed, invader and alien plant species occurring within disturbed and/or rehabilitated areas.
Rectification	Applicant	Rehabilitation must be in accordance with the natural plant communities of the area.
Rectification	Applicant	Reinstate ecological function by recreating an open system.
Rectification	Applicant	All anthropogenic influences required during operation must not be visibly intrusive in the natural landscape.

Activity Group 4: Loss of employment

Description of potential impacts

- Change of land use / livelihoods.
- Decline in economic state.
- Economic impacts.

Uncertainties & limitations with predicting this impact

- Identified concerns from local residents have not been forthcoming thus far in the Public Participation Process.
- It is uncertain if the proponent will sign an additional Power Purchase Agreement with the utility for an additional term.

Assumptions made when assessing the impact

- None.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Alternative	Mitigation Action	Extent	Magnitude	Duration	Probability	Significance	Acceptability	Status	Mitigation potential (to meet objectives)
1	Without	3	3	4	3	30	3	Negative	M
	With	2	2	4	3	24	2	Neutral	
2	Without	3	3	4	3	30	3	Negative	M
	With	2	2	4	3	24	2	Neutral	
3	Without	3	3	4	3	30	3	Negative	M
	With	2	2	4	3	24	2	Neutral	

No-go	N/A	1	1	1	1	3	1	Neutral	N/A
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High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
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Reference (legal, scientific, social or other criteria)

1. Aucamp, I. 2017. *Social Impact Assessment Report for the proposed development of 225 MW solar PV plant in Northern Cape Province*. Equispectives Research & Consulting Services, Pretoria.

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- Following the operation period there will be a loss of employment opportunities.

Mitigations

Goal: Address social concerns.

Objective(s) (including targets):

- To avoid creating false hope where job creation opportunities are concerned.

Impact 4: Decline in economic state		
Type of mitigation	Responsible authority	Mitigation
Reduction	Proponent Contractor	Transparent communication through the right channels to communicate with the community as to when and how their contracts will come to an end.
Reduction	Proponent Contractor	Implement safety plan, access protocols, grievance mechanism and compensation policy.
Reduction	Proponent Contractor	Continue community relations strategy until all activities on site cease and rehabilitation is completed.

Reduction	Proponent Contractor	Implement social mitigation for closure.
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